JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

MINISTRY OF AGRICULTURE AND CO-OPERATIVES,
THE KINGDOM OF SWAZILAND

THE STUDY ON IMPROVEMENT OF RURAL ENVIRONMENT IN DEGRADED LAND IN THE KINGDOM OF SWAZILAND

Final Report

Main Report

JANUARY 2004

KOKUSAI KOGYO CO., LTD.
SANYU CONSALTANTS INC.

PREFACE

In response to a request from the Government of the Kingdom of Swaziland, the Government of Japan decided to conduct The Study on Improvement of Rural Environment in Degraded Land and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA dispatched a study team headed by Mr. Tatsumi TANABE of Kokusai Kogyo Co., Ltd. , consisting of Kokusai Kogyo Co., Ltd. and Sanyu Consultants Inc. , to The Kingdom of Swaziland between January 2001 and November 2003.

The team held discussions with the officials concerned in the Government of the Kingdom of Swaziland, and conducted field surveys in the study area. Upon returning to Japan, the team conducted further studies and prepared this final report.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relationship between our two countries.

Finally, I wish to express my sincere appreciation to the officials of the Government and those concerned in the Kingdom of Swaziland for the close cooperation they have extended to the study.

January, 2004

Shinki Suzuki
Vice-President
Japan International Cooperation Agency

January 2004

Mr. Shinki SUZUKI
Vice-President,
Japan International Cooperation Agency
Tokyo, Japan

LETTER OF TRANSMITTAL

Dear Sir,

It is our great pleasure to submit herewith the Report for the Study on Improvement of Rural Environment in Degraded Land in the Kingdom of Swaziland.

The study was carried out by Kokusai Kogyo Co., Ltd. in association with Sanyu Consultants Inc. under the contract with JICA. The contract period for the Study was 38 months, starting from December 2000 and ending in January 2004. The main purpose of the study was to formulate the master plan to improve the degraded land in the Kingdom of Swaziland, with which, not only establishes a sustainable as well as rational mechanism that works to improve the degraded land in the Kingdom but also contributes to the establishment of the rational land use therein.

With the above-stated purpose, the master plan was formulated targeting at selected three (3) areas with total acreage of 61,800 ha, where land degradation is seriously in progress, with the recommended implementing period of 17 years, starting from 2004 and ending in 2020. In formulation of the master plan, the lessons learnt obtained through implementation of the pilot projects were fully taken into account so that the projects proposed in the master plan can be continuously implemented by participation of the community people concerned in the future.

The basic concepts of the master plan are (1) to implement the proposed projects in combination with top-down and bottom-up methods, and (2) to implement the proposed projects, combining the main components and sub-components proposed in the master plan.

In addition, the study team prepared the Guideline for Soil Conservation, targeting at the study area with the total acreage of 465,000 ha. The guideline was prepared paying attention to the experiences and lessons learnt through the study. We hope the Guideline will be fully utilized for further promotion of the degraded land improvement projects in the Kingdom of Swaziland.

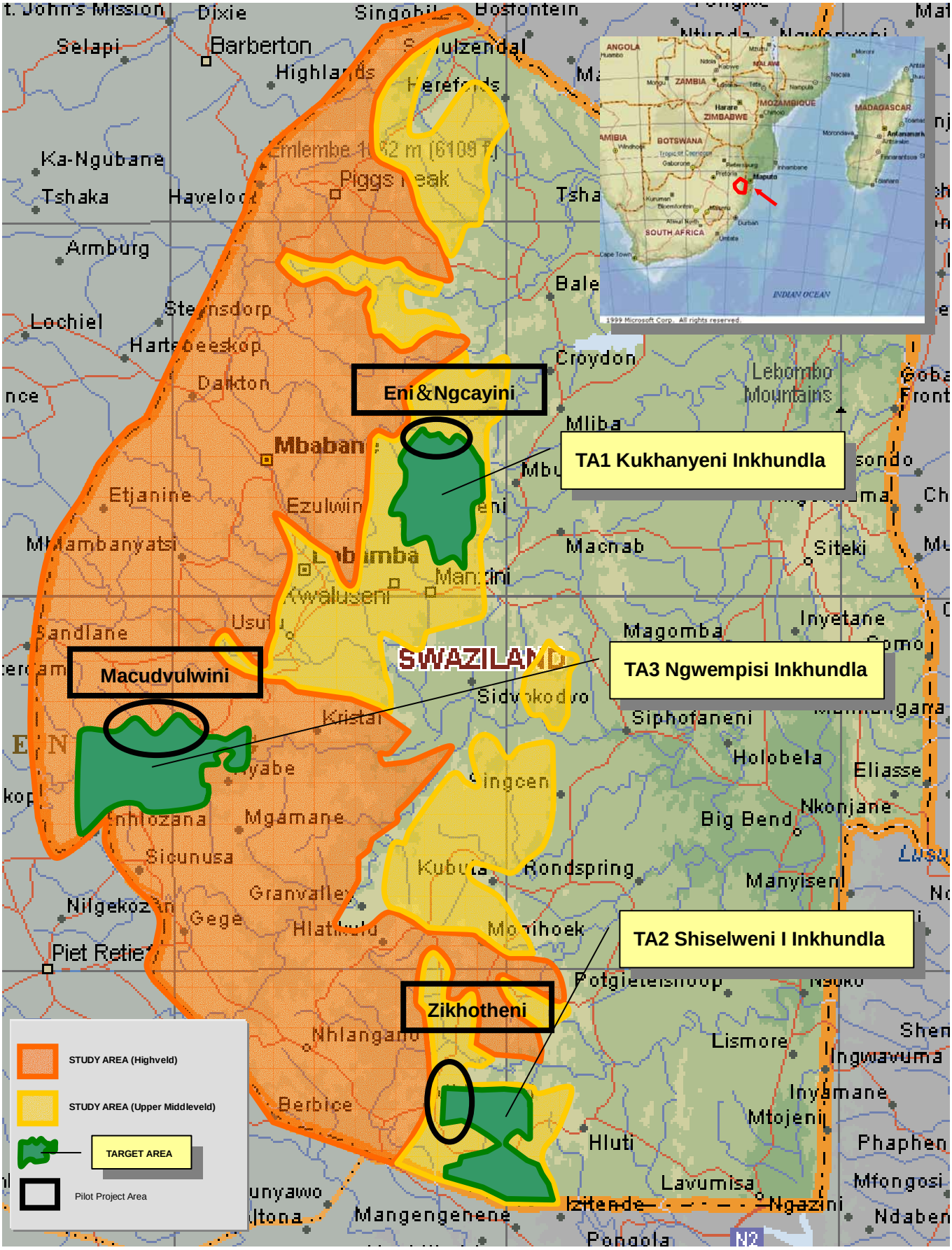
We wish to express our deep appreciation and sincere gratitude to your Agency, the Ministry of Agriculture and Co-operatives of the Kingdom of Swaziland, Embassy of Japan in the Republic of South Africa and to JICA South Africa Office for their close cooperation and assistance extended to the team during the study.

Very truly yours,

Tatsumi TANABE,

Team Leader of the Study Team
for the Study on Improvement of
Rural Environment in Degraded Land
In the Kingdom of Swaziland

Location Map



Project Photograph

1. Contour Terrace

Contour terrace was constructed by community People manually.

After forming the terrace shape, sorn branch was placed in order to protect seeds from livestock

Contour terrace was covered with grasses

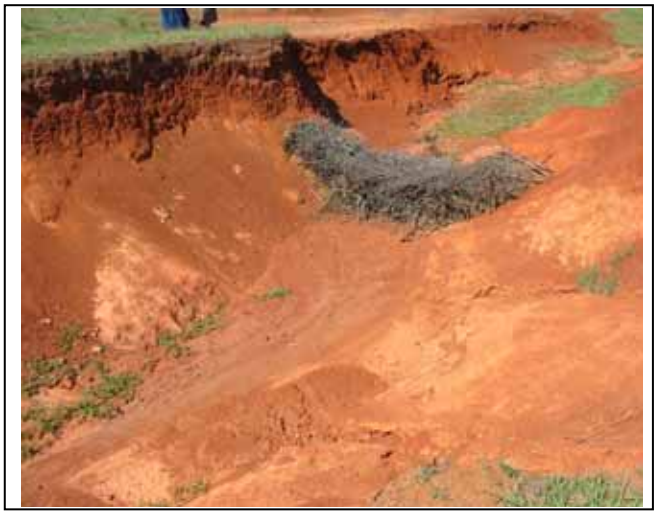
2. Gully Training - 1

Checks made of sand bags and tree branches. Sand and cement were mixed at the rate of 7 to 1.

Checks made of tree branches

Check made of Stones
They are difficult to transport and place in position compare to sand bags.

3. Gully Training - 2



One year after construction of checks inside gully, soils were deposited upstream of checks.

Soils were deposited behind the sand bags. Grasses start to grow and it will be the sign of stabilization of gully.

General views of inside gully after one year

4. Fenced Grazing Scheme

Fencing at the steep slope.

Community people are carrying heavy fencing post to install in remote area.

Cattle were grazed in fenced area in a controlled manner.

5. Feed Lot Beef Fattening Unit

Napia grass was cut by the community people for feeding cattles

Feeding by a feed lot sub-committee member.

Napia grass looks delicious for the cattle.

6. Fodder Plot

Napia grass was cut by community people to make it bundles for transportation

Napia grass stalk was buried in the plot.

Napia leaves are growing very healthy from stalks buried in TA1, ready for harvesting.

7. Afforestation Project

Water tank was constructed for water supply of the nursery and community garden in Zikhoteni (TA2) with the storage capacity of around 56 m^3.

Nursery shed was ready for germinating seeds.

Seed bed was constructed in the nursery compound.

8. Afforestation Project - 2

Fence and gate are erected in order to protect afforestation area from any kind of livestock.

Eucalyptus was selected for initial tree species to be planted.

Soil conservation structures were constructed surrounding the afforestation area.

9. Afforestation Project - 3

Sesbania Sesban was geminated and grown in Central RDA nursery at Ludzeludze for afforestation project

Seedlings are growing very healthy.

Seedlings are planted in the maize field inside Central RDA premises.

10. Spring Protection

The area is protected from livestock by the surrounding fence. Water was stored in the concrete tank with the capacity of 1.2 m^3. Water tap was provided just beside the water tank so that people can save time to fill water to their container.

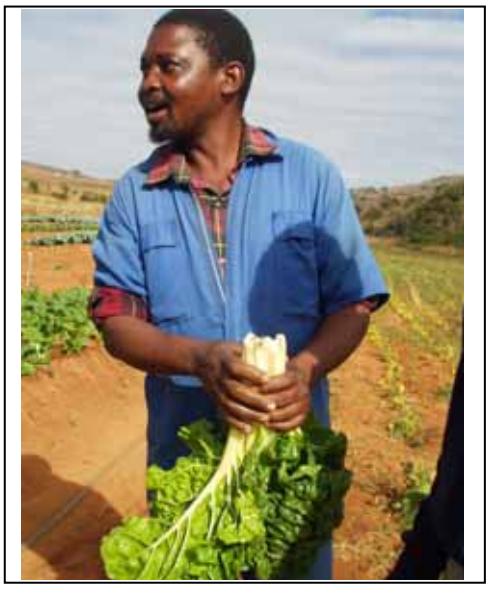
People are very happy to wash their clothes using newly installed washing basins. It is not necessary to bend down the body during washing, enabling them easier and more comfortable works. Simple shower rooms were provided also.

Washing basin

11. Community Garden

Water intake structure which was made of stone and cement mortar.
Silt trap was constructed to prevent the delivery pipe to be choked up.

Watering manually.



Healthy spinach was produced and ready to sell for income generation.

12. Improved Cooking Stove

An improved cooking oven is made of locally available materials such as stones, soil, and water.

An improved cooking oven which was modified by the community people.
It is very neat and looks beautiful.

Oven was painted very beautifully.

13. Self Evaluation Workshop

Self Evaluation Workshop in TA1 held at a school. Women are aggressive to present their experience.

Inter-location monitoring tour visitors at water source protection site in TA3.Participants are very interested to see the washing basin which makes them easy to wash.

Inter-location monitoring tour visitors in TA2 community garden site. People are keen to see the products which are grown very healthy.

14. Training

Soil Conservation Training was conducted in each pilot project area by the staff from MOAC.

Forestry management training for the nursery sub-committee members from Zikhoteni was conducted at Malkerns Research Centre

Feedlot management training was conducted for the feedlot sub-committee members of Eni, Ngcayini and Macdvulwini chiefdoms.

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Abbreviations and Acronyms

CDC:	Community Development Committee
DPMO:	Deputy Prime Minister's Office
GIS:	Geographic Information System
GOS:	Government of Swaziland
JICA:	Japan International Cooperation Agency
MOAC:	Ministry of Agriculture and Co-operatives
NAP:	National Action Plan
NDS:	National Development Strategy
NGO:	Non-Governmental Organization
NLEP:	National Land and Environment Policy
PCM:	Project Cycle Management
PDM:	Project Design Matrix
PPMU:	Pilot Project Management Unit
RDA:	Rural Development Area
SEAP:	Swaziland Environment Action Plan
SFDF:	Swaziland Farmers' Development Foundation
SNL:	Swazi Nation Land
TA:	Target Area under the Study
TDL:	Title Deed Land

Currency Equivalents

Currency Unit:	Emalangeni (E)
1.0 E	0.127965 US$
US$ 1.00	7.8146 E (As of May 27, 2003)

Measurements

m:	Meter
Km^2:	Square Kilometer
ha:	Hectare (10,000 m^2)
m^2:	Square Meter
m^3:	Cubic Meter

Executive Summary

1 Introduction

1.1 Introduction

This is the Draft Final Report (2) for the Study on Improvement of Rural Environment in Degraded Land in the Kingdom of Swaziland, which was prepared in accordance with the Scope of Work agreed upon between the Ministry of Agriculture and Co-operatives (MOAC) and Japan International Cooperation Agency (JICA) on August 23, 2000.

1.2 Background of the Study

Agriculture is one of the most important industries in Swaziland. About 60 % of Swazi people engage themselves in agriculture and livestock farming. Accordingly, the country's GDP largely depends on the agricultural production. As population increases more intensive land use has prevailed throughout the country. Above all, grazing land in SNL has heavily been degraded due to overgrazing as compared to arable fields where grass strips have protected them against erosion. So far, no systematic countermeasures against land degradation have been taken on grazing land in SNL, although some studies and trials have been carried out by MOAC, NGOs or the projects sponsored by foreign donors.

Topographically, Swaziland is divided into 4 zones, i.e., Highveld, Upper and Lower Middleveld, Lowveld, and Lubombo Plains. It has been reported that most severe land degradation is observed in the Highveld and Upper Middleveld of the country. Especially, land degradation in Swazi Nation Land (SNL), located within the Middleveld, where people usually practice small-scale livestock farming and agriculture under the leaderships of traditional chiefs, has been rapidly progressing due mainly to lack of proper range management.

In spite of these situations, no proper countermeasures against land degradation have been taken in the most part of SNL. Under these circumstances, several studies and policies were made and proposed by foreign donors to improve the above-mentioned situation. And several land conservation projects were and have been implemented in 3 target areas by MOAC and local NGOs; however, the outcomes of those projects are not fruitful in general. The reasons for this may be attributed mainly to the following:

(1) Lack of technology and capability of project implementation and management by administrative sectors,

(2) Lack of considerations for social and environmental conditions in implementation of the projects, and

(3) Project implementation body in combination with governmental administrative sectors, NGOs and communities has not been fully established.

In 1996, the Government of Swaziland, in due consideration of the above situation, requested the Government of Japan to undertake a study on improvement of degraded land and its development. In response to this request, considering the need of further information on the condition of the land degradation and on-going related studies by other donors, the Government of Japan undertook a project formation study on contract basis with a local consultant in Swaziland. The report on the study was completed in April 1999. In the report, 3 targets areas were proposed for further study. Also, it was proposed in the report that several pilot projects focusing on improvement of degraded land should be implemented at different levels, i.e., central government, Inkhundla as well as at community levels in the course of the study.

The Government of Swaziland, in 1999, requested again the Government of Japan, (1) to review the above report, (2) to conduct a study in 3 target areas, and (3) to formulate a master plan on improvement of rural environment in degraded land in the Kingdom of Swaziland. In response to this request, the Government of Japan, in August 2000, dispatched a study team to discuss and finalize the scope of works for the study. On August 23, 2000, the Government of Swaziland and JICA Preparatory Study Team signed the Scope of Works for the study.

1.3 Purpose of the Study

The purpose of the study is to realize sustainable land use in Highveld and Upper Middleveld in the Kingdom of Swaziland through improvement of the degraded lands in 3 target areas. To achieve this target, the following works are carried out in the course of the study.

(1) To formulate a master plan to improve the degraded lands in 3 target areas, paying attention to: i) income generation; ii) improvement of living environment; and iii) environment conservation in 3 target areas.

(2) To establish a consistent basis for land degradation control systems, which enables sustainable implementation of the pilot projects together with related government agencies, NGOs and traditional communities in 3 target areas.

(3) To prepare a guideline for improvement of the degraded lands in the study area, applicable to SNL in Highveld and Upper Middleveld.

(4) To undertake technical transfer to the counterpart personnel of the Government of Swaziland with respect to planning procedures and methods as well as with respect to the study items specified in this study.

1.4 Study Area

The study area consists of the following two (2) areas.

(1) Target Area (TA)

Target area is defined as the area, for which the Master Plan is formulated. It consists of the following 3 areas. Total target area covers about 13 % of the study area.

Table 1-1: Target Area and Related Inkhundla

Name of Target Area	Name of Related Inkhundla	Area (km^2)
TA1	Kukhanyeni	195 (19,500 ha)
TA2	Shiselweni 1	117 (11,700 ha)
TA3	Ngwempisi	306 (30,600 ha)
Total of Target Area	3 Tinkhundla	618 (61,800 ha)

(2) The Area for Formulation of the Guideline (Study Area)

The study area consists of SNL in Highveld and Upper Middleveld, which include the said 3 target areas. The study area covers approximately 4,650 km^2. The guideline will be formulated targeting at the study area.

1.5 Study Schedule

The flowchart of the overall study schedule is presented in Figure 1-1.

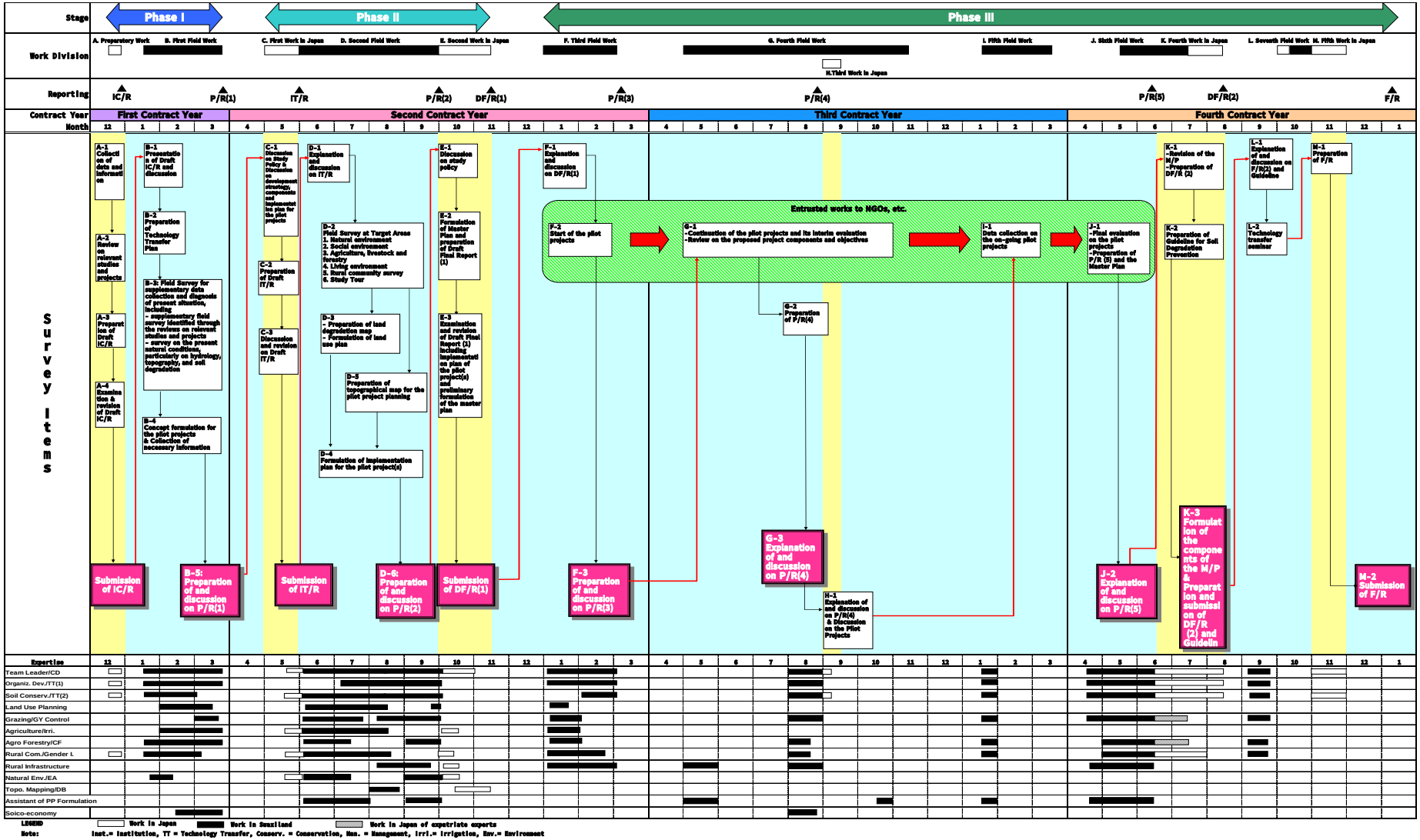


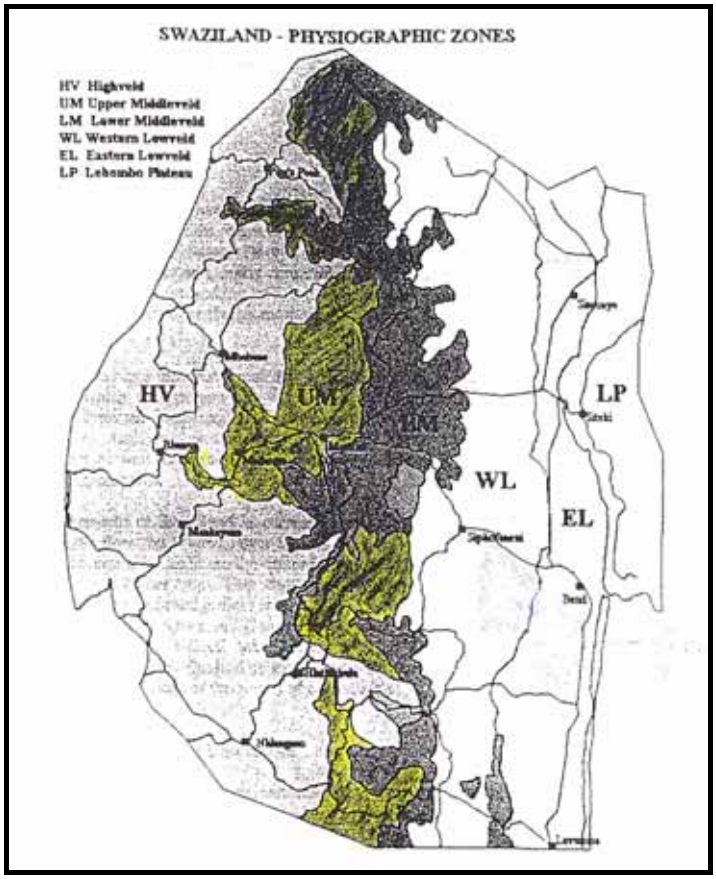
Figure 1-1: Flow Chart of the Study

2 General Condition of the Study Area

The study area is located in western part of the country and it covers an area of about 4,650 km^2. It consists of Highveld and Upper Middleveld. Topographically, Swaziland is divided into 4 zones, i.e., Highveld, Upper and Lower Middleveld, Lowveld, and Lebombo plains. It has been reported that most severe land degradation is observed in the Highveld and Upper Middleveld of the country. Especially, land degradation in Swazi Nation Land (SNL), located within the study area, where people usually practice small-scale livestock farming and agriculture under the leadership of traditional chiefs, has been rapidly progressing due mainly to lack of proper range management. In spite of these situations, no proper countermeasures against land degradation have been taken in the most part of SNL in the country.

Physiographic Zone	Altitude (minimum – maximum)	Landform
Highveld	600 – 1,850 m	Medium hills associated with high hills and plateau
Upper Middleveld	400 - 1,000 m	Medium hills associated with low hills and plateau
Lower Middleveld	250 – 800 m	Plain associated with low hills
Lowveld	200 – 500 m	Plain
Lebombo plains	100 – 750 m	Plateau dissected

Source: A Remmlezwaal (1993)



2.1 Present Condition of the Target Area

2.1.1 Target Area 1 (TA1)

The basic information of TA1 is summarized below.

TA1 is located in the central part of the Upper Middleveld, characterized by typical agro-ecological features in this veld. The western half of the TA has more seriously eroded than the eastern half mainly because of heavier and longer exploitation by overstocking, less rate of arable land in land use pattern and higher erodibility of soil surface. It's also partly attributable to features of surface geology with typical faults running over western half, developed over highly weathered granodiorite base versus less weathered granitic gneiss covering western half.

Though the eastern part shows severe erosion in places, mainly in the central and southern areas of Nyakeni and Maliyaduma, it is generally less eroded than the western part. Changes in land use, from arable to grazing, which in particular occur in the northern part of the TA, have resulted in improved protection of grazing land from erosion owing to the remnant old grass strips remaining over converted grazing tracts. Contour lined grass strip in the contemporary arable plots in the eastern half also serves as an efficient protector against erosion. Comparison of the 1999 air photography with that of 1989 reveals that the area covered with wattle shrubs has increased. This is a typical type of land degradation by encroachment of useless plant narrowing the area under palatable grass for grazing. Overall land use has not changed much in these decades, though few arable area has been added and few arable fallow area has been converted into grazing land.

This TA has more favourable climatic and soil condition as compared to TA2, but the problem lies in fewer coverage of tree canopy that gives an adverse effect on both firewood supply and water retentive capacity of watershed. Hilly nature of topography and high rate of barren ground surface foster faster runoff of rain water, leading to the area lower surface and groundwater availability and excessive drying of ecosystem. Agricultural activity puts priority more on crop production than on animal husbandry, and still remains in sedentary nature despite favourable market access. Availability of surface water for irrigation and processing industries has been limited by the reason as cited above, and this serves as a limiting factor for the area to develop further. Local population has long been engaged in traditional grazing , however, cattle kept by them have not brought any substantial earning to the local people, just because it has not been market-oriented, but only contributed to keep private property in the form of livestock

As land degradation proceeds in this TA, carrying capacity of the grazing land dwindles year after year, whereas rate of overstocking is evident in the figure of actual density thereon that indicate around four times as much as sustaining capacity of land. Such heavy overgrazing has been urging and accelerating soil erosion. Expansion of eroded patches is leading to escalation of denuded, bare ground over grazing land, spurring exponential increase of surface soil loss both during rainy season through rainwater runoff and during dry season through gale wind erosion. What cannot overlook is the fact that around 30% of grazing land has been affected by encroachment of alien tree and herb species and unpalatable grasses, threatening growth of desirable grazing grass species.

Socioeconomic profile gives higher dependence on migrant works due to less opportunity of domestic earning making use of local resources. However, lingered recession has narrowed chance of earning out of the TA, thus many migrant workers have returned from abroad and urban quarters failing to keep their income sources. Traditional grazing now impedes the creation of new income chance within homestead area because useful land has been occupied by unprofitable cattle herds, since livestock owners can hardly dispose them so long as they survive on grazing fields. In this TA, poverty is not immediate concern but large cattle herds

occupying fairly large area forms a vicious circle, giving detrimental effect on the efforts of introducing opportunities of income generation within the local media, though NGOs began challenging to under-employment by bringing cottage industries for development of women based activities.

Table 2-1: Current Status of TA1

Item	Area (ha)	Population	No. Household	Cattle head	No. of Chiefdom
Sociological data	19,500	18,500	2,900	15,700	15
Economic data	Annual income	farm income	Staple/capita	Market access	Annual expense
	E16,758	E8,000	0.41 ton/year	favorable	E15,000
Meteorological	Rainfall	Max. rainfall	Min. rainfall	low temp.	high temp.
data (mm/year)	903	1,293	524	15.3C	23.6
Land use data	Arable field	Forest	Grazing area	Amenity area	Altitude
(ha)	5,530	280	10,430	41	600m
(%)	34	2	64	0	~870m
Agriculture	maize	sweet potato	groundnut	other crop	Total
ha / household	1.75	0.66	0.30	0.07	2.78
annual output	2.8 t	4.6 t	0.2 t	0.2 t	7.8 t
Livestock	cattle	goat	sheep	pig	carrying capacity
No. of head	15,707	8,278	605	800	0.26 LSU/ha
Head / household	6.8 adult	3.4	0.4	0.6	actual density
Holding household	53%	29%	5%	22%	0.99 LSU/ha
Forestry	community woodlot	yield /year	firewood use	firewood requirement	self-supply rate
	11.5 ha	329 m^3	410 kg/capita	8,924m^3	4 %
Land	extremely eroded	severely eroded	moderately eroded	slightly eroded	encroachment
Degradation	360 ha	1,510 ha	6,030 ha	120 ha	2,920 ha
	2 %	8 %	31 %	0 %	28 % of G.F.
No. of TRGs:	99	RTG density	per 2 km^2	annual soil loss	5.7 ton/ha/year
Rural society	migrant workers	equality on D.M.			
& gender	77 %	44 %			

Note: GF; grazing field area. RTG; ravine type gully, LSU; livestock unit (250kg live-weight equivalent)

2.1.2 Target Area 2 (TA2)

The basic information of TA2 is summarized below.

TA2 is located in the lower edge of the Upper Middleveld, with a typical agro-ecological feature of growing desertification. The northern part of the TA has most seriously eroded that the eastern half mainly because of heavier overgrazing, higher population density and outstanding erodibility of soil surface. Frequent occurrence of ravine type huge gullies is attributable to surface geological features with a fault running from south to north, developed over severely weathered granitic gneiss, with heavy clay (mainly kaolinite) formation catalyzed by fault development.

Communal grazing land along this fault, lying along the basin of Ngwane River undergoes heavy dissection by gullies, though entire area is subject to accelerated erosion process. Expanding RTGs are even engulfing part of arable land lying over the river banks. The southern part of the TA seems less eroded than the northern part, partly because of less populated. Changes in land use, from arable to grazing, does occur in the southern part since farmers have abandoned long left fallow land that can hardly recover soil fertility. In several tracts, complete topsoil has been eroded through runoff, exposing bare rock, stone pieces and gravel over the surface, as commonly observed throughout southern plateaus in Swaziland. For the entire TA, the land degradation has caused a considerable loss of grazing grass and cereal production. Though vegetative cover with wattle shrubs has not so much increased as other TAs, indigenous aloe has intensely expanded its colonies over grazing fields of this TA. This also gives a typical type of land degradation by encroachment of useless plant species. Land use in this TA has changed in these decades through land acquisition by the Government from late private owners.

This TA has relatively adverse climatic and soil condition as compared toTA1 andTA3, where the problem arises from least canopy cover that exerts disadvantageous effect on both firewood supply and water conservation of watershed. Somewhat flat nature of topography could curb runoff washing risk but high rate of widely distributed bare ground patches induces heavier runoff during rain-storms, leading to the area acute depletion of groundwater resource and accelerated desertification of entire ecosystem. As farming activity can hardly sustain livelihood, many households have resorted to migrant labor opportunities in South Africa. Here, crop production remains too erratic to rely upon, and local population tend to rely more cattle grazing as a form of saving account earned and remitted from abroad. On the other hand, farming still lags behind as a sedentary form because of inconvenient market access. Availability of surface water for irrigation has been highly limited amidst the decertifying process, and this plays as a hurdle for the area to develop further. Local population has long been entrapped in traditional grazing; however, cattle kept by them have not often been sold because of its nature of safety net to be prepared for unexpected expenditure.

As land degradation proceeds in this TA, carrying capacity of the grazing land has been so deteriorated that it marks lowest of the 3 TAs. To reflect this situation, the actual herd density also gives lowest level among three TAs, though still keeping more than two times as much as sustaining capacity of land. Continued heavy overgrazing has resulted in occurrence of RTGs with higher density than TA1. Ever growing RTGs are not only engulfing arable land, but also threatening housing quarters in Galile, where the house of vice-chairman of the development committee is about to be fallen into encroaching gully heads. Expansion of eroded areas with barren patches is partly attributed to the nature of exposed saprolite rocks over grazing land where even subsoils has been eroded away. In this area, considerable portion of surface soil loss occurs both during rainy season through rainwater runoff and during dry season through gale wind erosion, due typically to topographic plainness. Also, 14% of grazing land has been affected by encroachment of alien tree and herb species like *Aloe marlotti*, *Lantana camara*, *Psidium guyava*.

Socioeconomic profile gives considerable dependence on migrant works due to meager opportunity of domestic earning due to poor local resources. However, lingered recession in South Africa has narrowed chance of earning out of the TA, thus many migrant workers ought to have returned from working places or urbanized areas losing their income sources. As they still cling to traditional way of grazing that has become an obstacle against creative efforts of additional income chance within villages, for precious land has still been dedicated to lean and too many cattle herds, since livestock owners can hardly forsake their long-kept herds so long as they survive on grazing fields. In this TA, poverty is threatening daily life with a burden of heavy cattle herds that continue to use vast grazing space, affecting the efforts of improving livelihood by WID

Table 2-2: Current Status ofTA2

Item	Area (ha)	Population	No. Household	Cattle head	No. of Chiefdom
Sociological data	11,700	14,700	2,300	11,900	5
Economic data	Annual income	farm income	Staple/capita	Market access	Annual expense
	E11,000	E6,200	0.20 ton/year	Too remote	E13,200
Meteorological	Rainfall	Max. rainfall	Min. rainfall	low temp.	high temp.
data (mm/year)	783	1,172	288	13.5C	20.9C
Land use data	Arable field	Forest	Grazing area	Amenity area	Altitude
(ha)	3,597	67	8,028	8	350m
(%)	31	0	69	0	~620m
Agriculture	maize	sweet potato	groundnut	other crop	Total
ha / household	1.47	0.50	0.29	0.06	2.32
annual output	2.1 t	3.6 t	0.2 t	0.1 t	6.0 t
Livestock	cattle	goat	sheep	pig	carrying capacity
No. of head	11,902	5,352	811	2,200	0.24 LSU/ha
Head / household	5.8 adult	2.6	0.4	1.0	actual density
Holding household	50%	37%	7%	3%	0.56 LSU/ha
Forestry	community woodlot	yield /year	firewood use	firewood requirement	self-supply rate
	6.5 ha	95 m^3	450 kg/capita	7,782	1%
Land	extremely eroded	severely eroded	moderately eroded	slightly eroded	encroachment
Degradation	270 ha	839 ha	2,530 ha	280 ha	1,124 ha
	2 %	8 %	21 %	3 %	14 % of G.F.
No. of TRGs:	131	RTG density	per 1.1 km^2	annual soil loss	3.2 ton/ha/year
Rural society	migrant workers	equality on D.M.			
& gender	77 %	44 %			

2.1.3 Target Area 3 (TA3)

The basic information of TA3 is summarized below.

TA3 is located in the western edge of the Highveld, characterized by a humid agro-ecological zone and steep topography in this veld. The western and the central parts of the TA has somewhat more seriously eroded than the northern and the eastern parts mainly because of heavier overgrazing over colluvial, friable deposits. The northern border of the TA has less arable land but wider forest cover owing to the activity of Usutu Forestry Company. Apart from the central part, the north eastern border where Mankayane township is located has been subject to serious gully erosion, because the area is situated on a south-north running fault line. As seen in the below table, This TA has densest RTG distribution among 3 TAs on highly weathered granodiorite and colluvium base

Northern part is least eroded thanks to thick litter coverage. Changes in land use, from arable to grazing, or vice versa, which partly take place in the southern part of the TA in the form of resettlement, have resulted in improved protection of grazing land from erosion owing to the remnant old grass strips or new ones worked over newly reclaimed land. A special feature of this TA resides with vast thriving of wattle forests of Australian origin. This encroachment is not becoming a nuisance due to low value and low demand for tanning. The reason why wattle bursts out may lie in the fact that field burning fosters to break dormancy of wattle seed lying over the ground and also sparse population have cut fewer tree stands. This is really a typical type of land degradation by encroachment of useless species narrowing grazing space under palatable grass cover. Overall land use has virtually not been changed much in these decades, though some forest area has been purchased as SNL by the government and some grazing space has been offered to resettlement.

This TA has been endowed with favourable climatic and soil condition as compared to other TAs, but the problem arises from remoteness with poor access to farm markets and mountainous nature of topography. Local population can enjoy ample firewood supply and water resource. and low rate of barren ground surface that can conserve rain water, contributing to higher surface and ground water availability that prevents from drying of ecosystem. Agricultural activity puts priority more on crop production than on animal husbandry, though still remaining in subsisting nature partly because of poor marketing access. Availability of surface water for irrigation and processing industries has been high by the above-cited reason, and this offers a good opportunity for the area to develop further. Local population, in particular those living around river basin has traditionally been engaged in cattle grazing , however, cattle kept by them have not given them any substantial earning, just because it has been too extensive and not at all market-oriented, contributing only to keep their surplus earning in the form of livestock

As land degradation with outbreak of RTGs goes on in this TA, carrying capacity of the grazing land has been seriously affected, whereas rate of overstocking is evident in the figure of herd density that stays three times as much as sustaining capacity of land. Such heavy overgrazing has been urging and accelerating soil erosion, along with increased frequency of field burning so as to reactivate grass regeneration, because local population ignore detrimental effect of burning. Expansion of eroded patches entails in escalation of futile, barren ground over grazing land, bringing about growing surface soil loss mainly during rainy season through rainwater runoff. What cannot overlook is the fact that 14% of grazing land has been affected by encroachment of alien tree and herb species and unpalatable grasses, threatening growth of desirable grazing grass species.

Socioeconomic profile indicates lower dependence on migrant works thanks mainly to pulp forest company that has offered casual hiring for timbering works. However, lingered recession has already reached, narrowing chance of earning within the TA, thus part-time workers have been dismissed from forest labour, losing their income sources.

Table 2-3: Current Status ofTA3

Item	Area (ha)	Population	No. Household	Cattle head	No. of Chiefdom
Sociological data	30,600	30,000	4,400	18,500	10
Economic data	Annual income	farm income	Staple/capita	Market access	Annual expense
	E13,000	E8,700	0.28 ton/year	remote	E14,000
Meteorological	Rainfall	Max. rainfall	Min. rainfall	low temp.	high temp.
data (mm/year)	878	1,770	415	12.9C	20.0C
Land use data	Arable field	Forest	Grazing area	Amenity area	Altitude
(ha)	8,500	2,360	18,325	36	880m
(%)	29	8	63	0	~1,420m
Agriculture	maize	sweet potato	groundnut	other crop	Total
ha / household	1.92	0.49	0.25	0.07	2.73
annual output	2.7 t	4.4 t	0.2 t	0.1 t	7.4 t
Livestock	cattle	goat	sheep	pig	carrying capacity
No. of head	21,040	12,448	758	2,000	0.29 LSU/ha
Head / household	12.4 adult	6.1	0.1	0.6	actual density
Holding household	75%	53%	3%	17%	0.78 LSU/ha
Forestry	community woodlot	yield /year	firewood use	firewood requirement	self-supply rate
	54 ha	1,440 m^3	410 kg/capita	14,480m^3	10%
Land	extremely eroded	severely eroded	moderately eroded	slightly eroded	encroachment
Degradation	700 ha	1,560 ha	4,560 ha	2,810 ha	1,460 ha
	2 %	5 %	15 %	9 %	14 % of G.F.
No. of TRGs:	113	RTG density	per 0.3 km^2	annual soil loss	4.2 ton/ha/year
Rural society	migrant worker	equality on D.M.			
& gender	50 %	25 %			
issues					

3 Pilot Projects

3.1 Objectives

Pilot Projects (P/Ps) are the experimental implementation of some important components of the Master Plan (M/P) to be made in the study. Therefore, the objectives of the P/Ps are to draw lessons, to examine the potential drawbacks and countermeasures, and to make the M/P more practical.

3.2 Selection of the Pilot Projects

3.2.1 Background and Methodology of Selection of P/P

Many programs and projects have failed due to not involving beneficiaries from the planning stage. People might feel that the fence prepared through the range management project belongs to the donor agency, not to the community. Therefore, when the necessity of maintenance arises, they simply wait for the donor to come back, rather than taking action from their side. Project ownership should belong to the community for the sustainability of activities. For that reason, participatory planning of the pilot project was adopted.

On the other hand, there is a limitation for the team side to leave planning open to the community needs. Considering about time schedule, size of input, balance of three pilot areas and objectives of this study, project planning should be done not “by the community”, but “with the community”. Therefore, the Project Cycle Management (PCM) Method was adopted as a tool for project planning and resource people were both community and the team.

Community people of each pilot area gathered at meeting points, which was decided by them, and Stakeholder Analysis (Workshop 1), Problem Analysis and Objective Analysis (Workshop 2) of PCM method, were carried out. Majority of the participants could read and write, and they had no problem of understanding the structure of problem/objective trees after showing the examples.

After objective tree was freely prepared by the community, study team provided additional information (Workshop 3) which was missing from the tree.

Finally, participants selected some of the components from the prepared means (Workshop 4). As a total, four workshops were conducted at each chiefdom for the formulation of pilot projects.

3.2.2 Selected Pilot Projects

After the several considerations, following Pilot Projects were selected at each Target Area.

Table 3-1: Selected Pilot Projects in each Target Area

Description of P/P	Location		
	TA1	TA2	TA3
Soil Conservation Project Gully Training and Contour Terrace	○	○	○
Range Management Project Rotation Grazing and Feed Lot	○		○
Forest Management Project Nursery and Afforestation		○	
Agricultural Management Project Community Garden		○	○
Improved Cooking Oven Project	○	○	○
Spring Protection Project	○	○	○

3.3 Results of Each Pilot Project

The results of each pilot project including its evaluation are summarised below.

3.3.1 Soil Conservation Project

<table>
<tr><td colspan="2">Objective:
1) To minimize soil loss from surface soil and improving vegetation in grazing area
2) To stabilize gully from bottom of the gully
3) To establish conservation methodology and justification of applied techniques, and
4) To raise the awareness of stakeholders for soil conservation activities</td></tr>
<tr><td>Participants of the Community:
- Soil Conservation Committee in each TA
- No. of members: TA1: 7HH, TA2: 40HH, TA3: 18HH</td><td>Major Inputs:
- Community; Labour force, Materials locally collectable (rock, sand, etc.),
- GOS; Coordination, transport, heavy machines
- JICA; Experts, Materials (fencing wire, posts, cements, etc.), employment of NGOs</td></tr>
<tr><td colspan="2">Major Activities:
Contour Terrace;
- The width of contour terraces is fixed at 1.7m and their interval varies from topographic gradient, ranging 15.5-20.5m. The length of the terraces is also variable, ranging 20-36m so that cattle can pass one block to another between two terraces of the same elevation. The surface of the terraces is planted with rhizomes of drought tolerant, palatable and readily available grass species.
Gully Training;
- In order to retain clay material and let them sediment at the bottom of gullies, locally available materials such as stones, sand, tree blanches were heaped in the bottom of gullies and induced sedimentation at the bottom.</td></tr>
<tr><td colspan="2">Major Achievement:
Contour Terrace;
- Natural regeneration of grasses over the terraces is favourably going on, and planted Eucalyptus grandis showed fast growth at a rate 100cm/year in TA1, though the grass</td></tr>
</table>

has not yet been regenerated over the treated surface inTA2.
- The surface of cut belts has been covered with germinated and crept by wild grasses. These terraces also have caught runoff soil particles flowing down from upward slope, with deposit as thick as 15-28mm on average above the cut surface in.
- The estimated soil volume trapped in the terraces amount to 9.9 to 13.2 m^3 flown from catchments of 0.25- 0.46ha equivalent to 29-40m^3 or 43-64 ton/ha.

Gully Training;
- The check structure for gully training could retain about 85m^3 of earth deposited by wall slumping. Since the volume of lost wall is estimated to 127.5m^3, the effect of these structures in retaining slumping amounts to 67%.
- In the case of the treated trenched gully, the head of rill part right branch proceeded by 3m to the upstream side, but that of left branch remains the same as it was observed before starting the activity.

Problems and Challenges:
- InTA1, it was observed that cattle invaded into the treated area.
- Because of strong acidic nature of surface pegmatitic saprolite the terraces constructed were still weak in TA2.
- Steeper slope gradient and rough bulldozer works disturbed heavier surface in TA3. It is necessary to re-think of the use of bulldozer.
- Although sufficient community people participated for the construction at the beginning, active participation was not acquired in the later half of the construction work and after completion of construction work due to the lack of motivation for the participants. In order to keep the motivation of the community people for participation in the public work such as soil conservation, combination with other profit-oriented schemes will be essential.

Comprehensive Evaluation:
Observing the result attained in pilot project, applied techniques were appropriate which are simple and effective, and utilisation of local materials apart from cement and wires contributes to minimise the construction cost. This methodology can be applied to other areas for effective soil conservation. On the other hand, the maintenance system by the committee has not been trained enough in terms of awareness to the necessity. Although, the training was carried out in the field in the end of May, more trainings will be indispensable for more effective work and sustainability.

Lessons Learnt:
- *Difficulty to sensitise the community*; Since land has been degrading in invisible process, it is time consuming process to make rural population fully aware of endangered land quality and to let them feel serious anxiety on soil loss, and encroaching desertification. Continuous education and training including the awareness toward disadvantages of overstocking of cattle, will be necessary.
- *Land degradation measures as public works*; Observing the amount and seriousness of gullies and land degraded areas, it is necessary to implement soil conservation work as public works.

Feedback to M/P:
- M/P should mobilize RDA staff to formulate work plans/ designs, to assist chiefdoms concerned for implementation of conservation works and to provide inputs.
- Awareness building and sensitization are essential to effectively involve stakeholders into soil conservation activities. Background education for school children and enlightenment of adult are required.
- Conservation works should be coupled with more attractive and fast ripening activities like community garden scheme.
- Majority of the stakeholders still cling to overgrazing, the direct cause of degradation, and never agree to take measures that may alter current traditional livestock holding system. Any criticism on overstocking is a taboo in front of those who keep cattle.

3.3.2 Grazing / Range Management Project

Objective:
1) To alleviate soil erosion caused by free grazing activities,
2) To increase income from livestock by improvement of grazing land and selling fattened beef in the feedlot
3) To train the community people on controlled grazing management and commercial livestock management

Participants of the Community:	Major Inputs:
- 3 Grazing management committee (2 in TA1&1 inTA3), - 2 Fattening unit committee (1 in each TA), c.f. Expected beneficiaries: Eni; 49HH, Ngcayini; 79HH, Macdvulwini; 400HH	- Community; Labour force, Materials locally collectable (rock, sand, etc.), - GOS; Coordination, transport, heavy machines - JICA; Experts, Materials (fencing wire, posts, cements, etc.), employment of NGOs

Major Activities:
Fenced Grazing Scheme;
- Fence the selected target area to control grazing. The area was subdivided into four(4) to six(6) paddocks in order to control the places for cattle to feed. The size of the fenced areas are as follows; Eni:90ha, Ngcayini: 100ha, Macdvulwini: 280ha.

Beef fattening in feedlot;
- Feedlots structures were constructed which have area of 140sqm concrete slabs, water trough and feed trough will be provided to feed.
- Fodder production field of 2-4 ha will be situated next to the feedlot to supply fodder to the cattle.

Major Achievement:
Fenced Grazing Scheme;
- The targeted areas were fenced as planned, however the effects have not be confirmed since the time period was not enough to see changes.
- The committee members have had general training in grazing management and are ready to start control grazing from next season in both committees.

Beef fattening in feedlot;
- Fodder plot in TA1 is being productive and currently being used to fatten cattle from 2ha of fodder.
- The feedlot in TA1 has being used to fatten 4 head of cattle (3 males and 1 female) for sale.
- The committee members have had general training in running feedlots, though a delay is observed in TA3 due to the failure of growing fodders.

Problems and Challenges:
- Grazing control system has to be established. Since the record of stock numbers for this past season has not been kept, it is necessary to start from it.
- In Ngcayini, the fence was broken by the un-participating community member due to jealousy issues. The problem has been solved by cooperation of Umpagatsi, but it is important to be careful about this kind of issue.
- Fodder plot in TA3 failed to establish productive plot in this season due to insufficient rain in the rainy season. It should be replanted in early spring of 2003.

Comprehensive Evaluation:
It is still early to see the visible results by these activities in general. Rotation grazing and beef fattening are still new for the community people and it is expected that more challenges will be encountered by the activity goes ahead, although the participation rate for construction work was relatively high. In order to continue these activities started in the pilot projects, the continuous and frequent assistance by skilful extension worker will be necessary.

Lessons Learnt:
- *Timeliness*: Timely training, organisation and planning are crucial for attaining success of the project in order not to miss the opportunity in season.
- *Necessity of Training and follow up*: Early specific training on management aspect

including planning, forming constitution, monitoring, management and evaluation methods. The continuous follow-up by extension staff of the government is inevitable for sustainable activity.
- *Site Selection*: The sites chosen for the projects should be of a size that will lend itself to having an impact by being large enough but is not too large that it can have serious downstream impact as well as for proper management of the activity.

Feedback to M/P:
- Timeliness of implementation is crucial and follows timely training, organization and planning.
- Early specific training on all aspects of planning, monitoring, participation and management of units is vital along with all aspects of leadership training if farmers are to be able to carry out the management of units on their own. Written technical extension material in Seswati needs to be prepared and distributed.
- Continuous systematically planned sustainable extension and training programs are critical to ensuring farmer participation and on-going involvement, especially in times of problems, doubt and stress.
- Promotion of commercialisation of financially viable activities is important.

3.3.3 Agroforestry / Community Forestry Project

Objective:
1) To solve the problem of shortage of tree seedlings,
2) To carry out afforestation for soil conservation,
3) To establish community woodlots for supplying of fire wood and poles,
4) To increase income by selling both tree and fruit seedlings, and
5) To increase soil fertility by installing improving fallow.

Participants of the Community:	Major Inputs:
- Tree nursery committee in TA2 c.f. Expected beneficiaries: 720HH for afforestation, 59 HH for improved fallow	- Community; Labour force, Materials locally collectable (rock, sand, etc.), - GOS; Coordination, transport, heavy machines, germinating seeds - JICA; Experts, Materials for nursery construction including watering facility, employment of NGOs

Major Activities:
Tree Nursery;
Around 3000m^2 out of the fenced area of 1ha is utilised for nursery. The nursery with water facility from adjacent stream was constructed, by NGO and the community people. A designed seedling capacity is 160,000 seedlings per year and tree species have been chosen by the participants, which could be used for afforestation, agroforestry and woodlot. The nursery has been ready to be operated by the tree nursery committee members.

Afforestation;
Around 6,000 trees were planted in the community area and the area was fenced off to protect the young seedlings form livestock browsing. *Eucalyptus* and *wattle* trees were mainly selected for initial tree specie for the sake of soil conservation as well as usage for poles and fuel wood in future.

Improved Fallow;
Sebania sesban will be planted at a spacing of 1m x 1m, though they are still under growing in the nursery in Ludzeludze RDA. In the first year, rows of maize will be planted as usual alternately between the rows of tree shrubs. In second year, tree shrubs will be left to grow alone, and in third year, the trees will be harvested and the leaves and small twigs will be incorporated into soil.

Major Achievement:
Tree Nursery;
The nursery construction was completed with water tank which could be utilised not only for nursery itself, but also for community garden, water source for school, and community

people. The 14 committee members have paid membership fee of 10E and received training on nursery management.

Afforestation;
The planted trees have been growing by the average growth of 25cm and the heights of them are around 150cm in average. Some of the trees have been also planted inside the gullies with view to stabilising advance of the active gullies. The demonstration effect of the afforestation site is obvious in the inter-location monitoring tour conducted during the pilot project. The guideline of afforestation was also produced for aiming dissemination of afforestation in other areas.

Improved Fallow;
The major achievement is actually sensitisation of farmers on the benefits and establishment procedure of improved fallow. The guidelines on establishment and benefits of the technology have also been produced.

Problems and Challenges:
- Nursery management have been delayed due to the delay of construction as well as training implementation. Since the members have been trained and have motivation to start operation of the nursery, continuous assistance by extension workers is indispensable for starting the activity.
- There is a problem of cattle invasion in the afforestation area. It is necessary to discuss within the community including traditional authority to solve this issue.
- It seems that there is a disputes between the community and the committee members, which is related to local political issue and it is affecting to increase the number of participants for nursery activity. It is also necessary to discuss within the community including traditional authority to solve this issue.

Comprehensive Evaluation:
The participating committee members are active and eager to continue their work with expecting the benefit from the nursery. Though the process of operation and results have not been confirmed, it is expected that the work may be started by themselves under assistance by the government since the government staff are quite cooperative in forestry. Since the established afforestation area has been managed well, it is also expected to be applied to other areas which have been already fenced in TA2. This activity has been also followed by the forestry section in MOAC and expected to be achieved by next season.

Lessons Learnt:
- *Necessity of community involvement in planning stage*; Involvement of local community in planning and designing stage is very necessary for success of the project in terms of growing ownership of the activity.
- *Motivation of the community people*; Individual benefit is greatly related to the motivation of the community people to work for the community. In this sense, it could be said that the methodology of introduction of agroforestry/community forestry project are matched to their motivation.
- *Necessity of rules*; The problem of invasion of cattle into the afforestation site may not be solved only by the discussion by the community people since it has been problems since before. Forming rules as a community which should be kept by the community as a whole will be necessary.
- *Necessity of training*; The continuous trainings to the community including committee members and PPMU are necessary for further implementation of the project. Especially, follow-up by the extension worker or PPMU is inevitable for continuity of the projects.

Feedback to M/P:
- The community members to be kept interested in the project by timely motivation, e.g. inter-location study tours.
- Technical training should be given by Forestry Section continuously.
- Malkerns Research Station (Forestry Seed Centre) to provide necessary back up in research, dissemination of research information and training on technical nursery matters, afforestation and agro-forestry of improved fallow.

3.3.4 Community Garden Project

Objective:
1) To achieve proper land use
2) To generate income from un-used natural resources
3) To get soil conservation effect through terracing in the garden

Participants of the Community:	Major Inputs:
Community garden committee Zikhoteni (TA2); 17 (F16, M1) Mhulatane (TA3); 27 (F15, M12) Mbeka (TA3); 68	- Community; Labour force, Land, Materials locally collectable (rock, sand, etc.), Tools - GOS; Coordination, heavy machines, extension worker, training - JICA; Experts, Materials for garden construction, employment of NGOs

Major Activities:
- Community gardens have been constructed in each garden site with small irrigation facilities (gravity irrigation). (Zikhoteni 1.2ha, Mhlatane 2.0ha, Mbeka 6.5ha)
- In parallel to the selection of the sites, soil test as well as market research were conducted by the experts.
- In parallel to the construction, the constitution was made among members and the membership fees have been collected.
- The garden was divided into plots to each participants equally under consensus of the participants, and operation has been done individually.
- Suitable vegetables such as cabbage, tomato, spinach, and carrot are chosen and planted by the result of market research and soil appropriateness. The production has been already started. In Mbeka, due to the delay of the training, the production has not been started yet in July 2003, but is expected to be started in short time.

Major Achievement:
- Vegetable production has been started and the participants are consuming the products as well as selling the surplus within/out of the community, which enrich the people's lives.
- High participation rate was achieved in general as 74 to 87% through the whole process.
- The formed committee have been functioning well with keeping the constitution made and all members have paid the membership fees and they are kept in the bank account as a name of the committee.
- Women could get access to cash income which they can manage by themselves by selling the products. It opens gate for women to widen their range of activities as well as raise the status in the society.

Problems and Challenges:
There are no serious constraints observed in the community garden activities. The problem raised in Zikhoteni, for example, was lacking of extension of pipe system for extension of cultivated land, but it is on the way to be solved by the members by themselves with proposing to Inkhundla Centre for assistance. As for diffusion of the activity, there is a problem of water since construction of water source is costly.

Comprehensive Evaluation:
The purposes of the projects have been achieved in a way of improvement of diet as well as income, and it is expected to contribute to improve degrade land for the sake of appropriate land use. The technology applied was also appropriate, which could be proved that around 76% of participants reply that they have confidence to continue by themselves. Moreover, about the important issue for sustainability of the activity, the management of the garden functions properly and expected to be continued in this way. Although the activity has been delayed in Mbeka, it could be also expected to be continued under support by the government as well as Mhlatane community garden members who are neighbours. Thus, it could be said that the sustainability in terms of technique as well as management aspect is quite positive.

Lessons Learnt:
- *Motivation originated by clear individual profits*; It was confirmed through the community garden project that the "motivation" to work is very much related to the individual profitability. If this point is clear, people are willing to contribute to work, even with having

cost share.
- *Importance on equality and transparency*; It was proved through the project that the community people do not like inequality and if the project clarifies the individual benefits with equality, the activity goes well. In the case of community garden, the equal allocation of plots, clear constitution, and individual management under individual responsibility have lead the success.

Feedback to M/P:
- In opening new community garden it is imperative to find available water sources and sites of garden nearer to water sources and to chiefdom living quarters, by effort of committee members and RDA staff.
- The community garden projects should be conducted as a supporting component for the soil conservation schemes, with the cost-sharing mechanism to cover a part of the costs for the soil conservation activities in the same community.
- Technical training program on horticulture should be continued by the relevant departments of MOAC.

3.3.5 Improved Cooking Stove Project

Objective:
1) To reduce firewood consumption, and
2) To reduce women's work load and cooking time

Participants of the Community:	Major Inputs:
- Cooking Stove Committee in each TA - Beneficiaries: 15 (TA1), 28 (TA2), 17 (TA3)	- Community; Labour force, Materials locally collectable (stones, mud, etc.), - GOS; Coordination, diffusion - JICA; Experts, training

Major Activities:
- Demonstration and seminar of cooking stove, which could be made with locally collectable materials, were carried out at each pilot area by JICA expert together with counterpart personnel.
- Each Cooking Stove Committee has started to construct stoves in their community.
- The constructed stoves have been used and maintained by the users.

Major Achievement:
- 15, 28, and 17 stoves have been constructed in TA1, TA2 andTA3 respectively.
- According to the users, the fuel consumption was reduced by 43 to 50%.
- The time of cooking lunch, for example, became 0.9hours instead of 2.2hours by cooking several dishes at the same time and saving time for fetching firewood.
- It was found that users are feeling it much importance on the modernisation of their kitchen, which may encourage women to have confidence to improve their lives.

Problems and Challenges:
The problems encountered in cooking stove promotion are more in extension aspect, rather in technical aspect. Due to the two reasons namely individualism and distance between homesteads, group activities have not been easily achieved. Considering these situations, the following solutions are proposed and depending on the necessity, the method could be chosen. 1) Install cooking stove individually by asking assistance to the skilled committee members, 2) diffusion based on the idea of professional work with certain fee, and 3) RDA provide transport and diffuse by strategic way of the government.

Comprehensive Evaluation:
The purposes of the projects have been achieved and are expected to contribute to reserve more trees in the forest for improvement of degraded land. The achievement is not very big in number, however still have been continued somehow, and the users are satisfied and well maintained them. Since it does not require high input, if there is an ultimate needs, it will be continued with their comfortable speed. Moreover, what could be highly evaluate through the cooking stove activities is 1) creation of time, and 2) Enhancement of motivation of female members for community development. These impacts are hidden, but crucial for continuous development including soil conservation.

Lessons Learnt:
- *Difference of the "sense" of time*; Promotion of cooking stove seems going slower than

which was expected at the beginning by the "Expert". However the participants are feeling that they have been working hard enough and are satisfying the achievement in general. It might be important for planner to understand this culture in order not to be too much ambitious and demanding in planning.
- *Existence of definite needs*; Promotion of cooking stove is not the activity, which is indispensable for soil conservation. At the same time, if people feel definite needs to reduce fuel wood as well as the information of effect of cooking stove, it may be diffused since it does not require construction cost as well as heavy labour force.
- *Promotion of cooking stove as a tool of empowerment*; It was found that the motivation of installation of cooking stove is not limited to save firewood, but other impacts such as reduction of cooking time, and modernisation of kitchen. In this sense, promotion of cooking stove has a meaning of complementary activity with creating time for other work as well as motivate people, especially women to contribute to communal work..

Feedback to M/P:
- Promotion of improved cooking stove would be placed as one of the tool to promote participation of the community people (especially women) in the Master Plan.
- Focus on potential deforestation areas regarding the effectiveness of reduction of fuel wood.
- Coordination with the home economic section of MOAC for more strategic dissemination, under coordination with RDA extension staff, with utilising the skilled community women.

3.3.6 Water Source Protection Project

Objective:
1) To secure protected water sources in rangelands,
2) To make effective use of existing resources, and
3) To alleviate the burden and time of women and children from fetching water.

Participants of the Community:	Major Inputs:
- Water Source Protection Committee in each target location - Beneficiaries: average 20HH at each location, totally 120HH approximately.	- Community; Labour force, Materials locally collectable (stones, sands, etc.), cash saving for maintenance - GOS; Coordination, diffusion - JICA; Experts, Materials for construction of facilities, employment of NGOs

Major Activities:
- Sites were selected by the community people from several water sources.
- Fence and protect the water source areas by preventing cattle to come in.
- Water intake, water tank, washing basin and shower room were constructed.
- The facilities constructed have been utilised without any problems so far.

Major Achievement:
- The following structures were constructed, namely, 6 fenced and protected water sauces, brick shower rooms and concrete washbasins, and all have been functioning without any problem.
- The cooperation to work by the beneficiaries has been high as almost all beneficiaries from women to children participated in the work.
- People can obtain clean water and women have more time as they are spending less time carrying water.

Problems and Challenges:
- No specific negative aspect to progress has been noted to this simple intervention, however the maintenance system is still weak since no committee have formed the rules for use as well as collection of maintenance fee.
- If there are large numbers of people gathering at one place for any length of time, there is likely to be a build up of a health hazard at these sites unless there are some forms of toilets and sanitation also included in the infrastructure.

Comprehensive Evaluation:
The water source has been protected from cattle invasion. Simultaneously, construction of washbasins as well as shower rooms have improved the living environment as well as saved working time of women and children. The insufficiency of maintenance system is a bit anxiety for sustainability. Enlightenment or support by extension workers to aware the community people, is necessary for sustainable use of the facilities.

Lessons Learnt:
- *Necessity of training*; It was found in the self-evaluation workshop that the participants have not yet started any action for maintenance of the facility constructed. Specific training on all aspect of maintenance is important.
- *Water source protection as a part of soil conservation*; Water source protection should be a supporting activity to soil conservation. Remembering this point, the activity should not be undertaken in isolation of one or other of these two activities. They are a way of generating community harmony and spirit within a community and a way of encouraging cooperation and hence their contribution to land rehabilitation should be considered from this point of view as well as a means of improving livelihoods.

Feedback to M/P:
- Timeliness of implementation is crucial and follows timely training and planning.
- Specific training on all aspects of maintenance should be included in the training program.
- Due to the importance of hygiene conditions around washing and water collection facilities, healthy toilets should be built.

3.3.7 Pilot Project Management Unit (PPMU)

Objective:
To implement the pilot projects smoothly through capacity building activities for government officials, community leaders and community people in general

Participants of the Community:	Major Inputs:
- PPMU (Project manager, an alternate manager, coordinator, project coordinators (extension workers or rural development officers) - Participants for training (community leaders and other representatives, 21-26 participants/training)	- Community; participation for trainings - GOS; Establishment of PPMU - JICA; Experts, facilities for GIS system, employment of NGOs for training,

Major Activities:
- Formation of the development committee in each target areas.
- Capacity building through leadership training, which targets traditional leaders, other community leaders, development committee members and community people (2 times).
- Monitoring and evaluation of the whole activities done as pilot projects, by way of questionnaire survey, inter-location monitoring tours and the series of workshops.
- GIS training to PPMU staff.

Major Achievement:
- *Improvement of Project management skills of PPMU staff*; It could be said that PPMU staff could accumulate the knowledge and experiences on monitoring and evaluation works through the series of monitoring and evaluation activities. These activities include facilitation skills of participatory approach. GIS trainees of PPMU have also obtained the skill of GIS usage, which could contribute to improve project management skills.
- *Improvement of project management skills of community leaders and community people*; Thanks to the workshop for traditional leaders at the beginning of the projects, they understood the purpose and necessity of the projects and became cooperative to the projects in general. Other trainings on improvement of management skills for the development committee members made them confident how to work as leaders for communal work. Due to their efforts, participation rate in the pilot projects in general was enhanced, and expected outputs by the pilot projects are considered to be mostly achieved.

Problems and Challenges: - The participation of members was quite low apart from the extension worker from central RDA office. It is necessary to discuss at the central level for re-organisation of PPMU for continuing the activity by themselves. - Although the monitoring and evaluation have been done through the pilot project, those activities have been supported by JICA experts and other supporting staff recruited from other department. Recruitment of enthusiastic members, especially for local staff will be significant point for sustainable activities and it could be expected that the capacity of those staff will be strengthen through OJT more effectively.
Comprehensive Evaluation: Around 75% of the pilot projects have been implemented and in active by June 2003. Participated major PPMU staffs were active in general, however it was observed that some local members were inactive, and it affected the efficiency of implementation of the projects. It was observed that the management ability of the PPMU staff have been improved in general, however there is plenty of scope for improvement of local staff. Since the capacity of local staff is crucial for working with the community people, it is necessary to give more training to them. As for the community leaders, the effectiveness of the series of trainings were evaluated highly in the self-evaluation workshop, and it contributed to enhance the community cooperation.
Lessons Learnt: *Importance of Project Coordinator and members*; The function of PPMU is totally relying on the responsibility, eagerness and efforts of the members. In order for appropriate staffing, careful appointment of the staff at the starting point as well as continuous skill up by training in kind are essential.
Feedback to M/P: - Project Management Unit (PMU) should be established for the smooth implementation of the Master Plan. - In the Master Plan stage, the project manager of PMU should be appointed as a permanent staff for the project. - The extension officer at Luve RDA should be appointed as the Project Coordinator for TA1 (Kukhanyeni) to cover the eastern part of the area, in addition to the current Project Coordinator. - The extension officers at Shiselweni agriculture office should give more frequent technical support for the project coordinator of TA2 (Hluti RDA). - The extension officers at Manzini agriculture office should give more frequent technical support for the project coordinator of TA3 (Ngwempisi RDA).

3.4 Change in Awareness in the Community

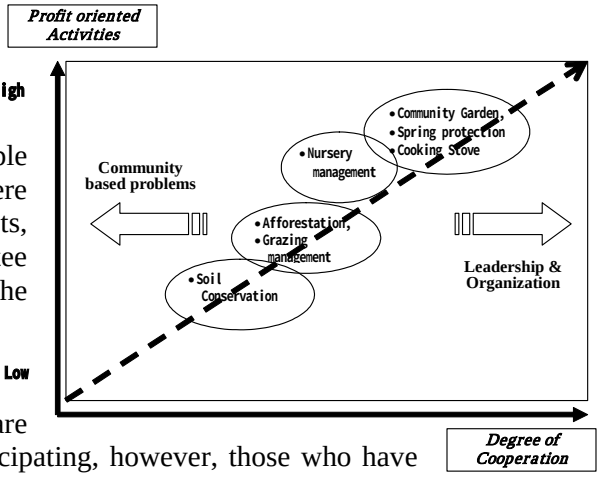
3.4.1 Changes in the community

a. Capacity and awareness of the community

It was found that more than half of the participants of the main component of the pilot projects are aware that they are working for soil conservation and feeling the effects of them. The major constraints for the community people in terms of implementation of the pilot projects were 1) communication (36%), lack of time (29%), and there were 33% of participants who did not feel any difficulties. Nobody mentioned about the difficulty in inputs, apart from some elder participants who find it physically difficult to provide enough labour force. Hence, as for the capacity in acquisition of material resources, it was found that the community people are manageable about it. Otherwise, they have access to obtain them somehow. As for the capacity in knowledge, 74% of the respondents of the questionnaire survey reply that they got knowledge and technique to continue the work.

Additionally, in each activity, 24 to 38% of the participants feel it as benefit that they have been motivated to work for community development through each activity. It is one of the great achievement and change since this is the element for sustainable activity.

b. Evaluation on participation and the tendency in communal work



Remarkable differences are observed in the evaluation by the community people and by the development committee. Especially in the case of TA1, around 80% of the community people evaluate themselves that community people were cooperative in the work during the pilot projects, whereas 50% of the development committee members evaluate that the cooperation by the community were "weak".

The gap shows that the community people who are involved in the activities are quite actively participating, however, those who have not been involved from the earlier stage still do not have interest to join the activities or are hesitating to join. Expanding the inclusion of other community members is the next step which should be challenged.

Observing the process of implementation in general, people tend to organise themselves in the activity which has got obvious individual benefit in short term, such as community garden and water spring protection, but it was not in other activities, such as soil conservation and afforestation.

Where there is more individual profit, the cooperation becomes higher. The leadership of the committee pull the degree of cooperation up, but if there are some community-based problems such as jealousy, disputes on land, the cooperation will be discouraged. On the place where those leading elements cross, the leading ability of development committee will be the key to make the cooperation stronger or weaker.

3.4.2 Changes in Gender

The pilot project was started with the understanding that Swazi culture tends to be male dominated culture as described in chapter 3. The following changes in gender could be observed in the pilot projects.

- Involvement in decision making process: 86.8 % of female participants feel that they have been involved in decision making process of pilot projects, whereas 73.8% of male have felt the same.
- Women became more active in the series of meetings
- In the community garden activity, the participants who are mostly women have got control how to use the benefit from the garden. Since most of them did not have control of cash so far, it may bring great changes in their lives as well as in social status.
- Expansion of the women's' activity from cooking stove to community development

3.4.3 Changes in Development Committee

When the development committees were formed at the beginning of the pilot projects, the members seemed quite motivated to start the activities, and they had evaluated their ability subjectively as development committee quite high as 4.5 in average (The criteria is categorised in 5. 5 indicates "very good", 4: "good", 3: "moderate", 2 "slightly weak", and 1 "Very weak"). Contrarily, after implementation of the pilot projects, it was evaluated lower to 3.9 unexpectedly in average. It does not necessarily mean that their leadership and

confidence as a development committee have been deteriorated, considering the interview survey results. Rather, this result could be analysed that 1) They have evaluated their capacity more realistically and objectively and, 2) Some members have encountered the difficulty of managing reality as leaders through their experiences. *Contrarily*, 83.1% of the respondents of the community people evaluated that the leadership of the development committee is "very good" or "good" with the average of three TAs, which used to be 63.8% before. It could be said that objectively, the community people are satisfied with the leaders in general.

This awareness change is important in two ways, namely; 1) for the committee members to grow by themselves and, 2) for external agency to know how to support them depending on the feature of the community.

On the other hand, evaluate the development committee from the aspect of involvement of community people to decision-making process. The results vary in each TA, but the number of respondents who answered as "slightly involved" and "not involved" has been decreased from 28.8% to 7.6%. There is no one who feels that they were not involved or only slightly involved in TA1. Moreover, positive change is observed remarkably in TA1 andTA2, which is shown as 84.9% and 78.9% of people (TA1 andTA2, respectively) feel that they are "very much involved", or "involved" in the decision making process.

These are positive change which shows the function of the development committee.

3.5 Summary of Lessons Learnt

The major lessons learnt are summarised as follows in three stages, namely planning, implementation, and follow-up.

3.5.1 Planning Stage

a. Mobilisation of Community

When the commitment of the community to participate in the project continuously, "how" to enhance the commitment and "how" to promote it is essential point to lead success of the project. When the ownership of the community people toward the activity is build, the sustainability of the project will be achieved. In order to achieve that, firstly, the project itself needs to be attractive to the communities with matching to the needs of the community people. Secondly, it needs to have short-term benefits that the local people can foresee, and thirdly, it is important to create better conditions for the communities to participate. Understanding these needs, sufficient explanation on the purpose of the project and discussion on the content of the activities is the process, which is inevitable to establish the ownership of the community people. Hence, having sufficient time for discussions at the planning stage will be significantly effective to achieve the expected results.

b. Cost Sharing

In this pilot project, it was planned and started that all initial cost is burdened by the project and the maintenance cost will be shouldered by the community people basically. The necessity to make it clear the cost sharing issue at the planning stage is quite high and it should be discussed that the cost share between the donor agency and the government, the government and the community, and among the community.

The dimension of "Community" is various, from lower class to high class and so forth. Consideration on the cost sharing among the community is important for keeping equality among the community, which is indispensable to discuss at planning stage.

c. Scale of the Project

Basically, all of the work, except for that requiring special skills, was carried out by the residents without any allowance. Considering the daily routine work of the community

people, it is important to consider the availability of workers when designing the scale and schedule of each pilot project. In particular, the number of beneficiaries should directly affect the scale of the project.

From the experience of the pilot project, it was found that the smaller the number of beneficiaries is, the easier it is to manage and control the project. This is because when fewer people were involved, they had a stronger sense of ownership towards the project and recognized that it would be their property in future. However, when the beneficiaries included the whole community, the project was difficult to manage and people's motivation was also very low. The scale of the project should be examined and determined, considering these features.

d. Combination of Various Projects

There are several types of projects, some requiring heavy physical work and others requiring easy and light work. The Team found that residents were very keen to participate in projects of which the short-term benefits could be foreseen and the number of beneficiaries was limited. On the other hand, they were reluctant to participate in projects of which the benefits could not be foreseen and the beneficiaries included whole communities.

Since the both activities mentioned are necessary for achieving the livelihood, including the effect of soil conservation, flexible combination of various projects is effective to keep the motivation of the community people for the implementation of the Master Plan.

3.5.2 Implementation Stage

a. Utilization of NGOs

Although, there are various NGOs exist in Swaziland, the NGOs which might be able to work for soil conservation, grazing management, afforestation and agriculture are quite few. Simultaneously, MOAC have only a few experience to work with NGOs, which means the relationship between MOAC and NGO is quite weak.

In this pilot project, the series of construction as well as trainings, which could not be covered by the government, have been conducted by NGOs, and it was confirmed that they have ability in regards to design, supervision, and logistic support. On the other hand, there is a fear to relay on NGO in terms of ; 1) Utilisation of NGO is costly for the government, and 2) Too meticulous care of the community people may increase dependency of the community people.

Thus, utilisation of NGOs is subsidiary measures for implementation of the project, and it is recommended to utilise them depending on the availability of human resources or necessity of specific technique alternatively.

b. Inter Location Monitoring Tour

The same kind of project was implemented in three target areas and an inter location monitoring tour was carried out to observe the activities in the different locations. There was an active exchange of opinions regarding the increased need for tree planting in soil conservation sites and methods for managing community gardens and nurseries, which further developed the residents' willingness to participate in such activities.

Observing the success example of the farmers who live in similar circumstances encourages other farmers and the credibility of the activities may also become high. Hence, it could be proposed to include this activity as one of important item for the master plan.

c. Measures Concerning Village Leaders

When implementing the projects, the traditional village leaders (i.e. the elders, etc) often hindered the activities of the Development Committee and the various subcommittees. The reason is believed to be that the traditional leaders are not accustomed to sharing power and wanted to show their authority over the Development Committee, which is mainly composed of young members.

At the request of the Development Committee, the study team and the C/P facilitated a meeting in order to explain to the village leaders the project activities and the specific roles of the Development Committee and other concerned persons (i.e. JICA, etc). The study team also made it a point to include them in the inter location monitoring tour.

The authority of the traditional leaders is significantly high still in the target areas, and it is necessary to include them with asking cooperation at each certain point from planning stage to implementation.

d. Transparency and Fairness

The importance on avoiding jealousy is crucial for promoting any community development project in the target areas.

It has been stated by people there are many cases of spoiled group or community activities recognised in the study area because of "jealousy", and several devices as involving whole chiefdoms in the selection process have been carried out in the pilot project. However, some problems had occurred by the problems related to these issues. As it was tried in the pilot projects, keeping transparency and fairness of organisation and activities are inevitable for successful implementation. Frequent regular meetings, discussion for reaching consensus and, keeping records of participants and meetings may assist to keep transparency to support the fairness.

e. Continuous Training

The series of trainings have been carried out during project implementation and covered a variety of fields including soil conservation, agriculture, livestock production, and forestry, as well as training on management aspect such as strengthening of leadership. The effectiveness of the training is evaluated highly by the community people in the self-evaluation workshop, and at the same time, it was found that the fact that "Received training" could be important encouraging element for the community people. Thus, continuous training can be an effective means for implementation of the projects.

3.5.3 Follow-up Stage

a. Periodic Follow Ups

It is essential to conduct periodic follow-ups after completion of the project in order to 1) establish a relationship of mutual trust between the government and the community, and 2) Encourage the motivation of the community people to continue the work. For instance, it was observed that the stagnated activity during absence of the study team was re-started with this opportunity of re-visit of the Study Team in the pilot project. Although there are problem of lack of human resources and transportation, the RDA extension staffs have sufficient skills to conduct these kinds of follow up. It is, therefore, important for the government to implement the follow-ups, preferably through the MOAC, which has local offices and staff stationed throughout the country.

4 Degraded Land Improvement Master Plan

4.1 Objective

The objective of the M/P can be summarized as follows:

1) To improve the environmental condition of rural areas included in 30 chiefdoms of 3target areas through improvement of the degraded lands with the combined efforts of all the stakeholders, including the governmental agencies concerned, community people, and NGOs. With this achievement,

2) To further expand and realize sustainable land use in the study area in the same manners with the help of the Guideline for Soil Conservation in the Study Area, which will be prepared together with the M/P.

4.2 The Basic Concept

This Master Plan (M/P) has been formulated under the following concept, which could be summarised in the Figure 4-1.

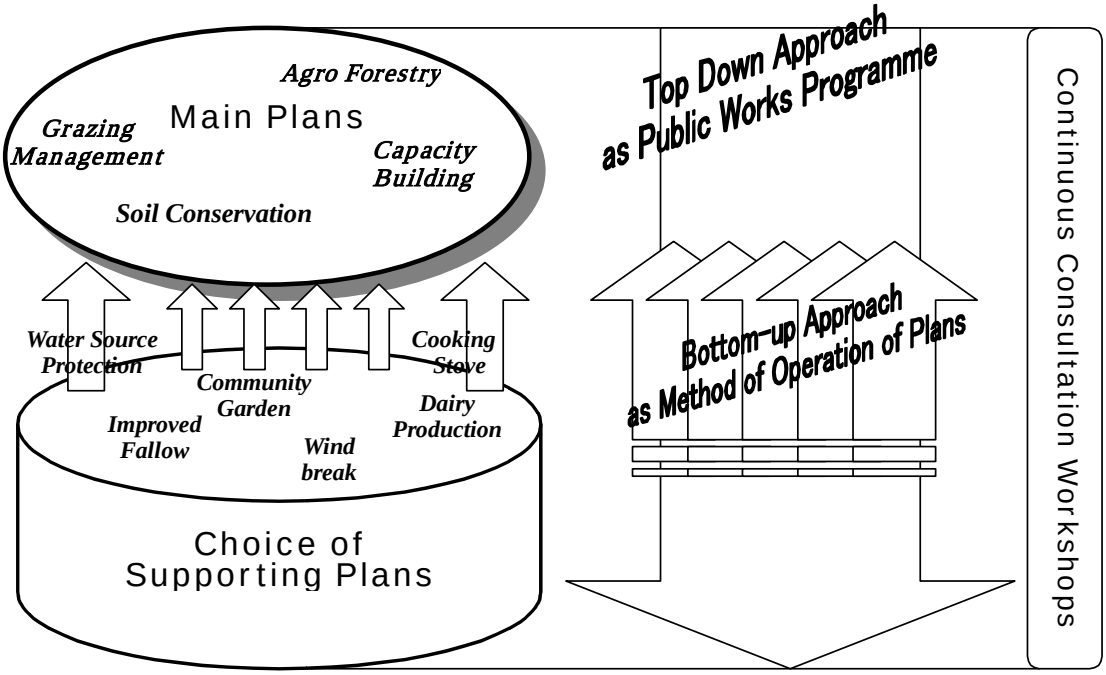


Figure 4-1: The Concept of the Master Plan

a. Soil Conservation as Public Works

Judging from the seriousness of soil degradation and urgency to tackle them, the soil conservation works should be principally planned and implemented as indispensable public works. In this sense, it is expected that MOAC should play an important role as the leading agency to be responsible for the works. The community people may contribute their labour force required for implementation of the works and also they can contribute to the maintenance of completed facilities as well as to the other activities included in the proposed supporting plans.

b. Combination of Main Plans and Supporting Plans

The degraded land improvement M/P proposed in this report consists of several sub components. It is because that the motivation of the community to participate in soil conservation activity is generally low and there is a necessary to seek the way to motivate the community people in order to continue the activities in long term period.

Hence, this M/P is categorised into two, namely, **"Main Plans" as inevitable component for improvement of land degradation, and "Supporting Plans" as necessary supplementary component to enhance smooth implementation of the "Main Plans"**. Parallel implementation of the "Main Plans" and "Supporting Plans" may produce the effect toward soil conservation.

Main Plans consist of 1) Soil Conservation Plan, 2) Grazing Range Management Plan, 3) Agro/Community Forestry Development Plan and 4) Capacity Building Development Plan.

Supporting Plans consist of various options of components related to each scheme of main plans, which are compiled as; 1) Grazing Management Supporting Plan, 2) Agro/Community Forestry Supporting Plan, and 3) Livelihood Improvement Plan. The Supporting Plans are various and it will be selected depending on the situation of the target community and their needs.

Since the Main Plans include indispensable actions for improvement of degraded soil, it is assumed that those will be implemented as public works with inputs by the government. Instead, since some Supporting Plans may provide individual benefit, it is expected to consider the rotation use of the profited obtained. This mechanism is briefly introduced in section 4.3 of this executive summary as an approach to achieve the target.

c. Combination of Top-down Approach and Bottom-up Approach

As mentioned above, the degraded land improvement plan will be basically implemented as public works. However, in order to sustainably implement and manage the proposed soil conservation plans, active participation by the community people is inevitable. Simultaneously, people's motivation to work depends on the situation and needs of the community. Accordingly, there must be a gap between the demand of the community and the emergency needs of soil conservation.

Hence, to bridge the said gap as well as to materialize the proposed soil conservation plans, the proposed M/P should be implemented with the combination of Top-down Approach and Bottom-up Approach, thereby, the both parties, i.e., the related government agencies and community people can find the way for suitable as well as sustainable implementation of the proposed M/P

d. Gradual Reduction of the Heads of Cattle

It has been identified that about 48,600 heads of cattle are presently grazed in 3 target areas whose grazing area amounts to about 39,000 ha. This means that present cattle population density is 1.2 heads/ha. This population density is already too high to naturally graze the cattle on the grazing area of SNL of 3 target areas.

On the other hand, it has been confirmed through the pilot projects that direct promotion of reduction of the number of cattle will only hamper the implementation of the Master Plan. This Master Plan proposes that controlling the number of cattle will be gradually made through 1) introduction of rotational grazing, 2) introduction of habit of tethering cattle with provision of fodder, and 3) encouraging commercial use of the cattle etc.

e. Capacity Building through Implementation

For implementation of this M/P, it is necessary for all the stakeholders to fully understand the purpose and the necessity of implementation of the plans. Especially understanding of the community people who are living in the core of the problems is crucial.

In this target area, the community people have certain capacity to carry out the activities, which was confirmed through the pilot projects. Hence, this M/P proposes mainly OJT combined with the series of trainings during the implementation of the plans, and do not consider social preparation period in advance to start implementation.

The whole process of plans from the planning stage, implementation, monitoring to evaluation of the activities, is a great learning process for the community people to have ownership of the activities as well as being capable to manage their activities with having clear idea of the activities. It may be more practical to learn through the process with seeing the result of action done by themselves under instruction and training of the government support.

4.3 Proposed Mechanism to be established among each Activity

As stated earlier, the soil conservation is the work, which should be done as public work basically. However considering the capacity of the government, it is inevitable to be taken care of by the majority of the community people continuously after completion of the physical work.

At the same time, the effectiveness of supporting projects has been confirmed through the pilot projects and it has been found especially that the “motivation” to work is very much related to the individual profitability. On the other hand, it has also been found that those supporting projects could assist only specific people who could have access, and most probably, it may be attributed to the fact that the effect of supporting project toward soil conservation may have been limited.

Considering the public benefit as public works, those supporting projects should not be implemented as an independent project, which provides benefit only to specific target; instead, it should be implemented as a part of contribution to improve soil condition in the target areas.

In this sense, it is proposed that the following mechanism should be established among each activity (in other words it may be replaced with “each components”) proposed in this M/P. This mechanism aims to;

1) keep equivalency within the community with linking the “individually profitable activity” and “communally profitable activity”,
2) attain sustainable soil conservation activities, and
3) fill up the gap between the peoples’ demand and necessity to conserve soil.

The illustrative images given in Figure 4-2 will explain the above stated mechanism.

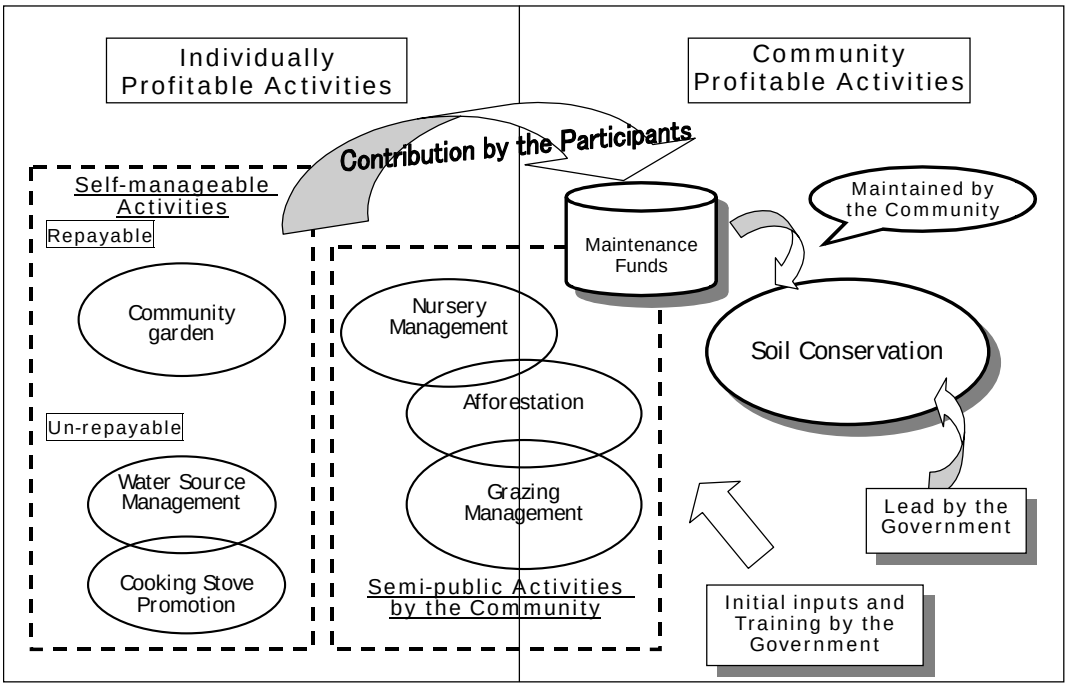


Figure 4-2: The Linkage between Individually Profitable and Community Profitable Activities

4.4 Basic Parameters for Formulation of M/P

A series of below-listed Tables summarize the basic parameters for formulation of M/P. Table 4-1 summarizes the present land use in the chiefdoms included in 3 target areas.

Table 4-1: Present Land Use in 3 Target Areas

Unit: ha, 1997

Target Area	Chiefdom	Grazing Area	Arable Land	Forestry	Amenities	Total
TA1 (Kukhanyeni)	Eni	224	163	9	0	396
	Mdayane	359	205	24	0	588
	Butfongweni	484	316	29	0	829
	Maliyaduma	755	418	24	0	1,197
	Ngwazini	587	307	0	4	898
	Mbeka	658	229	0	0	887
	Swaceni	143	184	14	16	357
	Mkhulamini	788	431	123	8	1,350
	Sankolweni	563	169	24	0	756
	Ngcayini	713	668	0	0	1,381
	Ntunja	809	130	30	0	969
	Nkiliji	1,107	875	30	0	2,012
	Nyakeni	3,346	1,400	18	5	4,769
	Bhekinkoshi	1,164	765	4	5	1,938
	Nsenga	789	367	7	10	1,173
	(15 Chiefdoms)					
	Sub-total	12,489	6,627	336	48	19,500
	Percentage (%)	(64.0)	(34.0)	(1.7)	(0.3)	(100.0)
TA2 (Shiselweni)	Manyandzeni	634	339	1	4	978
	Mchinsweni	82	146	0	0	228
	Mabona	3,217	1,423	112	1	4,753
	Dumenkhungwini	735	179	2	3	919
	Zikhoteni	2,673	2,139	10	0	4,822
	(5 Chiefdoms)					
	Sub-total	7,341	4,226	125	8	11,700
	Percentage (%)	(62.7)	(36.1)	(1.1)	(0.1)	(100.0)

TA3 (Ngwempisi)	Bhadzeni II	1,371	675	635	20	2,701
	Dladleni	601	225	0	0	826
	Lishikishini	3,201	1,672	76	26	4,975
	Macdvulwini	3,977	826	683	5	5,491
	Mahhashini	534	308	2	0	844
	Bhadzeni I	1,382	701	756	1	2,840
	Mgazini	2,015	1,534	86	9	3,644
	Khabonina	646	255	20	0	921
	Ngcoseni	1,167	803	8	22	2,000
	Velezizweni	4,352	1,753	238	15	6,358
	(10 Chiefdoms)					
	Sub-total	19,246	8,752	2,504	98	30,600
	Percentage (%)	(62.9)	(28.6)	(8.2)	(0.3)	(100.0)
	Total (30 Chiefdoms)	**39,076**	**19,605**	**2,965**	**154**	**61,800 (618.0 km^2)**
	Average Percentage (%) (Total 30 Chiefdoms)	**(63.2)**	**(31.7)**	**(4.8)**	**(0.3)**	**(100.0)**

Table 4-2 summarizes the numbers of homestead, household, and population in the chiefdoms included in 3 target areas.

Table 4-2: Homestead, Household, and Population in 3 Target Areas

Target Area	Chiefdom	Number of Homesteads	Number of Households	Population (1997)
TA1 (Kukhanyeni)	Eni	50	59	375
	Mdayane	81	96	607
	Butfongweni	63	75	472
	Maliyaduma	160	190	1,199
	Ngwazini	192	228	1,439
	Mbeka	65	77	487
	Swaceni	51	61	382
	Mkhulamini	320	381	2,398
	Sankolweni	47	56	352
	Ngcayini	68	81	510
	Ntunja	58	69	435
	Nkiliji	210	250	1,573
	Nyakeni	740	880	5,545
	Bhekinkoshi	280	333	2,098
	Nsenga	83	99	622
	(15 Chiefdoms)			
	Sub-total	**2,468**	**2,935**	**18,494**
TA2 (Shiselweni)	Manyandzeni	300	357	2,248
	Mchinsweni	300	357	2,248
	Mabona	635	755	4,758
	Dumenkhungwini	125	149	937
	Zikhoteni	606	721	4,541
	(5 Chiefdoms)			
	Sub-total	**1,966**	**2,339**	**14,732**
TA3 (Ngwempisi)	Bhadzeni II	230	274	1,867
	Dladleni	68	81	552
	Lishikisini	758	902	6,152
	Macudvulwini	500	595	4,058
	Mahhashini	44	52	357
	Bhadzeni I	250	297	2,029
	Mgazini	500	595	4,058
	Khabonina	200	238	1,623
	Ngcoseni	246	293	1,997
	Velezizweni	900	1,070	7,305
	(10 Chiefdoms)			
	Sub-total	**3,696**	**4,397**	**29,998**
	Total (30 Chiefdoms)	**8,130**	**9,671**	**63,224**

Table 4-3 summarizes the heads of main livestock in the chiefdoms within 3 target areas.

Table 4-3: Heads of Livestock in 3 Target Areas

Dip Tanks- Based, 2000

Target Area	Chiefdom	Cattle	Goat	Sheep	Horse	Donkey
TA1 (Kukhanyeni)	Eni	350	225	0	1	46
	Mdayane	596	593	0	0	0
	Butfongweni	84	101	0	0	31
	Maliyaduma	419	1,013	30	0	9
	Ngwazini	699	1,351	0	0	0
	Mbeka	294	191	0	0	18
	Swaceni	91	68	0	0	0
	Mkhulamini	105	43	8	3	18
	Sankolweni	378	146	0	0	0
	Ngcayini	1,049	225	13	0	0
	Ntunja	776	450	0	0	18
	Nkiliji	1,748	945	0	0	0
	Nyakeni	7,760	2,251	495	6	46
	Bhekinkoshi	489	563	50	0	15
	Nsenga	870	113	10	0	15
	(15 Chiefdoms)					
	Sub-total	**15,708**	**8,278**	**606**	**10**	**216**
TA2 (Shiselweni)	Manyandzeni	87	98	10	3	6
	Mchinsweni	760	3,056	612	0	8
	Mabona	1,216	978	47	0	32
	Dumenkhungwini	342	183	41	0	42
	Zikhoteni	9,497	917	102	0	106
	(5 Chiefdoms)					
	Sub-total	**11,902**	**5,232**	**812**	**3**	**194**
TA3 (Ngwempisi)	Bhadzeni II	1,306	374	72	27	35
	Dladleni	78	829	14	0	3
	Lishikishini	2,395	935	98	0	12
	Macdvulwini	1,305	62	33	0	7
	Mahhashini	122	106	6	0	7
	Bhadzeni I	1,044	249	65	4	9
	Mgazini	1,100	170	0	16	12
	Khabonina	133	374	65	6	11
	Ngcoseni	5,721	939	405	0	50
	Velezizweni	7,837	8,411	0	11	124
	(10 Chiefdoms)					
	Sub-total	**21,041**	**12,449**	**758**	**64**	**270**
	Total (30 Chiefdoms)	**48,651**	**25,959**	**2,176**	**77**	**680**

4.5 Phased Planning

The proposed M/P has been prepared for the years of 2004 through 2020 and it also has been prepared phase-wisely based mainly on the following reasons and considerations.

1) Various national and strategic papers including action plans for environment protection, which have been prepared by the Government of Swaziland, aim to accomplish the targets given in the said papers by and around the year of 2020.

2) The land degradation in 3 target areas has been accelerated since 1980 and it is still going on. To improve this situation and to recover the situation of the land degradation level at 1980, it is assumed that at least time span of 20 years will be required.

3) It is considered that the proposed soil conservation plans for 3 target areas should be carried out putting the first priority on the areas under initial stage of land degradation, the second priority on the areas under moderately-eroded condition, and the third priority on the

areas under seriously-eroded condition in due consideration of effectiveness of the soil conservation works, required period for implementation of the soil conservation works depending on the different stages of land degradation, and cost-benefit performance of the soil conservation works.

4) Consideration on the work volume as well as the implementation capacity of MOAC and community people that was observed through implementation of the pilot projects during the study.

With above-stated reasons and considerations, the target year has been set at 2020 and the period of Y2004 to Y2020 has been divided into 3 phases, namely, Phase-1 (Y2004-Y2009), Phase-2 (Y2010-Y2015), and Phase-3 (Y2016-Y2020).

4.5.1 Selection of Chiefdoms in each Phase

a. Selection Criteria

1) The same or similar numbers of Chiefdoms are grouped in each Phase for a target area.

2) In view of ample opportunities for inhabitants to observe and monitor the implemented demonstration of pilot components, top priority was placed on the Chiefdoms located in the vicinity of those already implemented, i.e., adjacent Chiefdoms were chosen for the group to be implemented in Phase-1. Then, those adjacent to the Chiefdoms selected in Phase-1 group were given second priority to be implemented in Phase-2.

3) Notwithstanding the preceding criterion, Chiefdoms with relatively large portion of the areas that have severely been degraded where restoration can be envisaged through the proposed measures were chosen for phase-1 group on account of immediate necessity for taking timely countermeasures.

4) Chiefdoms with least degraded land were grouped in Phase-3 since there's little need of early implementation, though degradation would proceed as time elapses. By the similar reason, those with most seriously degraded to such an extent that measures in a scale of participatory conservation works are not enough to rehabilitate the devastated state in an acceptable period were also set aside as phase-3 groups.

b. Selection Process

Judging from the above criteria, the following process was taken to allocate the target chiefdoms in each phase. The basic principle of selection resides with both gradual diffusion originated from the Pilot project to surroundings, and taking timely measures to moderately eroded areas, because too seriously eroded ones require prohibitive costs, period and efforts and too mildly eroded ones may allow sometime to leave them as it is. The grouping procedure of chiefdom in three TAs is tabulated below.

Table 4-4: Grouping of Chiefdoms in TA's

TA	Factor considered	Phase-1	Phase-2	Phase-3
1	Pilot Area (ha)	Eni(396), Ngcayini(1381)	-	
	Nearest to P.A.	Nkiliji (2042), Nsenga(1173)	-	
	Area adjustment	Butfongweni(829)*	Below 5 occupy 1/3 of TA1	The rest Kingdoms:
	Nearer to P.A.	These 5 occupy 1/3 of TA1	Mdayane(588), Bhekinkoshi (1938), Ngwazini(898)	Sankolweni (too eroded), Ntunja (too eroded), Nyakeni, Swaceni (least eroded), Mbeka(d.o.)
	Phase 2 Area adjustment		Mkhulamini(1350), Maliyaduma(1197)	
2	Pilot Area (ha)	Zikhoteni(4822)	-	
	Nearest to P.A.	This larger than 1/3 of TA2		Mchinsweni (228), Manyandzeni (978)
	Area adjustment		Mabona(4753), Dumenkhungwini (919)	These two are nearest to PA but least eroded
	Nearer to P.A.		These two are moderately	
	Area adjustment		Eroded	
3	Pilot Area (ha)	Macdvulwini(5491)		
	Nearest to P.A.	Velezizweni(6,358), Bhazeni II (2701)	Bhadzeni I (2840), Mahhashini(844), Khabonina(921)	
	Area adjustment	These 3 occupy 1/3 of TA3	These three have comparable degree of erosion	
	Nearer to P.A.			Mgazini(3644), Dladleni(826),
	Area adjustment			Ngcoseni(2000), Lishikishini(4975)

c. Grouping of Chiefdoms for Project Implementation

Finally, the following groups of chiefdoms were proposed for the implementation of the projects proposed in the Master Plan.

Table 4-5: Proposed Phase-wise Grouping of Chiefdoms in Target Areas

Stage/Phase	Pilot Stage (Y2001-Y2003)	Phase-1 (Y2004-Y2009)	Phase-2 (Y2010-Y2015)	Phase-3 (Y2016-Y2020)	Total
Implementing Body	**MOAC/JICA**	**MOAC**	**MOAC**	**MOAC**	
Numbers of Target Chiefdoms	(4)	9	11	10	30 chiefdoms
TA1	Eni, Ngcayini	**Eni, Ngcayini,** Nkiliji, Nsenga, Butfongweni,	Mdayane, Maliyaduma, Bhekinkoshi, Ngwazini, Mkhulamini	Sankolweni, Ntunja, Nyakeni, Swaceni, Mbeka	15
TA2	Zikhoteni	**Zikhoteni,**	Mabona, Manyandzeni, Dumenkhungweni	Mchinsweni,	5
TA3	Macdvulwini	**Macdvulwini,** Bhadzeni II, Velezizweni	Bhadzeni I, Mhhashini, Khabonina	Lishikisini, Mgazini, Dladleni, Ngcoseni	10

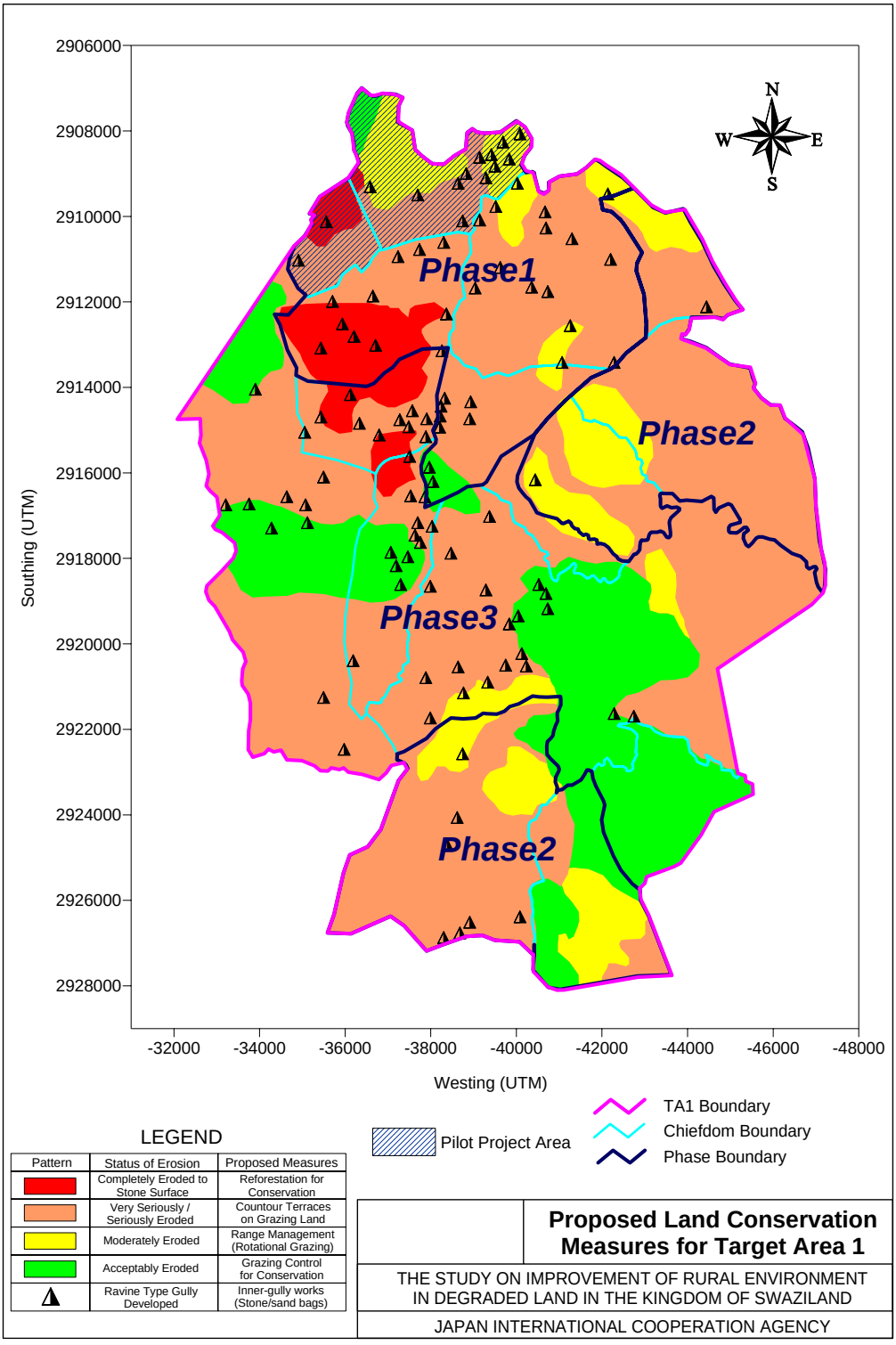


Figure 4-3: Phase-wise Implementation Area for TA1

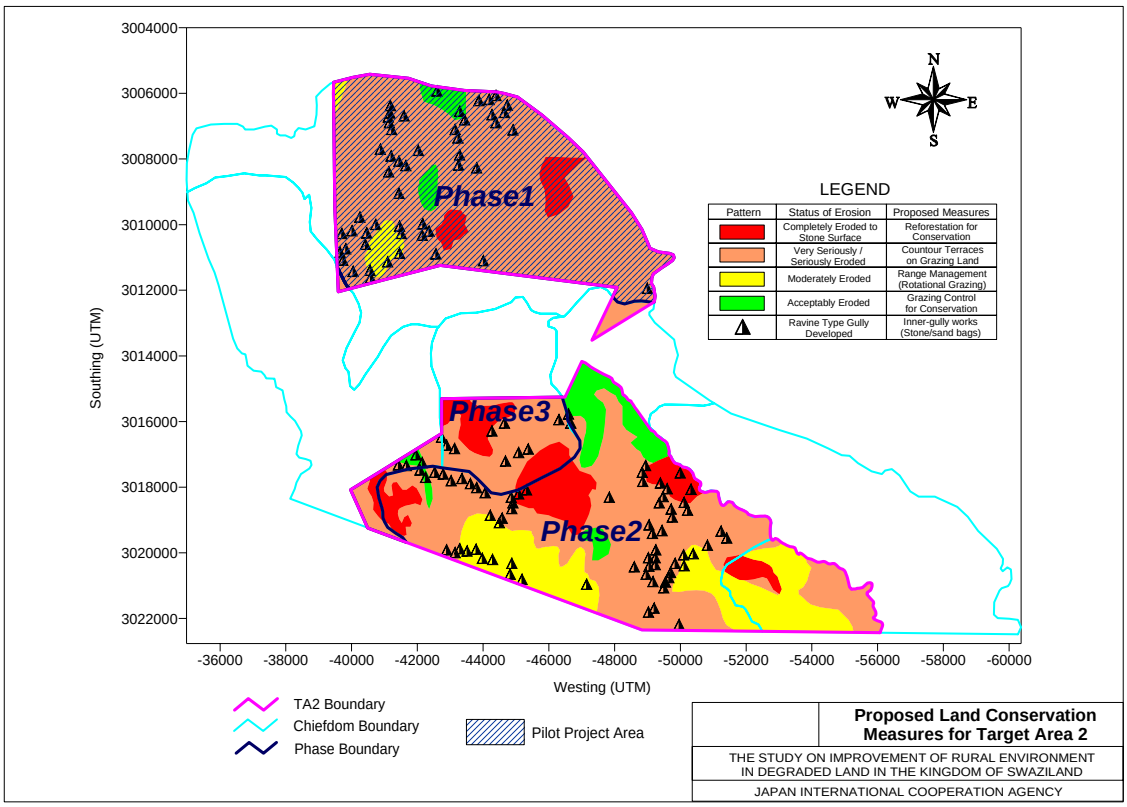


Figure 4-4: Phase-wise Implementation Area for TA2

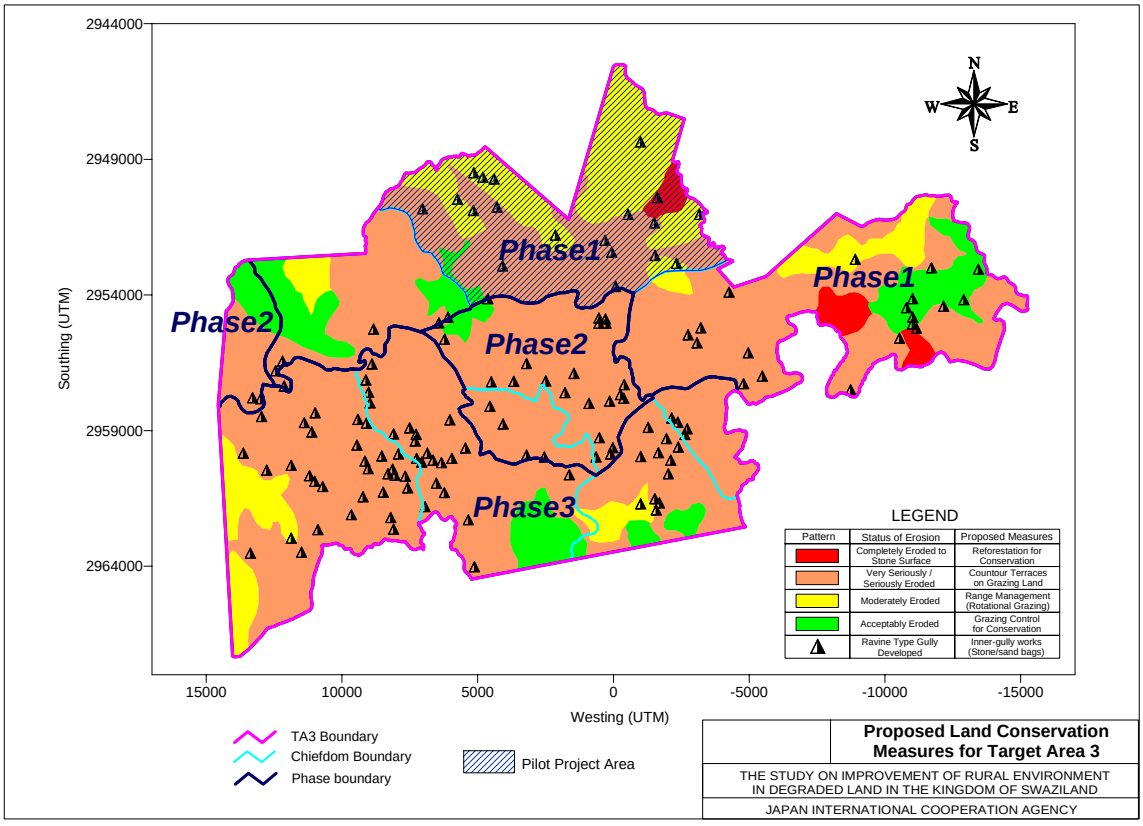


Figure 4-5: Phase-wise Implementation Area for TA3

4.6 Main Components of the M/P

The main components of the proposed M/P consist of; 1) Soil Conservation Plan, 2) Grazing/Range Management Development Plan, 3) Agro/Community Forestry Development Plan, and 4) Capacity Building Development Plan, each of which is briefly introduced below.

4.6.1 Soil Conservation Plan

The proposed soil conservation plan consists of: a) construction of contour terrace, b) gully training, and 3) rill stabilizing. The details of each sub-component are described in section 5.5.1 of chapter 5 of the report. The proposed soil conservation plan has been made paying attention to the prevailing land degradation condition of each target area, type of soil erosion, degree of land degradation. And priority was put on the degraded land, where initial stage of land degradation is prevailing.

Table 4-5: Phased Target Quantity of Soil Conservation Plan

Location	Sub-component	Phase I	Phase II	Phase III	Total
TA1	Contour terraces (ha)	910	1,370	2,280	4,560
	Gully training (sites)	25	15	30	70
	Rill stabilizing (rills)	10	15	25	50
TA2	Contour terraces (ha)	320	480	800	1,600
	Gully training (sites)	40	30	20	90
	Rill stabilizing (rills)	6	10	16	32
TA3	Contour terraces (ha)	639	950	1,591	3,180
	Gully training (sites)	20	30	40	90
	Rill stabilizing (rills)	15	18	31	64
Total	Contour terraces (ha)	1,869	2,800	4,671	9,340
	Gully training (sites)	85	75	90	250
	Rill stabilizing (rills)	31	43	72	146

4.6.2 Range Management Development Plan

This plan has been formulated with the intension of realizing the controlled grazing/range management in 3 target areas in the future. Although it is anticipated that it will take time to realize the proposed grazing/range management plan, efforts should be made by the Government of Swaziland together with the community people concerned. The proposed grazing/range management development plan is summarized below.

Table 4-6: Phased Target Quantity of Range Management Plan

Year	Y2004-Y2009	Y2010-Y2015	Y2016-Y2020	Total
TA1	335 ha	1,125 ha	500 ha	1,960 ha
Fenced Grazing	3 Schemes	5 Schemes	3 Schemes	11 Schemes
Fattening Units	1 Unit	4 Units	1 Unit	6 Units
TA2	290 ha	510 ha	650 ha	1,450 ha
Fenced Grazing	2 Schemes	2 Schemes	3 Schemes	7 Schemes
Fattening Units	1 Unit	1 Unit	1 Unit	3 Units
TA3	750 ha	1,485 ha	1,1035 ha	3,270 ha
Fenced Grazing	3 Schemes	5 Schemes	4 Schemes	12 Schemes
Fattening Units	2 Units	1 Unit	2 Units	5 Units
Total	1,375 ha	3,120 ha	2,185 ha	6,680 ha
Fenced Grazing	8 Schemes	12 Schemes	10 Schemes	30 Schemes
Fattening Units	4 Units	6 Units	4 Units	14 Units

4.6.3 Agro/Community Forestry Development Plan

The proposed agro/community development plan has been formulated as one of the main components to support the proposed soil conservation plans in 3 target areas. To achieve the objective of the proposed M/P, agro/community forestry development plans for each target area have been made as one of the main components to support realization of the soil conservation in 3 target areas. Namely, for each target area, the main components include the sub-components of 1) establishment of integrated tree nursery, 2) afforestation of stony surface, 3) woodlot development, and 4) wattle trees management. The details of each sub-component are given in section 5.5.3 of chapter 5 of the report.

Table 4-7: Phased Target Quantity of Agro/Community Forestry Development Plan

Location	Sub-component	Phase I	Phase II	Phase III	Total
TA1	Tree nursery production (seedlings)	739,266	960,586	1,101,045	2,800,897
	Afforestation of stony surface (ha)	90	130	210	430
	Woodlot development (ha)	30	65	65	160
	Wattle management planting area (ha)	30	40	25	95
TA2	Tree nursery production (seedlings)	623,942	878,757	829,565	2,332,264
	Afforestation of stony surface (ha)	50	70	110	230
	Woodlot development (ha)	65	30	25	120
	Wattle management planting area (ha)	20	235	165	420
TA3	Tree nursery production (seedlings)	790,372	894,872	1,257,685	2,942,929
	Afforestation of stony surface (ha)	80	120	210	410
	Woodlot development (ha)	0	20	80	100
	Wattle management planting area (ha)	60	16	39	115
Total	Tree nursery production (seedlings)	2,153,580	2,734,215	3,188,295	8,076,090
	Afforestation of stony surface (ha)	220	320	530	1,070
	Woodlot development (ha)	95	115	170	380
	Wattle management planting area (ha)	110	291	229	630

4.6.4 Capacity Building Development Plan

In due consideration of the importance of the capacity building for the implementation of the Master Plan, a capacity building development plan has been prepared, especially targeting at community leaders and community people concerned as well as the government officials including RDA staff. The capacity building plan has been formulated at central government level as well as at the community level.

The proposed capacity building development plan includes: i) establishment of Project Management Unit (PMU); ii) Inkhundla workshops for the project implementation at Inkhundla Centres; iii) chiefdom workshops for the project implementation at each community; iv) leadership trainings for the community leaders and community members; v) execution of the technical training programs inclusive of environmental education programs mainly targeting at younger generation of the communities concerned; and vi) periodical monitoring and evaluation workshops at each community.

It is noteworthy to mention that the proposed PMU is expected to act not only as the implementing body of the proposed M/P but also as the coordinating body to carry out the

capacity building activities involving the government staff from various departments at central as well as regional level.

Table 4-8: Phased Target of Capacity Building Plan

	Phase 1	Phase 2	Phase 3
	2004 – 2009	2010 - 2015	2016 – 2020
Inkhundla Workshops			
Chiefdom Workshop			
Leadership / Technical Training			
Monitoring & Evaluation			
Workshops (Nos.)	33	33	33
Technical Training (Nos.)	133	130	137
Chiefdoms in TA1	Eni, Ngcayini, Butfongweni, Nkiliji, Nsenga	Mdayane, Maliyaduma, Bhekinkoshi, Ngwazini, Mkhulamini	Sankolweni, Ntunja, Nyakeni, Swaceni, Mbeka
Chiefdoms in TA2	Zikhoteni, Manyandzeni	Mabona, Dumenkhungwini	Mchinsweni
Chiefdoms in TA3	Macdvulwini, Bhadzeni 2, Velezizweni	Bhadzeni 1, Mahhashini, Dladleni	Lishikishini, Mgazini, Dladleni, Ngcoseni

4.7 Supporting Plan

4.7.1 Grazing/Management Development Plan

Supporting plans for the above main component consist of the following.

1) Fodder field nursery,
2) Provision of training, advice and extension,
3) Alternate production and production of cattle on fodder plots
4) Water source protection around springs and sponges,
5) Development of alternative watering sites,
6) Establishment of perennial plants on the rangeland,
7) Transfer of livestock from rangelands to productive pasture, and
8) Weed control.

4.7.2 Agro/Community Forestry Development Plan

Supporting plans for the above main component consist of the forestry development support components in TA1, TA2 andTA3, and they include;
1) Improved fallow
2) Alley cropping promotion
3) Windbreaks/shelterbelts
4) Live fence, and
5) Conservation of indigenous fruit tree

4.7.3 Livelihood Improvement Plan

Livelihood improvement plans consist of 1) Community Garden Plan, 2) Water Source Protection Plan, and 4) Improved Cooking Stove Extension Plan. Outline of each plan is briefed below.

a. Community Garden

The main objectives of the community garden are: i) to economically support the community people, particularly women, through the vegetable production in the garden; and ii) to directly contribute to prevent the community lands from further degradation by way of vegetable production on the terraced garden plots.

Prior to the implementation of the project, community workshops should be organized by PMU and the community development committee to discuss on the project implementation including selection of the site, acquisition of land, listing of the participants, cost sharing arrangement for the construction works, and establishment of rules or constitution of the sub-committee.

The project will contribute much to the improvement of rural life. It will improve the nutritive conditions of rural households and will increase the income level, particularly for women.

b. Water Source Protection Plan

In terms of materials, there should be five- or even six-strand barbed wire fencing designed to exclude both cattle and small stock around these key and vital spring and sponge water sources. The area included within the fencing should ensure that the water remains clean and the wet areas free of trampling and puddling. In addition, small livestock water troughs to provide water away from the sensitive water points should be established. This will ensure that there is a reduction in cattle tracking to water points.

At appropriate places a sump should be built from bricks and cement from which water is lead off to a small storage tank and then into a pipe with a tap to a water trough from which livestock can drink and humans can gather fresh clean water.

c. Improved Cooking Stove Extension Plan

The objective of the improved cooking stove extension plan is to utilize the promotion of improved cooking stove as a tool to promote participation of community people, especially women. Since it assists a lot to reduce consumption of fuel woods, which also assist to reduce the expenditure for buying firewood, prioritise on potential deforestation areas. However, under the concept above, the target group is *all homesteads*, which have interest within the target area, regardless of the location of chiefdoms.

Improved Cooking Stove will be promoted in two ways. *One* is diffusion under the coordination by the government, i.e. home economic section which is in charge of promotion of cooking stove under MOAC. This section could promote the cooking stove under coordination with RDA extension staff with utilising the skilled community women who have gained the skill to construct stoves.

The other is community-based diffusion. In each TA, there are several women who have gained the skills through the pilot projects. They are already motivated to promote cooking stoves and are promoting them continuously within their chiefdom though the speed of adoption is not fast.

Since construction of cooking stove does not require any cost, the community people may promote by themselves if there are needs in this way.

4.8 Summary of the Phased Target

The summary of the target to be achieved under this M/P is summarized in the Table below.

Table 4-9: Summary of the Phased Target

Main Plan	unit	Phase 1	Phase 2	Phase 3	Total
Soil Conservation Plan					
Contour Terrace	ha	1,869	2,800	4,671	9,340
Gully Training	site	85	75	90	250
Rill Stabilizing	site	31	43	72	146
Grazing Range Management Plan					
Rotation Grazing	ha	1,375	3,120	2,185	6,680
Feedlot	site	4	6	4	14
Grazing Control(Tethering)	ha	490	730	1,240	2,460
Agro/Community Forestry Development Plan					
Integrated Tree Nursery	site	2	0	0	2
Stony Surface Reforestation	ha	220	320	530	1,070
Woodlot Development	ha	95	115	170	380
Wattle Management	ha	110	291	229	630

4.9 Estimated Implementation Cost of the M/P

4.9.1 Phased Quantity

Main Components of the M/P will be implemented in three phases in which phase 1 will be from 2004 to 2009, phase 2 will be from 2010 to 2015 and phase 3 will be from 2016 to 2020. Each quantity in each Target Area will be summarized in the following tables.

Table 4-10: Phased Quantity for Main Components of the M/P

Description	unit	Quantity			
		Phase1	Phase2	Phase3	Total
Soil Conservation					
Contour Terrace	ha	1,869	2,800	4,671	9,340
Gully Training	site	85	75	90	250
Rill Stabilizing	site	31	43	72	146
Grazing Management					
Rotation Grazing	ha	1,375	3,120	2,185	6,680
Feed Lot	Nos.	4	6	4	14
Grazing Control (Tethering)	ha	490	730	1,240	2,470
Forest Management					
Integrated Nursery	Nos.	2	0	0	2
Stony Surface Reforestation	Ha	20	320	530	1,070
Woodlot Development	Ha	95	115	170	380
Wattle Management	Ha	110	291	229	630
Capacity Building	session	156	153	160	469

4.9.2 Implementation Cost

Total implementation cost for the M/P will be estimated as follows based on the quantity and unit cost which were presented above. These cost include both hard and soft components to carry out each component of the M/P in a phased manner.

Table 4-11: Total Implementation Cost for the M/P

Description	Implementation Cost (Emalangeni)			
	Phase1 (2004-2009)	Phase2 (2010-2015)	Phase3 (2016-2020)	Total (17years)
Soil Conservation				
Contour Terrace	7,476,000	11,200,000	18,684,000	37,360,000
Gully Training	850,000	750,000	900,000	2,500,000
Rill Stabilizing	77,500	107,500	180,000	365,000
Sub Total	8,403,000	12,057,500	19,764,000	40,225,000
Grazing Management				
Fenced Rotation Grazing	1,100,000	2,496,000	1,748,000	5,344,000
Feedlot	320,000	480,000	320,000	1,120,000
Grazing Control (Tethering)	49,000	73,000	124,000	246,000
Sub Total	1,469,000	3,049,000	2,192,000	6,710,000
Forest Management				
Integrated Nursery	1,052,000	0	0	1,052,000
Stony Surface Reforestation	2,200,000	3,200,000	5,300,000	10,700,000
Woodlot Development	950,000	1,150,000	1,700,000	3,800,000
Wattle Management	550,000	1,455,000	1,145,000	3,150,000
Sub Total	4,752,000	5,805,000	8,145,000	18,702,000
Capacity Building	267,384	262,242	274,240	803,866
Total	14,891,884	21,173,742	30,375,240	66,440,866
(US$)	(1,909,216)	(2,714,582)	(3,894,262)	(8,518,060)

Above implementation cost will be divided by the duration of each phase and annual implementation cost will be calculated as follow.

Table 4-12: Annual Implementation Cost of the M/P

Description	Annual Implementation Cost (Emalangeni)			
	Phase1 (2004-2009)	Phase2 (2010-2015)	Phase3 (2016-2020)	Average (17years)
Soil Conservation	1,401,000	2,010,000	3,953,000	2,366,000
Grazing/Range Management	245,000	508,000	438,000	395,000
Forest Management	792,000	968,000	1,629,000	1,100,000
Capacity Building	44,564	43,707	54,848	47,286
Total	2,481,564	3,528,707	6,074,848	3,908,286
(US$)	(318,000)	(452,000)	(778,000)	(501,000)

4.10 Benefit Cost Analysis of Main Projects

The benefit cost calculation of the main projects is summarized in Table 4-1.

Table 4-13: Summary of the Benefit Cost Analysis

Project Component	IRR	B/C	Main Benefits
Community garden	17.9 %	1.13	Sale of the vegetables
Integrated Tree Nursery	4.7 %	0.92	Sale of tree seedlings
Soil Conservation	10.7 %	1.03	i) grazing grass recovery; ii) prevention of dam sediment and gully formation; iii) creating IGA opportunities; iv) improving water conservation
Feedlot Fattening	19.5 %	1.15	Sale of fattened cattle

Note: (1) Refer to Annex G.4 for the detailed calculation sheets.
(2) IRR = Internal Rate of Return; B/C = Benefit cost ratio
(3) Benefit cost analysis has been conducted only for the main projects as it is considerably difficult for other projects (such as water source protection, improved cooking stove, and afforestation) to quantify the benefits.

As presented in the above table, most projects indicate the economic and financial viability as IRR exceeds the opportunity cost of capital (10 %).

Only the integrated tree nursery project indicates the lower IRR It is recommended that the said project should be conducted under full support from the Forestry Section of MOAC.

4.11 Proposed Project Implementing Body

4.11.1 Basic Concept

For a sound management structure to ensure the coordinated delivery of goods and services for the Master Plan, the establishment of Project Management Unit (PMU) has been proposed. PMU will act not only as the implementing body for the projects proposed in the Master Plan, but also as the capacity building body for the government agencies staff who will be involved in the Master Plan through in-service training during the implementation of the project. In addition, capacity building activities for local community leaders and community people will also be conducted through the training programme organized by the PMU. Beneficiaries of the project would be encouraged to fully participate in the project through these activities.

The PMU activities include the promotion of the development committees to be established in each community for the implementation of the projects. The development committees established during the implementation of pilot project played a very important role and proved to be quite efficient for the smooth implementation of the pilot projects. The same approach will be applied to the project proposed in the Master Plan.

4.11.2 PMU as the Project Supervising Body

The PMU will be led by a Project Manager and will have the project management staff who are in charge of the main tasks of; i) community development; ii) monitoring and evaluation; and iii) technical support.

Under the project management staff, a project coordinator will be assigned in each target area. Project coordinators will be selected from extension officers in the RDA offices, i.e. Central RDA at Ludzeludze, Luve RDA, Hluti RDA and Ngwempisi RDA.

In the case of TA1 (Kukhanyeni Inkhundla), there should be two project coordinators so that the eastern part of the area will be covered by Luve RDA and the western part by Central RDA at Ludzeludze.

Organizational structure of PMU is depicted in the following figure.

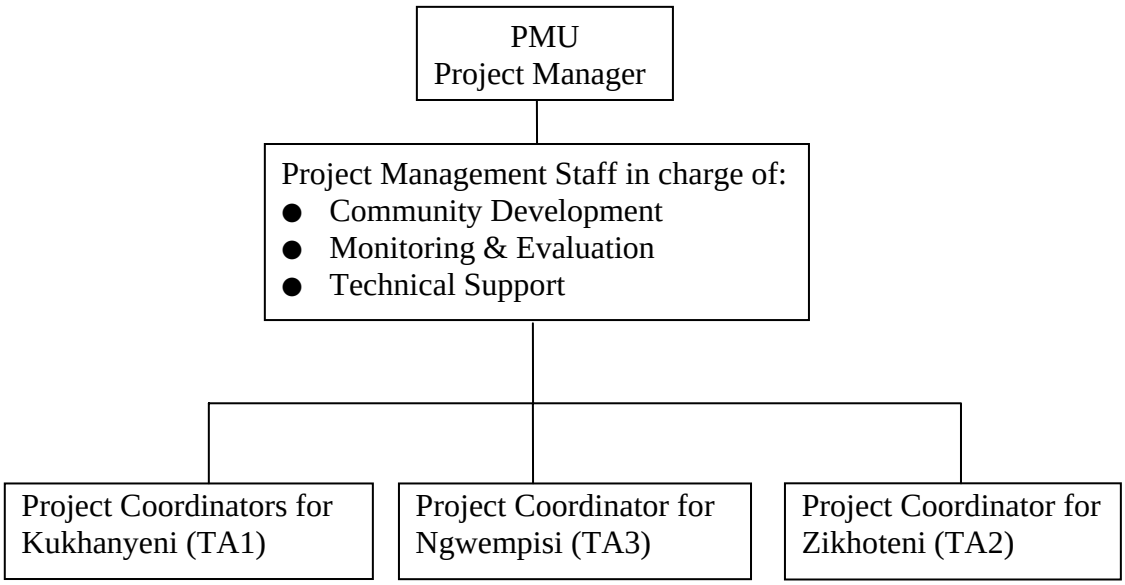


Figure 4-6: Organizational Structure of Project Management Unit

4.11.3 Establishment of Committees for Implementation of the Master Plan

The establishment of the Community Development Committee (CDC) is indispensable for the implementation of the Master Plan at community level. Such a committee will be established under the approval and support from chiefdom authority.

CDC will be led by a committee chairperson who will be assisted by a vice chairperson, a secretary, a treasurer, and some other members. Under the committee, there will be sub-committees in the fields of soil conservation, grazing, feedlot, nursery, afforestation, improved cooking stove, spring protection, and so on.

4.12 Expected Roles of MOAC, Inkhundla and RDA, NGOs and Community People

4.12.1 Expected Roles of MOAC

MOAC is expected to play a leading role in implementation of the proposed soil conservation projects in 3 target areas. Judging from the nature of the soil conservation projects as well as the experiences obtained from the implementation of the pilot projects, it will be very difficult to ask community people to continuously take part in soil conservation projects for a long time without any support by the government. With this understanding, JICA study team considers that the soil conservation plans/projects proposed in this M/P should be implemented as the important public works to be carried out by the Government of Swaziland

with wide-range as well as long-term support by the community people (the majority of the stakeholders), inviting NGOs where necessary.

In addition to the above, MOAC should take accountability for the community people that the prevailing land degradation in 3 target areas has been caused as a result of long-term as well as combined human activities by the community, availing every possible means and opportunities such as media and workshops etc., through which, it is expected that community people will gradually realize that it is not only the government but also the community who people are also responsible for the prevailing land degradation in 3 target areas.

4.12.2 Expected Roles of Inkhundla and RDA

Each Inkhundla in 3 target areas consists of several chiefdoms. Accordingly, each Inkhundla concerned is expected to play an important role, especially in execution of proposed grazing management projects in 3 target areas, which include rotation grazing, feedlot (cattle fattening) and grazing control. Because, the proposed grazing management projects will be implemented in the wide areas, which cover 2 to 3 chiefdoms. Accordingly, to implement these projects it needs adjustments among the chiefdoms concerned.

Thus, it is expected that each Inkhundla to take action to settle the matter prior to implementation of the projects. Also, it is expected that each Inkhundla to take necessary action so that the community people can access to the development committee established in each Inkhundla to obtain further fund for continuous implementation of the soil conservation projects by community people.

4.12.3 Expected Roles of NGOs

Considering the present activities of NGOs in Swaziland, also considering the achievements of NGOs that took part in implementation of the pilot projects, the expected roles of NGOs in implementation of the proposed M/P are summarized as below.

JICA study team considers that all the components included in the proposed M/P should basically implemented by the stakeholders, i.e., all the related government agencies inclusive of the community people concerned. Accordingly, although JICA study team highly evaluates the ability of NGOs in Swaziland that was proved through implementation of the pilot projects, also it is necessary as well as effective to use the NGOs in implementation of the proposed project components in the M/P, the expected roles of NGOs in implementation of the proposed M/P are that they should act as supplemental staff and they should always keep neutral positions and act as a organization which bridges the gap between the communities and the government. Because over presence of NGOs will bring the problems of increase in the costs for implementation of the proposed components of the M/P as well as it may hamper creation of self-depending mind of the community people concerned.

4.12.4 Expected Roles of the Community People

In implementation of the pilot projects, community people have proved that they have capability of 1) carrying out planning and implementation of the projects together with the governmental officials and NGOs, 2) decision making for establishment of rules to be observed for management of the implemented projects. During implementation of the pilot projects, community people were well guided by the governmental staff, NOGs, and JICA study team, thereby they achieved good performance in implementation of the pilot projects, self-evaluation of the pilot projects, discussions with each other regarding the pilot projects, also in the performance of inter-location monitoring of the pilot projects etc. These experiences are not only highly evaluated but also they will make it possible that community people can continue this kind of soil conservation projects by themselves provided that the government extends necessary supports and accountability for the community people of the

necessity of the soil conservation in their communities. Accordingly, it is expected that the community people take part in the soil conservation projects from it initial stage i.e., from planning stage of the projects to the management and operation and maintenance stage of the projects in collaboration with the governmental staff and NGOs, where necessary.

5 Conclusions and Recommendations

5.1 Conclusions

JICA study team started the study on Improvement of Rural Environment in Degraded Land in the Kingdom of Swaziland in late December 2000 based on the S/W agreed upon between the Government of Swaziland and JICA on August 23, 2000. During implementation of the study, efforts by the counterpart personnel of MOAC, community people, NGOs, together with JICA study team were made to work out suitable as well as sustainable countermeasures tackling for improvement of the degraded lands in 3 target areas.

As a result of the said study, the Master Plan (M/P) as proposed in this report has been formulated. The M/P consists of the main components of: 1) Soil Conservation; 2) Grazing and Range Management; 3) Agro/Community Forestry; and 4) Capacity Building Plan, together with the supporting components of : 1) Grazing and Range Management (e.g., Establishment of Improved Pasture, Water Source Protection); 2) Agro/Community Forestry (e.g., Improved Fallow); and 3) Livelihood Improvement Plan (e.g., Community Garden Projects as income generation, Improved Cooking Stove Projects).

During the study, some of the proposed proj ned above were implemented in 3 target areas as the pilot projects, and proved to be effective for attainment of the targeted objectives. Accordingly, it is hereby concluded that the proposed M/P is considered to be the effective tools as countermeasures for improvement of the degraded lands in 3 target areas, and it should be implemented as early as possible, taking the following recommendations into consideration.

5.2 Recommendations

1. Early Implementation of the M/P

Since the contents of the proposed M/P presented in this report have been prepared taking all the working results that were obtained as a result of co-work with community people, counterpart personnel of MOAC and related governmental agencies, and NGOs, it is recommended that MOCA should decide as early as possible to implement the proposed M/P together with its supporting components.

2. Supporting Activities

It is anticipated that implementation of the proposed M/P seems difficult to put into practice only through the participatory approach of the stakeholders unless harnessed by supporting activities, since no immediate needs to implement the soil conservation plans are felt by the majority of the stakeholders, while they acutely need income generating activities. This is the main reason why JICA study team considers to implement the proposed M/P coupled with its supporting activities that contain income generating components.

3. Strong Leadership

The proposed M/P should be implemented by the Government of Swaziland as one of the most important public works with strong leadership by MOAC in collaboration with other government agencies concerned and participatory activities by the community people concerned.

4. Assistance and Orientation by the Government

The reasons why soil conservation measures should be taken include the necessity of inheriting productive land to coming generations, the requirement on sustainable land use for

livelihood of current generation. Although MOAC shall play a key role of promoting and supporting soil conservation, it is local population that should take initiative for its implementation as major actors. All the public works ought to be started by the request of the stakeholders, through assistance, cooperation and subsidies by the Government. MOAC and the related government agencies are responsible for education, training, awareness promotion enlightenment, sensitization of organizing the working groups, providing local population with substantial and technical assistance etc., however, it is essential to orient them to the direction until they are disposed of doing soil conservation works for themselves as well as for their descendants.

5. Continuous Capacity Building

Through working together with community people during the study, it has been observed that community people do not concern much the soil conservation in the communities to which they belong. However, it has been observed that change in community people with respect to need of soil conservation has been gradually growing among the community people. This change implies that education and training can foster the stakeholders to acquire more scientific and environmental knowledge and experiences required for better understanding on soil conservation.

6. Controlled Grazing Systems

Though it has been identified through the study that overgrazing continues a major cause of soil erosion, keeping as much cattle herd as possible still remains as traditional behaviour, and very few agree with any reduction of herd size. However, the study to date has revealed that actual carrying capacity on grazing land has steadily been dwindling as herd pressure on grazing land continues to deteriorate grass cover, and this tendency will lead in the future to catastrophic situation after heavy loss of topsoil and subsoil, or grave natural feed crisis for cattle. This means that cattle herds are decreasing regardless of stakeholders' intention. Then, local population cannot but abandon primitive grazing and have to rely on feedlot or other artificial feeding systems. They will learn that proper range management like rotational fenced grazing is the only way to sustain natural grazing.

7. Quick Action for Environment Conservation

Current status of land degradation still remains treatable with relevant measures, although whether local population really try to take measures or not is uncertain. Yet, feeble concern on environmental problems prevails throughout African Continent and this is not at all specific matter in Swaziland. In order to radically rectify this grave situation, a long term tactic will be required including school education, adult sensitization, community training, provision of incentives etc. Recently, a host of legislative efforts have been made in developed world and some developing countries to facilitate environmental care or rehabilitate damaged nature, for fear of emerging un-retreatable catastrophic state before stakeholders take initiatives. Under these circumstances, a powerful administrative action will be waited by the initiatives of the Government of Swaziland to extend what has been achieved in this study. An example of action is proposed in this report.

8. Recruit of Manpower

Smooth implementation of the proposed M/P needs manpower and further strengthened implementation organizations. During the study, PPMU was established. And PPMU paid very important role not only in implementation of the pilot projects but also in performing the training programs and workshops together with community people in collaboration with other staff of MOAC.

However, since implementation of the proposed M/P will take a long time of 17 years (from the year 2004 through the year 2020), it is necessary to further strengthen the manpower both at MOAC and at the offices of RDA. Based on the experiences obtained through

implementation of the pilot projects, it is proposed that at least one administrative officer and two technical officers, in total three offices should be additionally recruited to presently existing PPMU, with this arrangement and providing other additional functions, PPMU will be strengthened into PMU (Project Management Unit), which is the proposed core-organization for implementation of the proposed M/P.

At the same time, it is recommended that a series of trainings with respect to soil conservation should also given to the recruited field officers at the offices of RDAs (Central RDA and Luve RDA inTA1, Hulti RDA in TA2, and Ngwempisi RDA in TA3) so that they can work and act as the locally-located officers who will not only to guide and direct the community people but also work with community people during implementation as well as management of the projects proposed under this M/P. It is expected that this arrangement will contribute to deepen the relationship between the central government and the local authorities during implementation of the proposed M/P.

9. Implementation Priority of the Proposed Master Plan in Case of Insufficient Arrangement of the Budget and Manpower

The proposed master plan has been prepared on the assumptions that the budget and manpower required for implementation of the proposed master plan will be properly managed by the Government of Swaziland. At the same time it is important to implement the proposed phase-wise main projects simultaneously. However, if it is found difficult to arrange such amount of budget, or if it is found difficult to arrange the manpower as proposed in the master plan, in such case, JICA study team recommends that MOAC should start with the Proposed Capacity Building Project (targeting at community people) or with the Proposed Forestry Management Project in Phase1 (see Table 4-6) in combination with soil conservation projects, based on following considerations.

a) The proposed capacity building projects targeting at community people may be implemented with relatively low cost. And implementation of the capacity building project will help accelerate the progress of the proposed soil conservation projects.

b) The proposed forestry management project in Phase 1 has the following nature and merits.

(1) The proposed forestry management project in phase1 is scheduled to be implemented in the vicinity of TA2, where a tree nursery was constructed at Zikhoteni under the pilot projects during the study. Accordingly, it is expected that tree planting for the areas specified as phase 1 may be carried out at low cost by utilizing the tree nursery and it will contribute to the soil conservation works in the areas specified as phase1.

(2) Tree planting as forestry management project is well recognized and accepted among the community people. This means that tree planting projects have a possibility of spreading over the wide areas. This function is considered very important to promote the whole soil conservation works in the areas specified as phase 1.

(3) In construction of the tree nursery in TA2, the staff of forestry department of MOAC made useful advices at the construction site also the staff had several chances to discuss with community people in TA2 regarding tree planting etc. In addition to this, the staff conducted training at Malkern on the management of tree nursery for the selected 10 people in the community of TA2, with the purpose of further utilization of the completed tree nursery in TA2. With these backgrounds it is expected that tree planting in the areas specified as phase 1 may be promoted and expanded through these core people.

(4) Implementation of the range management project in the areas specified as phase 1 is of course very important and indispensable from the view point of promotion of soil

conservation works. However, judging from the prevailing social conditions in the communities, quick and smooth implementation of range management projects in the areas specified seems to be difficult compared to the implementation of the proposed forestry management plan in phase 1.

Chapter 1

Preface

1 PREFACE

1.1 Introduction

This Draft Final Report (2) for the Study on Improvement of Rural Environment in Degraded Land in the Kingdom of Swaziland was prepared in accordance with the Scope of Work agreed upon between the Ministry of Agriculture and Co-operatives (MOAC) and Japan International Cooperation Agency (JICA) on August 23, 2000. This report summarizes the all the study results obtained by JICA study team from the initial stage of the study to date. Based on the study results, this report mainly contains the following.

(1) Background of the study,
(2) General conditions of the study area and target areas,
(3) Pilot projects, which were implemented during the study, including lessons learnt obtained through implementation and evaluation of the pilot projects,
(4) Proposed degraded land improvement plan in three (3) target areas (proposed draft final M/P) and,
(5) Conclusions and recommendations.

1.2 Background of the Study

Agriculture is one of the most important industries in Swaziland. About 60 % of Swazi people engage themselves in agriculture and livestock farming. Accordingly, the country's GDP largely depends on the agricultural production. As population increases more intensive land use has prevailed throughout the country. Above all, grazing land in SNL has heavily been degraded due to overgrazing as compared to arable fields where grass strips have protected them against erosion. So far, no systematic countermeasures against land degradation have been taken on grazing land in SNL, although some studies and trials have been carried out by MOAC, NGOs or the projects sponsored by foreign donors.

Topographically, Swaziland is divided into 4 zones, i.e., Highveld, Upper and Lower Middleveld, Lowveld, and Lubombo Plains. It has been reported that most severe land degradation is observed in the Highveld and Upper Middleveld of the country. Especially, land degradation in Swazi Nation Land (SNL), located within the Middleveld, where people usually practice small-scale livestock farming and agriculture under the leaderships of traditional chiefs, has been rapidly progressing due mainly to lack of proper range management.

In spite of these situations, no proper countermeasures against land degradation have been taken in the most part of SNL. Under these circumstances, several studies and policies were made and proposed by foreign donors to improve the above-mentioned situation. And several

land conservation projects were and have been implemented in 3 target areas by MOAC and local NGOs; however, the outcomes of those projects are not fruitful in general. The reasons for this may be attributed mainly to the following:

(1) Lack of technology and capability of project implementation and management by administrative sectors,

(2) Lack of considerations for social and environmental conditions in implementation of the projects, and

(3) Project implementation body in combination with governmental administrative sectors, NGOs and communities has not been fully established.

In 1996, the Government of Swaziland, in due consideration of the above situation, requested the Government of Japan to undertake a study on improvement of degraded land and its development. In response to this request, considering the need of further information on the condition of the land degradation and on-going related studies by other donors, the Government of Japan undertook a project formation study on contract basis with a local consultant in Swaziland. The report on the study was completed in April 1999. In the report, 3 targets areas were proposed for further study. Also, it was proposed in the report that several pilot projects focusing on improvement of degraded land should be implemented at different levels, i.e., central government, Inkhundla as well as at community levels in the course of the study.

The Government of Swaziland, in 1999, requested again the Government of Japan, (1) to review the above report, (2) to conduct a study in 3 target areas, and (3) to formulate a master plan on improvement of rural environment in degraded land in the Kingdom of Swaziland. In response to this request, the Government of Japan, in August 2000, dispatched a study team to discuss and finalize the scope of works for the study. On August 23, 2000, the Government of Swaziland and JICA Preparatory Study Team signed the Scope of Works for the study.

1.3 Purpose of the Study

The overall purpose of the study is to realize suitable as well as sustainable land use in Highveld and Upper Middleveld through improvement of the degraded lands in 3 Target Areas, i.e., Kukanyeni Inkhundla (TA1), Shiselweni Inkhundla (TA2) and Ngwempisi Inkhundla (TA3). To achieve the said target, the following are carried out in the course of the study.

(1) To formulate a master plan to improve the degraded lands in the said 3 target areas, putting the emphases on 1) income generation in the communities, 2) improvement of

the living environment of community people concerned, and 3) environment conservation in and around the communities of 3 target areas,

(2) To create a consistent basis for land degradation systems, which makes it sure to implement the pilot projects of different nature in collaboration with the related governmental agencies, NGOs and community people in 3 target areas,

(2) To prepare a guideline for improvement of the degraded lands in the study areas, which is applicable especially to Swazi Nation Land (SNL) in Highveld as well as in Upper Middleveld, and

(3) To undertake technology transfer to the counterpart personnel of the Government of Swaziland with respect to planning procedures and planning methods as well as with respect to the study items specified in this study.

1.4 Study Area and Target Areas

The study area consists of SNL in Highveld and Upper Middleveld of the Kingdom of Swaziland. The said 3 target areas are included in the study area. The study area covers approximately 4,650 km^2. Table 1-1 presents the basic information of each target.

Table 1-1: Basic Information of 3 Target Areas

Target Area	Name of Inkhundla	Number of Chiefdoms Included	Population (Y1997)	Number of Households (Y1997)	Area (km^2)
TA1	Kukhanyeni	15	18,492	2,935	195.0
TA2	Shiselweni	5	14,731	2,338	117.0
TA3	Ngwempisi	10	27,693	4,396	306.0
Total		30	60,916	9,669	618.0

1.5 Study Schedule

As stated earlier, this draft final report (2), which includes the draft final master plan, will be submitted to MOAC in October 2003, and the contents of the report will be explained to MOAC and discussed with the counterpart personnel of the Government of Swaziland. After receiving comments on the report, JICA study team will make modifications on the report, where necessary.

With these procedures, the final report, including the final guideline for soil conservation in the study area will be submitted to MOAC in December 2003.

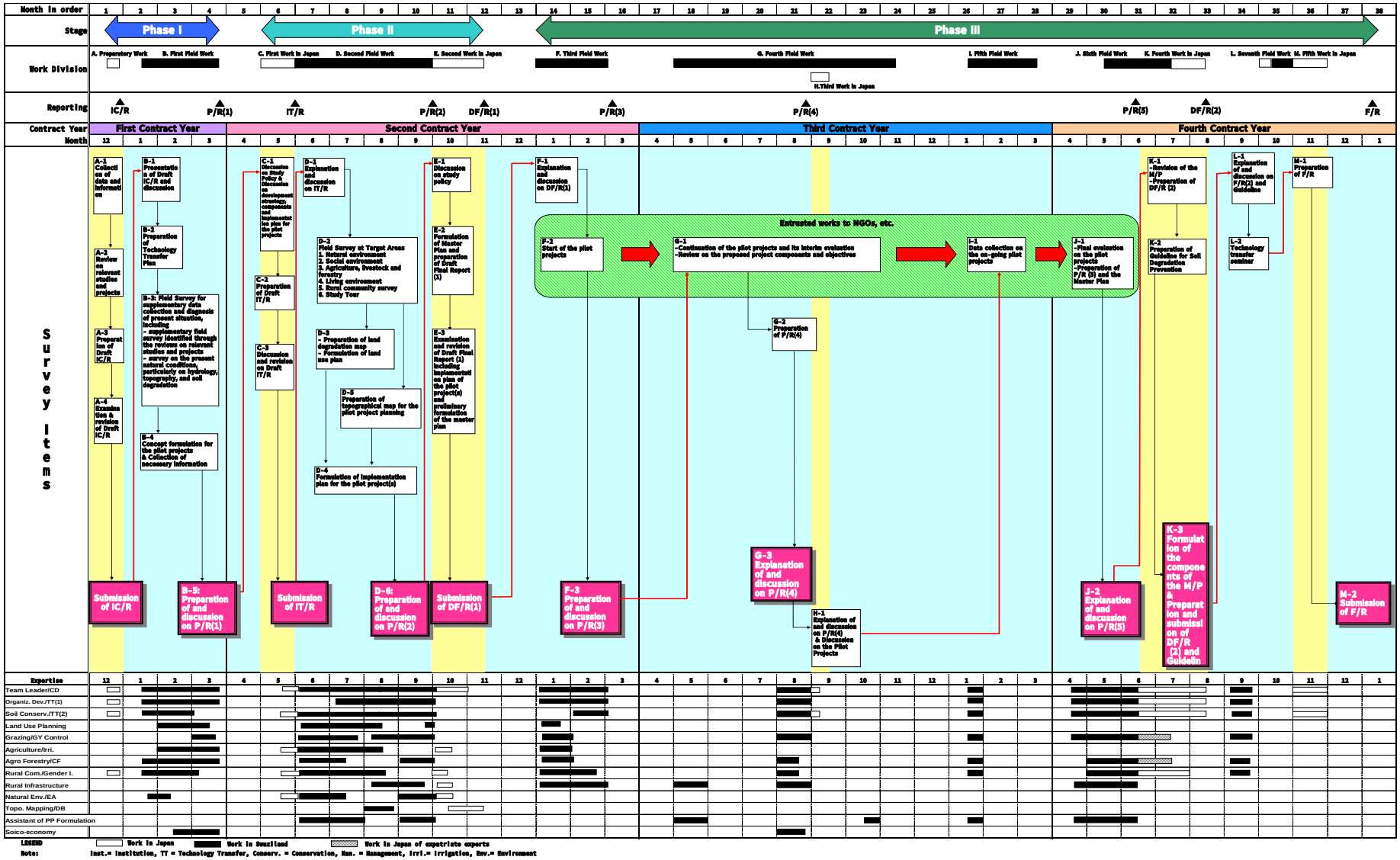


Figure 1-1: Study Schedule

Chapter 2

Background of the Study

2 BACKGROUND OF THE STUDY

2.1 General Socio/Economic Conditions of Swaziland

2.1.1 Demographic Characteristics in Swaziland

a Statistical Data on Population

Statistical data on population in Swaziland between 1976 and 1997 are summarized in the following table.

Table 2-1: Statistical Data on Population in Swaziland

Census Year	Population	Annual Growth Rate
1976	494,534	-
1986	681,059	3.77 %
1997	980,722	3.37 %

Source: Central Statistical Office, Mbabane

The population of Swaziland increased from 681,059 in 1986 to 980,722 in 1997 at an annual growth rate of 3.37 %. The population in 1997 comprised 473,520 males and 507,202 females, including 51,004 absentees (5.5 % of the total population) who are mostly migrant to South Africa and other countries.

b. Population Characteristics

The Swaziland population presents several important features. First, population growth rates have been high as indicated in the above table. Secondly, the proportion of women in the adult population is high with the sex ratio of 0.93 (93 men to 100 women) in 1997. Sex ratio is higher in urban areas (99) than that in rural areas (92). Thirdly, percentage of absentee population is high, particularly in Shiselweni Region.

Table 2-2: Population Characteristics in Swaziland

Region	Total Population	Sex Ratio	Absentee Ratio
Hhohho	269,826	0.92	5.6%
Manzini	292,100	0.93	4.0%
Shiselweni	217,100	0.91	9.1%
Lubombo	201,696	0.97	3.8%
Total	980,722	0.93	5.5%

Source: 1997 Swaziland Population and Housing Census, CSO

c. Female Headed Households

The 1997 census shows the extremely high percentage of female-headed households aged 12 years and over. Out of the total households in urban area, about 31 % are female-headed households. In the rural area, the female-headed households account for nearly two thirds of the total households as presented in the following table.

Table 2-3: Male and Female Headed Households

	Male-headed	Percentage	Female-headed	Percentage
Urban	40,329	68.8%	18,290	31.2%
Rural	57,531	33.6%	113,795	66.4%

Source: 1997 Swaziland Population and Housing Census, CSO
Note: female-headed households = households whose decision maker or source of income is a woman.

d. Urban and Rural Population

Most of the population in Swaziland lives in the rural areas. According to the Census in 1997, urban population accounts for 214,428 (23.1%) and rural population 715,290 (76.9%). Rural population in Shiselweni region shows the highest percentage (95.1%), while Manzini region the lowest (66.6%) as presented in the following table.

Table 2-4: Urban and Rural Population

Region	Urban	Percentage	Rural	Percentage
Hhohho	68,561	26.8%	186,884	73.2%
Manzini	93,905	33.4%	187,067	66.6%
Shiselweni	9,733	4.9%	189,245	95.1%
Lubombo	42,229	21.7%	152,094	78.3%
Total	214,428	23.1%	715,290	76.9%

Source: 1997 Swaziland Population and Housing Census, CSO

e. Growth Rate of Population

The country has an estimated rate of population growth of between 2.74 to 3.77 percent per annum according to 1976, 1986 and 1997 censuses. It is estimated that Swaziland's population growth rate is currently running at 2.7%.[1]

Due to the fact that the Swazi population is young with about 52 % being below 20 years of age, it is expected that population growth in Swaziland will remain at high level at least for coming 10-15 years.

With population growth rate of 2.7%, population in 2000 is estimated to be approximately 1.06 million persons and it will increase to 1.2 million by the year 2005, and will further increase to 1.8 million by the year 2020.

f. Swazi People

The Swazi nation consists of more than 70 clans. Their chiefs form the traditional hierarchy[2] under the *Ngwenyama* (the King) and *Ndlovukazi* (the Queen Mother), who are of the largest clan, the *Dlamini*. Traditional administration and culture are regulated by an uncodified Swazi Law and Custom, which is recognized both constitutionally and judicially. The language is Siswati, which is used generally for their daily communication.

The Swazis comprise about 97 percent of the population, the remainder being immigrants from Mozambique, South Africa, and the rest of the world. In addition, there are a few thousand Europeans and Asians and their families engaged in business activities.

The majority of Swazis belong to Christian churches, both Roman Catholic and Protestant, whose missions were responsible before independence for much of the education and health services, particularly in the rural areas. However, many adherents also retain the traditional beliefs and practices of the rest of the population.

[1] Population, Agriculture and Rural Development, MOAC, April 1999
[2] Refer to Annex H.1 for traditional hierarchy.

2.1.2 Local Administrative Divisions

a. Regional Administration

Local government is administered through four regional councils (Hhohho, Lubombo, Manzini, and Shiselweni) comprising the members of the electoral college and headed by regional administrators appointed by the King. Urban government operates under elected or appointed municipal councils (in Mbabane and Manzini) and town boards (in the smaller townships).

b. *Tinkhundla* System

The administrative regions (districts) are divided into 55 *Tinkhundla*[3]. The term is the plural of *inkhundla*, which means a meeting place, and applies to rural centres of administration.

The *tinkhundla* were formally defined as "the constituencies for both local and national government". In 1993 the number of *tinkhundla* was increased to 55, each of which has a representative in the House of Assembly. *Inkhundla* consists of several chiefdoms, which include at least one or several communities.

Administration at *tinkhundla* level is weak due to personnel and financial constraints. This is mainly due to the factors such as inadequately and insufficiently trained personnel, insufficient financial resources, and difficulties of communication between *tinkhundla* centres and communities.

c. Chiefdom Authorities

Chiefdom is the area under the control of a Chief. Every *umphakatsi* (Chief's residence) is headed by a Chief who is appointed by the King (*Ngwenyama*) after the Chief has been selected by the family council (*lusendvo*). The position of a Chief as a local head of one or more areas is usually hereditary and is regulated by Swazi law and custom.

There are 325 chiefdoms in Swaziland, 79 in Hhohho, 92 in Shiselweni, 99 in Manzini and 55 in Lubombo regions, respectively.

The main functions of chiefs are to: a) exercise his powers to promote the welfare of the community in his chiefdom; b) carry out any instructions given to him by the King (*Ngwenyama*); c) ensure that the community is informed of issues or development which affect them as a community or as part of the Swazi Nation; d) convene *umphakatsi* meeting; e) summon his subjects (*kumementa*); f) arrange the chiefdom ceremonies; g) arrange and facilitate national functions; and h) perform such other functions as may be conferred on him by or under the Swazi Administration Order, 1998 or any other law.

2.1.3 Land Tenure System

a. Land Tenure in Swaziland

There are three main categories of land tenure, i.e. Swazi Nation land (SNL), Crown land and title deed land (TDL). TDL is sometimes referred to as individual tenure farms (ITF). There is in fact a fourth category of concession land, which is minor and not well defined. Crown land is land over which Government holds title.

[3] Refer to Annex H.5 for *Tinkhundla* system.

Table 2-5: Land Tenure in Swaziland

Land Tenure Type	Area（km2）	Percentage
Swazi Nation Land, sensu stricto	8,830	50.9
Swazi Nation Land, purchased	4,050	23.3
Title Deed Land, urban area	130	0.7
Title Deed Land, rural area	4,240	24.4
Crown land	70	0.4
Water reservoirs	40	0.2
Total	17,360	100.0

Source: Swaziland Environment Action Plan (SEAP)

Land tenure in Swaziland is characterized by the dominance of customary land tenure system in SNL area. Under customary land tenure system, land is regarded as a free but limited good belonging to the whole community. It has no market price as it cannot be bought or sold by individuals. However, everyone accepted as a member of the local community has a basic and exclusive right to cultivate and use arable land. He has a right to use a fair share of the available land fixed, by traditional custom, accounting to his need. The right to use land is decided by the local community through their traditional leaders (e.g. chiefs） to whom this power is entrusted under clear, accepted rules. This naturally gives these leaders strong social and political control and partly explains their frequent resistance to efforts to change the system.

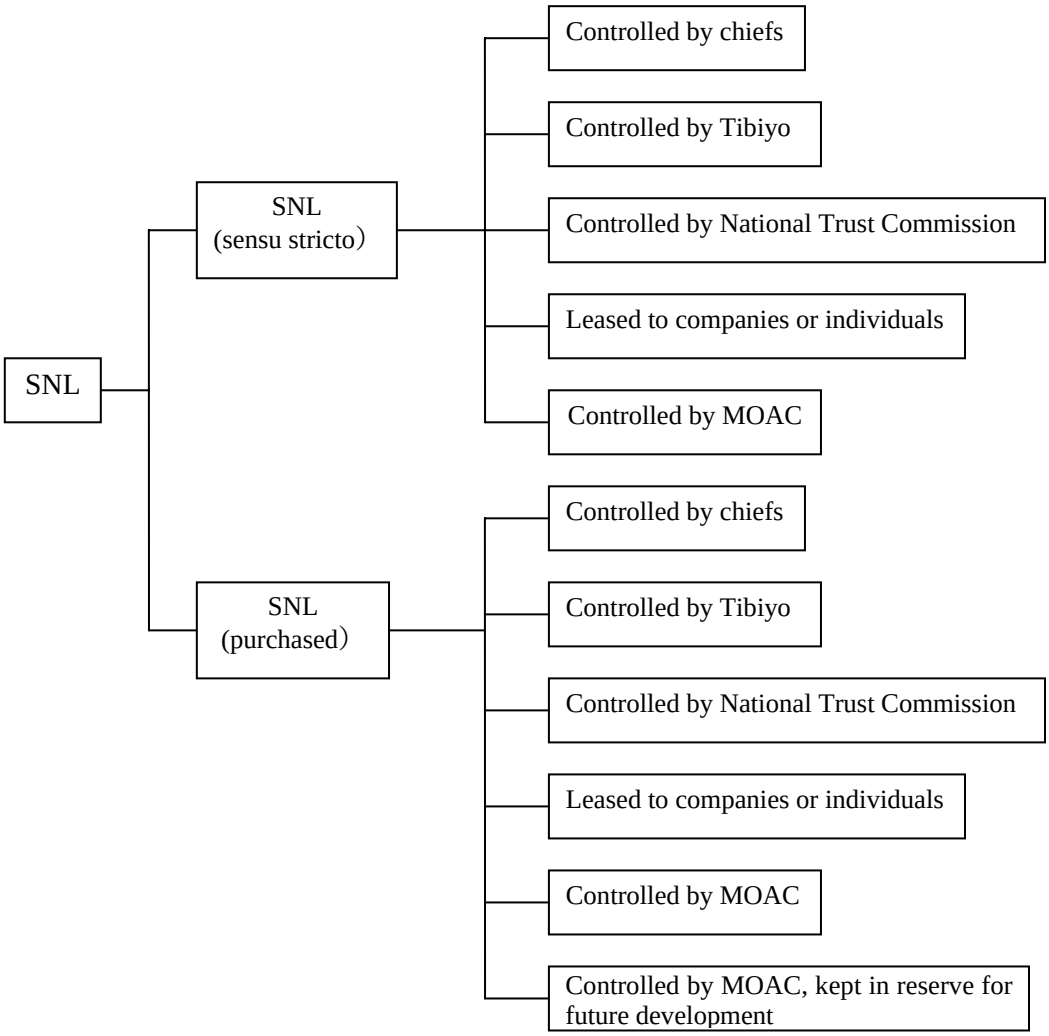
b. Swazi Nation Land (SNL)

At present approximately 74 percent of Swaziland is SNL. This land is held by the King in trust for the nation and is allocated by chiefs to homestead heads, who under Swazi law and custom are men. Although many women are *de facto* heads of homestead, land is allocated to them through male proxies. Membership in a local community is the condition for the right to receive or to be allocated land. Land can also be acquired through inheritance.

Swazi Nation Land is subdivided into SNL *sensu stricto*, comprising all the land that was SNL at independence, and SNL purchased, comprising all freehold land purchased after independence and returned to SNL status. There is still, however, a title on purchased SNL. The subdivision of SNL is made on the basis of the control over the land. Approximately 75% of SNL are controlled by chiefs, 9% by MOAC, 4% by Tibiyo Taka Ngwane (TTN)[4], 3% by National Trust Commission (NTC) and the remaining 9% is leased. (Source: Swaziland Environment Action Plan)

Classification of SNL area according to the categories as mentioned above is depicted in Figure 2-1.

[4] TTN is a Fund established by Royal Charter in 1968. Its declared purpose is to develop the material welfare, standard of living and education of Swazis, in a way that cherishes their customs and traditions. (Source: IFAD Report, 1993)



Source: Land Tenure Map of Swaziland, 1994

Figure 2-1: Classification of SNL Area

c. Title Deed Land

Title Deed Land is subdivided into rural and urban. As indicated in the above table, the total of TDL amounts to about 25 percent of the total land area in Swaziland.

d. Land Allocation in the Community

All SNL belongs to the community and the chiefs have the right to allocate land in their respective areas to all members. Every chief has a responsibility to the King to ensure availability of land for cultivation to heads of all homesteads. The rights to land in the community are defined principally with respect to arable land. On the other hand, the rights to graze stock, gather fruits and hunt have traditionally been unrestricted. As a member of the community, a Swazi is entitled to the nation's resources and particularly its productive land. Thus a Swazi man technically always has a place where he can stay and he is entitled also to derive a living from the land on which he resides, both arable and pastoral. Theoretically, a chief can banish a family from his chiefdom, but such banishment is rare. While there are some constraints with regard to the individual's right to total ownership of Swazi Nation Land, the system does provide security for people. Every Swazi may acquire TDL and still maintain rights to SNL, such that these two forms of tenure are not mutually exclusive. There are also transfers of income between rural and urban members of the same family. (Source:

Dual land tenure systems and multiple livelihoods: a comparison of communal and private land tenure in Swaziland, University of Swaziland)

e. Consideration on Land Tenure System

Within the framework of the above, particular consideration should be made on the following items in designing changes in the traditional land tenure system.

e. 1 Security of Tenure

According to the customary land tenure, farm families can have a right of use of land (not of ownership), once they have gone through the process of *kukhonta* (offer allegiance). While it is said that chiefs may not evict individuals unless they have committed unapprovable acts, there are several cases where evictions have been based on petty issues, primarily arising from simple jealousies. Such uncertainties do play a role in a farmer's decision to invest in land improvements and commercial production.

Land is usually allocated to married men. Access to land by women is only possible through male proxies. Special consideration should be taken on the possibility of land security for women who are the heads of their households.

e. 2 Clarity of Title

The rights and obligations of the farmer to land must be clearly stated to include a specification of his right to improve his holding, the propriety of fencing off arable land, and the extent to which he can exclude others from using his piece of land, for example, for communal grazing during winter months. Furthermore, each farmer must be certain about the boundaries of his land and about the extent of his rights regarding water use.

e.3 Utilization of Land as Collateral

Land, being an economic and productive asset, can be used as a means to assist farmers to secure credit from banks. Currently, under the existing system, farmers can only bond their cattle against bank loans. Where a farmer does not have cattle, he is left with no physical asset to use as collateral. The farmer should at least have the authority to use the monetary value of his land to secure credit from financial institutions.

2.1.4 General Economic Condition

The performance of the Swaziland economy, which started slackening early in the 90s, declining further in 1998 when a growth rate of 2.7 percent was recorded compared to 4.0 percent the previous year. Viewed against an estimated population growth rate of 3 percent per annum, this implies further worsening of the standard of living of the average Swazi people during this period. Overall, the economy was characterized by moderate GDP growth, stability in domestic prices, and a significant improvement in its balance of payments on the positive side of things. On the negative side, there was a slowdown in private investment growth. The positive economic growth during the review period can be ascribed to a relatively strong recovery of the agricultural sector coupled with moderate growth in manufacturing.

a. Economic Growth Rate

Estimates by IMF staff put real growth at 3.1 percent during in 1999, which is higher than the 2.7 percent achieved in the previous year. The positive economic performance in 1998 will emanate mainly from a strong recovery of the agricultural sector and an anticipated moderate growth in manufacturing. Agriculture’s recovery is associated with the continued more than average rainfall since 1997. Underlying the increase in manufacturing output was strong export performance during 1998.

Table 2-6: GDP Growth Rates in 1995-1999

Unit: Annual Percentage Change

	1995	1996	1997	1998	1999 Est.
Agriculture *	-6.5	26.6	-3.5	2.2	-3.6
Forestry	3.7	-5.4	16.5	-3.8	2.2
Manufacturing	3.8	2.6	5.5	1.0	4.3
Services	3.2	0.9	3.1	2.7	3.6
GDP at market prices	3.0	3.6	4.0	2.7	3.1

Note: * Agriculture including livestock sub-sector
Source: IMF Staff Country Report

The manufacturing and services sectors have been the major source of GDP growth. Growth of agricultural sector has been much slower, which increased the gap of economic and social conditions between urban and rural area.

b. Inflation

Inflation as measured by changes in the annual average consumer price index continued a three-year rise, to record a year-on-year growth rate of 8.0 percent in 1998 compared to 7.2 percent realized in the previous year. A major contributor to the increase in the price level was a surge in the price index for "education" which grew from 7.0 percent in 1997 to 27.2 percent in 1998. Further pressure on the price of goods and services emanated from a rise of 6.2 percent and 4.7 percent in the price indices for the sub-groups "transport and communication" and "health care", respectively.

Although Swaziland's inflation, as depicted by the "all income" group showed an increase of 0.8 percentage points to 8.0 percent, the cost of living was generally higher for the "middle and high-income" group when compared to that of the "low income" group. The "middle and high-income" group registered inflation of 7.9 percent, representing growth of 0.7 percent. Inflation for the "low-income" group on the other hand decreased to 7.6 percent in 1998 from 9.7 percent in 1997, owing mainly to a drop in the price indices for the sub-groups "food" (5.2 percent), "clothing and footwear"(10.9 percent), and "household operations" (4.3 percent).

Price levels during the first quarter of 1999 continued the downward movement which began in December 1998. Inflation dropped further in February and March registering rates of 6.6 and 6.4, respectively. Accounting for the decline in inflation during this quarter was due mainly to stagnation in the price of clothing due to a depressed textile industry, which experienced a perpetual surge in the importation of used clothing. There was also a significant slump in the prices of electronic equipment, as stocks were being cleared for year 2000. During the month of April however, inflation registered an increase of 0.1 percent to 6.5 percent, mainly because of an increase in the price indices for 'health care' and 'household operations'.

The inflation pressure is however expected to be offset by a stable lilangeni/rand exchange rate, which has accorded Swaziland the opportunity to reduce interest rates during the first quarter of 1999. The continued reduction of import tariffs as per the WTO agreement will also help to cushion any increase that may arise from the wage bill. (Source: The Central Bank of Swaziland Annual Report 98-99)

2.2 National Development Strategies of Swaziland

2.2.1 Previous Strategies/Programs for Improvement of Land Degradation

Some development programmes such as resettlement programme and rural development area programme were conducted in the country in order to raise the income and living standards of communities. One of the main objectives of the programmes was to improve the land degradation.

a. Resettlement Programme and Central Rural Development Board

Issues of land degradation in the country have been cause for concern since the colonial period. Measures to control soil erosion in the country started in the 1940s with the introduction of grass strips by extension workers. In 1951, the Natural Resources Board was established by the Natural Resources Act. This board was commissioned to supervise the use of natural resources in the country, except on SNL. This was followed by the formation of Central Rural Development Board (CRDB) by the King's Order in Council in 1954. The CRDB was charged with resettlement, the division of all SNL into arable and grazing areas and the management of the nation's natural resources. As a consequence to the formation of CRDB, local conservation or development committee (*imisumphe*) were established. However, due to conflicts with chiefs and basic ingredients of operations these became inefficient.[5]

Membership of CRDB consisted of a Chairman (*indvuna*) appointed by His Majesty the King as well as eleven members appointed to represent the eleven sub-districts of the country. There were in addition ten Rural Development Officers (RDOs), one Rural Development Supervisor and a Secretary.

The major functions of the Board are as follows.[6]

1. to hold districts and area meetings throughout the country for the purpose of studying, discussing and where appropriate, approving resettlement as well as other agricultural projects;
2. to submit to His Majesty The King periodic reports covering the state of the country's natural resources i.e. soil, water, flora and fauna, and thereafter recommend steps to be taken in the preservation and enhancement of the country's natural resources;
3. to submit to the King reports covering methods of settlement, present and proposed division of land into arable, residential and grazing areas; to ensure proper land use throughout the entire Kingdom;
4. to issue, as and when appropriate, Orders designed to ensure proper implementation of approved resettlement proposals;
5. to guard against violations of affecting approved resettlement plans, such as the unplanned and haphazard construction of homesteads;
6. to ensure at all times that the Chiefs, their *imisumphe* (land allocation specialists) and *emabandla* (councillors) are involved throughout all the stages of their resettlement programme;
7. to implement and/or assist in the implementation of the following Orders-in-Council, Order No. 2 of 1953, Order No. 3 of 1953 and Order No. 4 of 1953.[7] These orders were

[5] Swaziland National Action Programme, the Convention to Combat Desertification
[6] Annual Report of the CRDB, 1987/90
[7] Order No. 2 of 1953 and Order No. 4 of 1953 are presented in Annex H.3 and H.4.

established to ensure proper preservation and enhancement of the country's natural resources, i.e. soil, water, flora and fauna.

b. Rural Development Area Program

In 1970, Rural Development Area Program (RDAP) was established with funding from the United Kingdom. The programme was extended in 1976 with bilateral aid from West Germany, Sweden and Canada and multilateral aid from the World Bank, African Development Bank, European Economic Union (EEC) and UNDP. This programme was geared to improve the income and well-being of the Swazi farmers by providing infrastructure, fencing grazing areas, improving livestock management and land consolidation among other things.

RDAP aimed at land consolidation in order to improve land use and also to make provision of infrastructure relatively less expensive. It was carried out under the general supervision of the Central Rural Development Board (CRDB). The approach was based on the assumption that production levels in the rural areas were constrained by improper land use, lack of inputs, knowledge and infrastructure. However, it became evident that even where these technical inputs were successfully provided, production has not increased markedly as expected. It is now accepted that production in rural areas is not merely constrained by technical factors alone. It will also be necessary to take into consideration such factors as socio-economic environment, issues of governance and capacity of communities. [8]

Although no systematic assessment of the specific resettlement elements of RDA has been made, overall evaluations of RDA have been carried out. These evaluations concluded that the programme had some success in improving the provision of infrastructure. However, the RDA did not result in marked changes in farming systems and methods in RDA communities, nor did it lead to any significant increase in crop yields or in productivity of livestock, despite the fact such communities received more extension services and resources than non-RDA areas. There was also no increased cultivated land in RDA communities, although there was less of a reduction than occurred in non-RDA area.[9]

2.2.2 Recent Strategies and Plans

a. National Development Strategy (NDS)

The National Development Strategy (NDS) was initiated in 1993. The NDS document has been compiled on the basis of the report of the stakeholders group. NDS is the basic policy document in the country prepared to provide a long-term framework (covering 25 years from 1997 to 2022). It is expected that all sectors will use the NDS as a base for its sectoral planning.[10]

Sector Policies such as Swaziland Environment Action Plan (SEAP); National Environment Policy (NEP); Economic and Social Reform Agenda (ESRA); Water Conservation and Development Strategies; National Land Policy; Forestry Policy; Livestock Development Policy; and others have been formulated and some of these policies have been approved by the cabinet.

The agriculture sector in the NDS is combined with land and rural development. In this sector, the NDS identifies the following four broad objectives.

1. Achieving food security
2. Improving the low productivity in agriculture
3. Encouraging community participation in the management of natural resources

[8] Draft of the Resettlement Policy, April 2001
[9] Workshop Report, Legal and Institutional Assistance to the Resettlement Programme, 1998
[10] The excerpts from the NDS document are presented in Annex H.7.

4. Striking a balance between development and conservation

b. Swaziland Environment Action Plan (SEAP)

Swaziland Environment Action Plan (SEAP) was initiated in 1994 and finally adopted in 1997. SEAP is one of the top priority policies in the country.

The Swaziland Environment Action Plan provides the framework within which Swaziland's environment can be managed in a sound and sustainable manner. Central to the definition of this framework is the recognition of the cross-sectoral nature of the environmental problems, the identification of the relationships which exist between the environment and key sectors within the overall macro-economic framework, and the need for active and lasting community involvement and participation in environmental protection and natural resource management.

The objectives of the SEAP are as follows:

- Provide a state-of-knowledge overview of the environmental conditions in the country;
- Identify, prioritize and where possible quantify environmental problems;
- Propose solutions to immediate environmental problems in the form of programmes and projects, and institutional and legislative reforms, together with details of their funding requirements and their human resource/capacity-building needs;
- Establish a clear indication of government's priority areas with respect to the environment so as to guide and give proper orientation to donor intervention in this field;
- Establish a framework which provides coherent direction for the process of environmental monitoring and action planning in the future; and
- Provide a framework for continuous development and environmental policy dialogue within the country and with donor partners.

c. National Development Plan

The rolling National Development Plans for three years have been prepared by Economic Planning Office of MEPD. The 10th Development Plan, the latest issue[11], was prepared in August 1999. This Plan covers the three-year period of 1999/00 and 2001/02.

Planned capital expenditure programme for the period of 1999/00 – 2001/2002 amounted to E 944.4 million in the first year, E 1,199.8 million in the second year and E 890 million in the third year. The sectors which will absorb the largest proportions of planned capital expenditure are Agriculture, Forestry and Fisheries (32.2%), Transport and Communications (24.2%), General Public Services (15.2%), Housing and Community Services (11.2%), and so on.

d. Poverty Alleviation Programme

Government has identified poverty alleviation as one of its main priorities. While this has been addressed indirectly and in somewhat a fragmented fashion in the past, it has become necessary to formulate direct strategies which are to be prioritized in a coherent framework. Government has enlisted the support of the World Bank to assist in the strengthening of existing and development of new implementation structures at the local and central government levels. Government has allocated a sum of US$ 2.5 million over the past three years for community development activities. A further US$ 3.3 million has been allocated to cater for the implementation of employment creation activities in the rural areas of the four regions of the country.

e. Swaziland National Action Program

[11] The release of the Development Plan covering 2000/01 - 2001/03 is delayed due to unknown reason.

Although soil conservation policy is not established yet in Swaziland, this issue is addressed under the Swaziland National Action Program of the United Nations Convention to Combat Desertification (NAP).

The NAP report identifies the human activities most responsible for land degradation due to unsustainable land management practices in agriculture, forestry, mining and construction.

More specifically,

- In crop farming practices, it identifies SNL practices as often destroying the soil's capacities due to poor soil/land management systems.
- In livestock farming practices, it identifies the traditional livestock farming as the main causes of land degradation due to its emphasis on a quantitative rather than qualitative approach to stock.
- In road construction, it highlights the poor drainage engineering around roads, often resulting in serious gully erosion.
- In indiscriminate use of fire, it identifies the fire destroys not only the leaves but it penetrate the sub-soil and destroys the root structure of plants.
- In deforestation and afforestation, it identifies the negative effects caused by wrong selection of tree species. It is emphasized that detailed tree species/analysis need to be undertaken in afforestation programme.
- In poverty problem, it identifies depletion of indigenous forests for fuelwood, building, wood carving and furniture being widely taken place in poverty stricken communities, resulting in the land degradation.

f. National Land Policy (Draft)

The proposed vision of the National Land Policy (NLP) is the application of the vision of National Development Strategy (NDS) to the land context, i.e. "to maximize benefits to the entire society from land on a sustainable basis".

Objectives of National Land Policy are described in the draft version as follows:

- to improve access to land and secure tenure
- to encourage the rational and sustainable use of land
- to improve productivity, income and living conditions and alleviate poverty
- to reduce land-related conflicts
- to develop an efficient and effective system of land administration
- to encourage land ownership by Swazi citizens

The land policy principles are established as follows.

- Access to land for all citizens
- Integration of the National Land Policy with the vision and goals of the NDS
- Institutional coherence/alignment of land-related agencies
- A process of building upon Swazi culture and institutions
- Community participation, accountability and transparency in land administration
- Gender equity
- A process of enabling land and property markets to work
- Optimal sustainable use of the land resource to facilitate food security

g. Agriculture/Irrigation Development Policy

National Development Strategy (NDS) in September 1997 describes government policy on agriculture in the period from 1997 to 2022, and places the emphasis on food security for households, and also on the diversification to higher valued crops, horticultural crops and commercial farming at the same time. It also puts emphasis on the management of natural

resources and soil conservation, etc. by community participation. Irrigation infrastructure shall be developed for commercial crops. Where there is a bigger potential for cropping, cropping should take place instead of forestation and grazing in the Highveld and Middleveld. It mentions the necessity of improvement of agricultural research and extension services.

Important agricultural policies are excerpted from NDS as follows:

- Assist households to achieve basic food security (defined as access to adequate, nutritious and affordable quantities of food).
- Promote food management, processing and storage techniques at both national and household level and facilitate optimal distribution of food within households, communities and regions.
- Encourage diversification of agricultural production whilst intensifying production of high valued crops and stock.
- Promote community participation in the management of natural resources and soil conservation, appropriate land use management, resolution of land tenure issues, effective water management, effective rangeland management and management of wildlife and parks in harmony with the desired national development policies.
- Review NARS (National Agricultural Research Systems) activities, formulate a research policy and develop a research master plan.
- Strengthen linkages between research, extension, NGOs, parastatals and other stakeholders.
- Develop irrigation infrastructure in support of all commercially grown irrigated crops and charge for the water at cost-recovery levels.
- Re-organize national services such as agricultural research, early warning system, extension with a view of making these services more accessible and responsive to the agricultural sector.
- Enhance private sector involvement in the upliftment of SNL farmers from subsistence to commercial farming whilst maintaining economic efficiency in production.
- Increasing the access of agricultural producers to credit.
- Promote production and marketing of horticultural crops.
- Promote the production of crops suited to the different agro-ecological zones.
- Phase out forestry in areas with high crop potential.
- Discontinue grazing in the Highveld and Upper Middleveld where there is a bigger potential for crop production. Shift the grazing to areas with low crop production potential.

h. Other Policies and Plans

Other policies and programmes include, among others, National Environment Policy (NEP); Economic and Social Reform Agenda (ESRA); Resettlement Policy; Water Conservation and Development Strategies; Forestry Policy; Livestock Development Policy; and so on.

Brief summary of some of these policies and programmes is presented in Annex H.2.

i. National Strategies for Gender Issues

In the national development plan issued in 1997, gender concerns are regarded as an important element in development since women tend to be culturally placed in disadvantaged group, whereas they are contributing a lot to their society. Regarding to this point, the Gender Office in the Ministry of Home Affairs and Swaziland Committee on Gender and Women Affairs (SCOGWA) was formed in 1994 to strengthen the existing institutional arrangements dealing with gender relations.

Legislation reforms such as access to land, rights to decision-making and property acquisition and so forth, have been also proposed in the committee, though those are still under discussion.

In national land policy issued in 1999, which indicates the vision for improvement of degraded land as well as appropriate land use, the issue of "gender bias in land allocation" is identified. In the policy, it is determined that the purpose of allocating land is "to provide a means of raising a family", and "all land-related gender discrimination in legislation or administration be prohibited under the constitution". However, it is also written to say that "…any parent who can establish to the satisfaction of the competent authority that he or she is the sole caregiver for a child or children can have proprietary rights". It could be translated that in most cases, husband or men in the same homestead have access to land in practice.

In MOAC, Home Economics Extension Section is dealing with gender and development issues. This section has a mission of aiming to improve the quality of family life with including activities such as general community nutrition education, demonstration of fuel-saving stoves, skill training, leadership training, business management skills, loan savings schemes, etc.

Thus, the importance of gender concerns has been recognised and is determined in the national development policy, including sector policies.

j. Community Participation in National Development Strategy

According to the national development plan issued in 1997, the Community Development Department under the Deputy Prime Minister's Office is responsible for promoting development in the rural areas through encouraging and assisting communities to engage in development programmes and initiatives that can sustain their lives.

In the programmes undertaken during the development plan (1997-2022), it is stated, "communities are encouraged to participate in identification, preparation implementation and the supervision of their projects."

Especially in the sectoral strategies of agriculture, land use and rural development in national development plan, the community participation is regarded as one of the primary component in natural resource management. The importance on people's awareness and participation is also stressed in national environmental policy drafted in 1999.

As it could be seen, the importance on community participation is supported by each related national strategies.

k. Consistency of the Study Objectives with the National Development Strategy and Policies

After reviewing the National Development Strategy (NDS) and other policies as described above, it has been identified that the objectives of the Master Plan are fully consistent with the country's development objectives which put its top priority on the environmental improvement.

Chapter 3

General Conditions of the Study Area and Target Areas

3 GENERAL CONDITIONS OF THE STUDY AREA

3.1 General Conditions of the Study Area

3.1.1 Study Area Definition

In the Scope of Work agreed upon between the Ministry of Agriculture and Co-operatives and Japan International Cooperation Agency on August 23, 2000, the Study Area is defined as "Swazi Nation Land (SNL) in the Highveld and Upper Middleveld. The total area would be approximately 4,650 km^2". The Study Area includes the three target areas where a master plan will be formulated.

According to the Land Tenure Map of Swaziland in 1994 (Remmelzwaal and Vilakati, 1994), SNL is subdivided into the following categories.[1]

1. Swazi Nation Land, *sensu stricto* - controlled by chiefs, communal
2. Swazi Nation Land, *sensu stricto* - controlled by chiefs, non-communal
3. Swazi Nation Land, *sensu stricto* - controlled by Tibiyo
4. Swazi Nation Land, *sensu stricto* - controlled by National Trust Commission
5. Swazi Nation Land, *sensu stricto* - leased to companies or individuals
6. Swazi Nation Land, *sensu stricto* - controlled by Ministry of Agriculture
7. Swazi Nation Land, purchased - controlled by chiefs, communal
8. Swazi Nation Land, purchased - controlled by Tibiyo
9. Swazi Nation Land, purchased - controlled by National Trust Commission
10. Swazi Nation Land, purchased - leased to companies or individuals
11. Swazi Nation Land, purchased - controlled and used by Ministry of Agriculture
12. Swazi Nation Land, purchased - controlled by Ministry of Agriculture, kept in reserve

Out of the above classifications, categories 1, 2, 7 and 12 are considered to be the SNL as defined in the Scope of Work. Study Area thus defined covers the area of 4,646 square kilometres as tabulated below:

Table 3-1: Study Area Classification by Land Tenure

	Highveld	Upper Middleveld	Total
Swazi Nation Land, sensu stricto - controlled by chiefs, communal	2,310	1,486	3,796
Swazi Nation Land, sensu stricto - controlled by chiefs, non-communal *	6	0	6
Swazi Nation Land, purchased - controlled by chiefs, communal	524	118	642
Swazi Nation Land, purchased - controlled by Ministry of Agriculture, kept in reserve **	139	63	202
Total (in square kilometers)	2,979	1,667	4,646

Source: Land Tenure Map of Swaziland, 1994

Note: * "SNL controlled by chiefs, non-communal" is reserved for special purposes, such as military base, restricted hunting or selected ranching or farming.
** " SNL controlled by MOAC, kept in reserve" is the land which is kept in reserve for future development.

[1] Approximately 75% of SNL is controlled by chiefs, 9% by MOAC, 4% by Tibiyo Taka Ngwane, 3% by National Trust Commission (NTC) and the remaining 9% is leased.

3.1.2 Administration

a. Administrative Division

Swaziland is administratively divided into four administrative regions, i.e. Hhohho, Lubombo, Manzini, and Shiselweni. Out of these four regions, Lubombo region is entirely excluded from the Study Area as the region does not fall under the above classification.

The administrative regions (districts) are divided into 55 *Tinkhundla*[2] that applies to rural centres of administration. Out of these *Tinkhundla*, the following *Tinkhundla* are entirely or partly included in the Study Area.

Table 3-2: List of *Tinkhundla* in the Study Area

Region	*Tinkhundla* in the Study Area		
Hhohho	Timpisini	Ntfonjeni	Maphalaleni
	Piggs Peak	Mbabane West	Mbabane East
	Mayiwane	Hhukwini	Nkhaba
	Ndzingeni	Motjane	Lobamba
Manzini	Kukhanyeni ●	Ngwempisi ●	Mafutseni
	Mkhiweni	Mthongwaneni	Ntondozi
	Manzini North	Ludzeludze	LaMgabhi
	Manzini South	Mahlanya	Mahlangatsha
	Manzini West	Nhlambeni	Mangcongco
	Mhlambanyatsi		
Sishelweni	Shiselweni 1 ●	Matsanjeni	Lavumisa
	Kubuta	Mbangweni	Zombodze
	Nkwene	Maseyisini	Hosea
	Mtsambama	Sandleni	Sigwe
	Gege	Ngudzeni	

Note: ● Target Areas

b. Population in the Study Area

Population in the Study Area is estimated at 167,771 in Highveld and 195,110 in Upper Middleveld, with a total population of about 363,000 persons on the basis of the 1997 Census.

Table 3-3: Estimated Population in the Study Area

	Area	Population (1997)
SNL in Highveld	2,979 sq. km	167,771
SNL in Upper Middleveld	1,667 sq. km	195,110
Study Area Total	4,646 sq. km	362,881

Source: 1997 Population Census and Study Team's estimate.

3.1.3 Social Infrastructure

a. Education Facilities and Enrolment

Primary schools in Swaziland are classified as grant aided, government, and private schools. In Hhohho region, there are 140 primary schools, of which 112 are grant aided, 22 are government and the remaining 6 are private. In Manzini region, there are 146 primary schools, of which 114 are grant aided, 19 are government and the remaining 13 are private. In Shiselweni region, there are 131 primary schools, of which 97 are grant aided, 17 are government and the remaining 17 are private. In Lubombo region, there are 112 primary schools, of which 92 are grant aided, 12 are government and the remaining 8 are private. The total number of primary school was 529 in

[2] *Tinkhundla* is the plural of *Inkhundla*, meaning a meeting place. Refer to Annex H.5 for *Tinkhundla* system.

1996. The number increased to 539 in 1999. Number of pupils and teachers was 213,041 and 6,425, respectively, in 1999 with pupil/teacher ratio of 33:1.

Table 3-4: Primary Education in Swaziland

Year	No. of Primary Schools	No. of Pupils	No. of Teachers
1996	529	202,439	5,975
1997	529	205,829	6,094
1998	530	208,779	6,195
1999	539	213,041	6,425

Source: Education Statistics 1999

Table 3-5: Primary School Enrolment by Region

	Rural	Urban	Total
Hhohho	45,618	10,513	56,131
Manzini	50,166	12,360	62,526
Shiselweni	46,127	5,067	51,194
Lubombo	39,001	3,645	42,646
Total	180,912	31,585	212,497

Source: Education Statistics 1999

One of the main problems in primary education is existence of too many repeaters in each grade. Although almost all children enrol in Grade 1, only half complete the full seven-year primary course, and many of these take as long as 12 years to do so due to the system of year end examinations.

Secondary education is divided into three years of junior secondary and another two years of senior secondary or high school. Secondary school education has traditionally been regarded as the entrance to tertiary education, training and formal employment.

In Hhohho region there are 11 junior secondary and 31 high schools. In Manzini Region, there are 11 junior secondary and 36 high schools. In Shiselweni Region, there are 14 junior secondary and 31 high schools. In Lubombo Region, there are 13 junior secondary and 23 high schools.

Number of junior secondary and high schools and enrolment by region are presented in the following table.

Table 3-6: Secondary and High School Enrolment by Region

	No. of Secondary and High Schools	Enrolment
Hhohho	42	18,392
Manzini	47	17,674
Shiselweni	45	14,530
Lubombo	36	10,970
Total	170	61,566

Source: Education Statistics 1999

b. Health Facilities and Main Diseases

In order to provide preventive, promotive, rehabilitative and curative health services, Swaziland adopted the primary health care (PHC) strategy for health service delivery and care. At the primary level of the health care system, the points of contact for a potential client are the outreach site and the clinic. An outreach is a mobile clinic where health care personnel visit on a specific day. Medical supplies can be kept there if the community has constructed a room which is secure, otherwise the health personnel brings supplies with them. Outreach sites are potential future sites for clinics.

A clinic is a formally constructed health care delivery point which offers full time services to the community on an outpatient basis, although some clinics have been equipped with an overnight maternity wing. No x-ray or laboratory services are offered. Clinics are supervised by regionally based nursing sisters, although ideally they should be accompanied by public health medical officers.

The second level of the health system is a health centre which is a mini (24 to 42 beds) hospital. The services offered range from promotive and preventive to intermediate level curative services including operative surgery.

Table 3-7: Distribution of Health Facilities by Region and Ownership

		Hhohho	Manzini	Shiselweni	Lubombo	Total
Hospitals	Government	2	2	1	0	5
	Mission	0	1	0	1	2
Health Centre	Government	1	0	1	1	3
	Mission	1	0	0	1	2
	Industry	0	1	0	2	3
Public Health Unit	Government	2	2	2	1	7
Clinics	Government	10	20	16	10	56
	Mission	9	12	1	9	31
	Private	15	32	3	3	53
	Industry	4	6	0	8	18
	NGOs	2	1	0	2	4
Total Clinics		34	71	20	32	162
Outreach Clinics	Government	28	31	41	44	144
	Mission	6	9	1	24	40
	Private	0	-	2	0	2
	Industry	0	0	0	1	1
Total Outreach Clinics		34	40	44	69	187

Source: Development Plan 1999/00 – 2001/02

Based on the analysis of diseases by frequency of occurrence, respiratory diseases was the main health problem in 1997-1998, followed by diarrhoeal diseases. Skin disorder and genital disorder were also prevailing in the study area.

Table 3-8: Number of Outpatients in 1997-1998

Disease Type	1997	1998	Proportion (%)
Respiratory diseases	394,738	391,517	27.8%
Diarrhoeal diseases	167,571	157,089	11.1%
Skin Disorder	166,315	155,931	11.1%
Genital Disorder	118,293	107,681	7.6%
Digestive Disorder	92,063	86,804	6.2%
Musculo Skeletal Disorder	71,177	65,351	4.6%
Accidents/Trauma	55,323	54,659	3.9%
Eye Disorder	53,697	45,480	3.2%
Abdominal/ill defined	42,066	41,180	2.9%
Hypertension	36,642	33,849	2.4%
Malaria (presumptive)	30,075	32,886	2.3%
Intestinal Worms	36,455	31,143	2.2%
Urinary Disorders	34,195	30,907	2.2%
Other Diagnosis	108,489	101,325	7.2%

Source: Ministry of Health

c. Other Social facilities

Other social services available in the study area include shops, go-downs, markets, and churches. There are some small shops in the communities. Big shops, restaurants, and guesthouses are only found in the urban areas. The major government institution/departments are available in the urban area.

d. Road Transport

Swaziland has a well developed roads network by African standards. More than two-thirds of the country is within eight kilometres from all weather roads. A feeder road programme initiated in 1970 has contributed significantly to improved access to rural areas on SNL. According to statistics in the Ministry of Public Works and Transport, the total length of proclaimed roads increased from 1,720 km in 1945 to 3,247 km in 1998. Length of paved roads also increased from only 22 km in 1977 to 400 km in 1982. Presently Swaziland has nearly 1,000 km of paved roads, 2,500 km of unpaved roads. In addition to the proclaimed roads, there are approximately 1,500 km of feeder roads which have recently been included under the responsibilities of the Roads Department of the Ministry of Public Works and Transport (MPWT).[3]

3.1.4 Related Development Agencies

a. Government Agencies

Government agencies that are playing major roles in the issues of land degradation are, among others, the Ministry of Agriculture and Cooperatives (MOAC), Deputy Prime Minister's Office (DPM), Ministry of Natural Resources and Energy (MNRE), and Ministry of Tourism, Environment and Communications (MTEC). Roles and functions of these ministries, departments and sections are described in detail in Annex H.7.

b. Role of Ministry of Agriculture and Co-operatives

Key departments or sections in MOAC regarding environmental protection including land degradation are the Land Use Planning Section, Department of Agriculture, Forestry Section and Department of Veterinary and livestock Services.

Figure 3-1 shows current structures of the Ministry of Agriculture and Co-operatives.

[3] Priority Road Investment Programme, April 2001

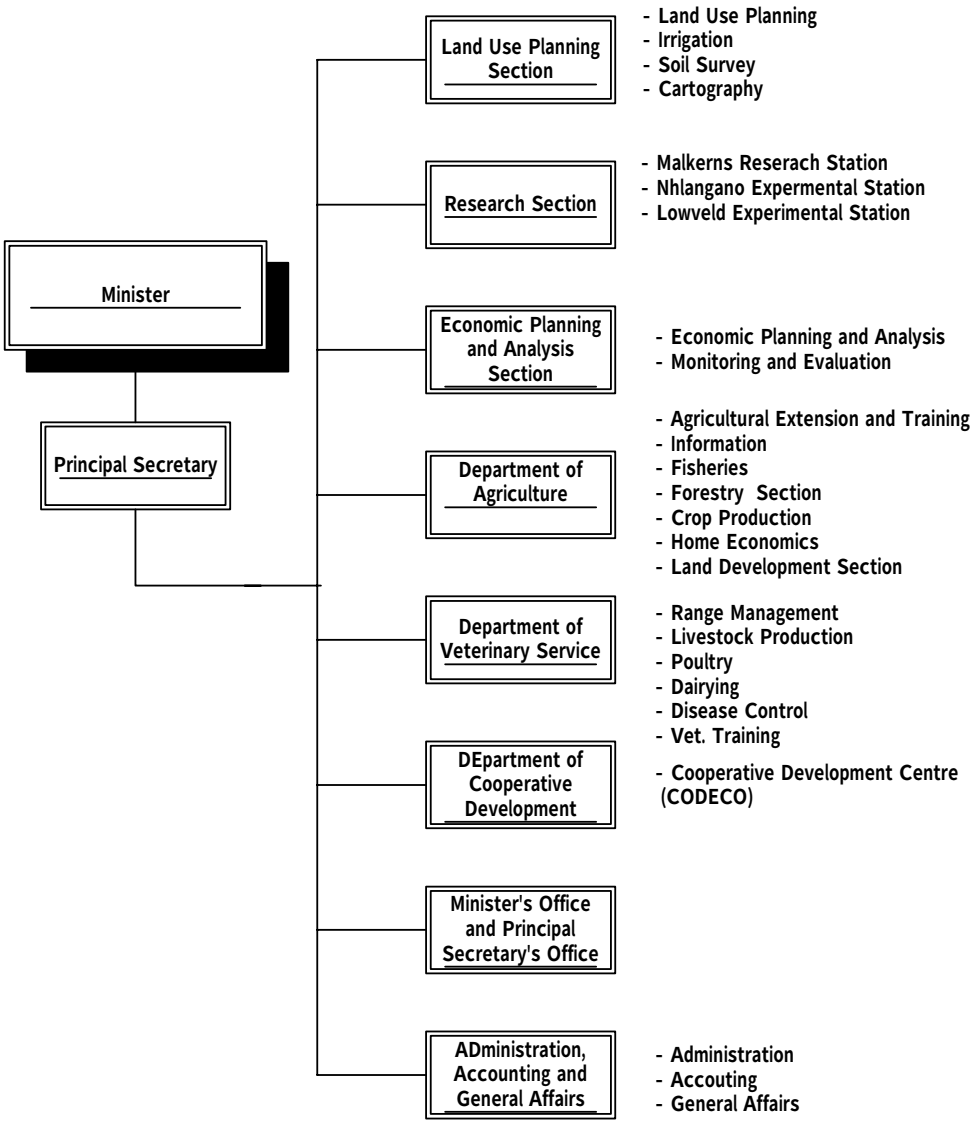


Figure 3-1: Current Structure of the Ministry of Agriculture and Co-operatives

b.1 Land Use Planning Section

This section has been playing a very important role in the planning and implementation of degraded land improvement program including land use planning, soil conservation practices promotion and implementation of resettlement projects. However, due to shortage of technical staffs and budgetary allocation, fulfilment of the mandate is not achieved successfully.

b.2 Department of Agriculture

This department is one of the original structures of MOAC. Today, the provision of extension services to smallholder farmers remains as the principle objective of the department. The mandate of the department is to equip Swazi farmers with relevant skills and knowledge to ensure increased agricultural productivity and improved standards of living among the people.[4]

MOAC's major goals in agriculture and extension services are: i) increased crop production to achieve national self-sufficiency in maize; ii) expanding fruit and vegetable production as a

[4] Report on Organization of The Ministry of Agriculture and Co-operatives, prepared in February 2001 by ZIMKEN Management Consultants, Zimbabwe.

means of increasing rural income and improving nutrition; and iii) encouraging cash crop production amongst small-scale farmers. Achieving these goals will involve the introduction of new crops to farmers as well as the intensification of production of existing crops and improving management and delivery of extension services to farmers.

b.2.1 Agriculture and Extension Services

Agricultural extension service is organized on the basis of the four administrative regions. There are four regional extension offices, each headed by a Senior Extension Officer (SEO). The regions are divided into sub-regions, some of which are the former Rural Development Areas (RDA) headed by an Extension Officer supported by a team of technical and field staffs. Extension services on farming are rendered directly to farmers by extension workers (field officers) at each RDA office. There are 17 RDAs in the whole country, four in Hhohho Region, four in Manzini Region, four in Lubombo Region and five in Shiselweni Region.

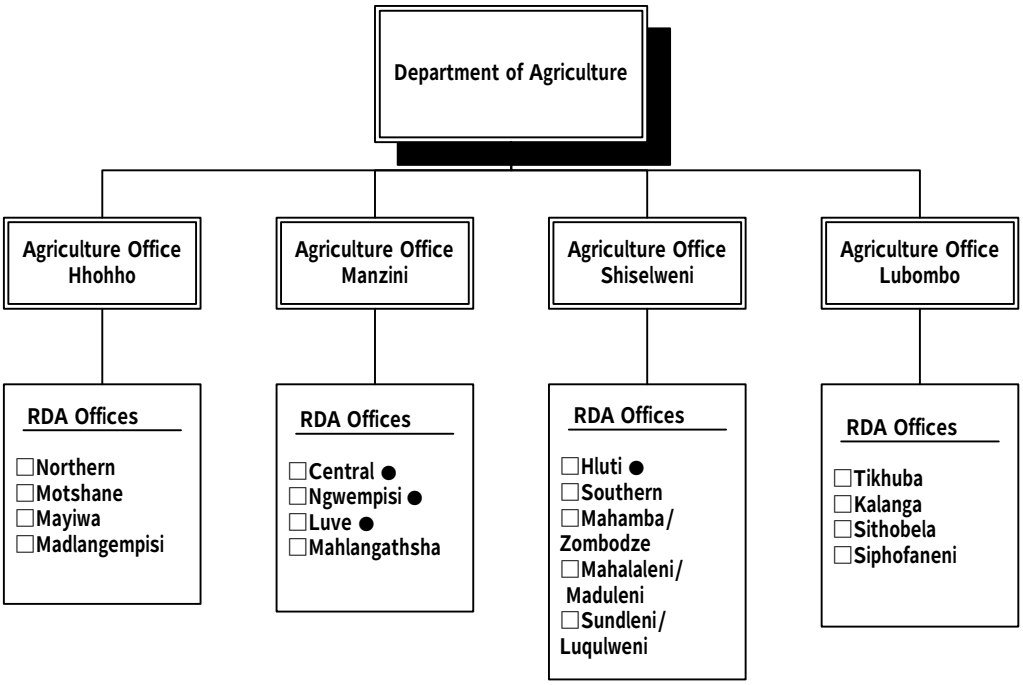


Figure 3-2: RDA Network for Agricultural Extension Services

As for animals, there are one veterinary specialist and one poultry specialist under the extension officer. RDA gives services of leasing tractor to farmers at a cheaper rate (E80/hour) than private lease (E100/hour). When an extension officer and extension workers need to give training to farmers, there are some training facilities of MOAC such as the Farmers' Training Centre at Nhlangano.

Extension workers are obliged to report on their work to the extension officer monthly. An extension officer at RDA has to report monthly as well to a senior extension officer at the Regional Administrative office, who must report quarterly to a senior agricultural officer in the MOAC. Each extension worker has his territory for his services. When an extension worker meets a problem occurring in the farm that he cannot answer at once, he may bring the problem through the extension officer to a subject matter specialist in agricultural research station who will coordinate with researchers on the matter. When soils matter in a farm, an extension worker may bring the soil sample to the research station for analysis. The agricultural research station also gives extension workers necessary training on new technology and new information.

b.2.2 Forestry Section

Main roles of Forestry Section are: i) to help alleviate environmental degradation and the shortage of fuel wood arising from the lack of trees; ii) to help speed up and strengthen the process of policy change in the area of deforestation, and iii) to satisfy community needs taking into account land sources degradation.

b.2.3 Land Development Section

Land Development Section (LDS) is responsible for the physical development activities of MOAC. Traditionally the section has implemented plans prepared by Land Use Planning Section (LUPS). Main activities were land conservation works extended under Rural Development Area Program (RDAP), rural roads and rural dam construction. During RDAP activities, it received heavy earthmoving equipment. As most of the equipment is now unserviceable, the Government is initiating the budget for the purchase of new equipment.

b.3 Department of Veterinary and Livestock Services

MOAC's overall goal in the livestock sub-sector is to transfer and equip livestock procedures with adequate knowledge and skill for the proper management and improvement of all available resources for an efficient and sustainable livestock industry which will foster positive contributions to the growth of the national economy. Priority areas in this sub-sector are as follows.

1) Increased off-take of cattle, poultry and dairy production to meet market demand and reduce the volume of imports;

2) Improved range management and rehabilitation to prevent overgrazing and control land degradation;

3) Improved livestock quality and condition through proper breeding and selection, and improved supplement feed preparation;

4) More effective livestock and livestock products marketing and trade through better marketing facilities and information;

5) Strengthening livestock extension activities under the Department of Veterinary and Livestock Services and the upgrading of the Veterinary and Farmer Training Centre to cover basic livestock extension and technology;

6) Better control of tick and tick-born diseases, parasites and other diseases of economic importance, and the provision of basic support data for livestock development, veterinary public health and animal health promotion through livestock and veterinary research.

b.4 Department of Cooperative Development

The primary objectives of the department are to:

1) Help people form cooperatives in order to obtain supplies and services at low cost;
2) Advise people on developing existing resources through cooperative action to enhance their standard of living;
3) Improve services and operating efficiency of cooperative members;
4) Inform the public on how cooperatives work and benefit their members;
5) Help educate all types of cooperatives in developing themselves;
6) Improve and stabilize the net income of the members;
7) Conduct the cooperatives business in a manner that will earn and retain the favourable regard of members, customers, employees, suppliers and the public; and
8) Ensure that societies adhere to all internationally recognized cooperative principles.

In addition to the above, there are some other sections in MOAC related to the development activities as depicted in the following organization chart. Roles and functions of these sections are described in Annex H.7.

c. Role of Deputy Prime Minister's Office

The main duty of the Deputy Prime Minister's Office is to coordinate all the regional development activities and to help in formulating developmental programmes at community level through *Tinkhundla* system for consideration and possible implementation by government. *Tinkhundla* administration also provides an electoral system which leads to direct representation to Parliament. Each *Inkhundla* has a Member of Parliament and Constituency Headman (*indvuna yenkhundla*) who are democratically elected by the people. Counsilors (*Bucopho* members), elected at each Chiefdom centre, represent their chiefdom in the regular meetings held at the *Inkhundla* centre.

d. Role of Ministry of Tourism, Environment and Communications, and Swaziland Environment Authority

This ministry and authority a) establish standards and guidelines relating to the pollution of water, land and as well as those relating to noise and other forms of environmental pollution, b) develop in cooperation with other Government authorities economic measures to encourage environmentally sound and sustainable activities, c) promote training and education programmes in the field of environment to create national awareness of environmental issues, d) ensure the observance of proper safeguards in the planning and execution of all development projects, including those already in existence, that are likely to interfere with the quality of the environment, and e) initiate measures for the coordination and enforcement of environmental protection legislation. The organization chart of Swaziland Environment Authority is presented in Annex H.7. As is seen from the chart, the authority is currently operated only by 9 staffs, accordingly its present activities is limited. Organizational chart of Swaziland Environment Authority is presented in Annex H.7.

e. Role of Ministry of Natural Resources and Energy

The role of this ministry is to ensure the proper coordination, development, management, preservation and enforcement of optimal and environmentally acceptable utilization of the country's renewable and non-renewable resources as well as the development and maintenance of cadastral surveys, mapping and land valuation standards and procedures.

f. Role of CANGO and NGOs

The roles of CANGO and representative NGOs involved in land management and degradation issues are summarized in Table 3-9.

Table 3-9: Roles of CANGO and Representative NGOs

Organizations	Main Field of Operation
CANGO	• The coordinating body for all NGOs in Swaziland to promote and support member organizations needs on a collective basis. • To maintain and exchange information of NGO activities from the past, present and future, and making this information accessible to all interested parties.
Yonge Nawe	• Support for small community development projects carried out either in cooperation with other agencies or independently. • To act as liaison between member organizations and relevant government ministries.
Swaziland Farmers Development Foundation (SFDF)	• Conservation including catchments area development and fencing surrounding area to allow vegetation regeneration. • Agricultural schemes, which involve community members' participation.

Source: Coordinating Assembly of NGOs, Swaziland, 2001

3.1.5 Natural Resources and Environment

a. Climate

Rainy season falls in the period from October to March, though every month rains are recorded. The higher the altitude is, the more rain falls, for every 100m increase in elevation, there is an increase of around 90 mm in mean annual precipitation. In High and Upper middle veld, annual rainfall ranges from 750mm to 1,050 mm depending on elevation and topography, with annual air temperature range of 15 ~ 20 C. Low temperature season falls on June to September.

Table 3-10: Climatic Parameters in 3 Target Areas

Parameter	TA 1	TA 2	TA 3
Mean Annual Rainfall	902.7 mm	783.0 mm	877.9 mm
Maximum Annual Rainfall	1,292 .6mm	1,172.2 mm	1,769.9 mm
Minimum Annual Rainfall	523.6 mm	288.3 mm	415.3 mm
Atmospheric Temperature	15.3 ~ 23.6℃	13.5 ~ 20.9℃	12.9 ~ 20.0℃

Note: The period of measurement for annual rainfall ranges 1961~2001, atmospheric temperature indicates monthly mean.

b. Natural Resources

As to useful natural resources available in the Study Area, water is considered most important followed by lignous resources. It has often been reported that surface vegetative cover over SNL has been deteriorated as population expands therein, evident from a comparison of old aerial photos with recent ones. This decline of surface cover has fostered higher runoff rate and as a result siltation / sedimentation of existing dams has been spurred to such an extent that their function of power generation, irrigation and potable water supply to urban areas has virtually ceased. In fact, effective water storage capacity of Mnjoli Dam has been halved through heavy sedimentation of Mbuluzi River, the water shed of which has hundreds of huge gullies and heavily sheet-eroded grazing land.

With regard to flora and fauna, they have been exposed to another risk of degrading diversity. Wild animals have been threatened either by rapid disappearance of forests and wood-lots or by encroachment of useless alien vegetation. There are only few weasels (*bolowane* in Swati), hares and some snakes in the fields though school textbooks emphasize protective measures of almost extinct animals like lions and jaguars. Swaziland is a signatory to such Conventions as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973), that on Biological Diversity in Lusaka Agreement on Cooperative Enforcement Operation Directed at Illegal Trade in Wild Fauna and Flora (1974). Also, the country has effected the Game Act of Swaziland for protecting all species of wild birds, reptiles and mammals.

However, increasing population pressure has extinguished precious indigenous tree stands and remaining ones are confined to alien, relatively less useful and nuisance ones. Australian wattle (*Acacia mearnsii*), guava (*Psidium guyava*) and *Lantana camara* represent the former while *Maurutius* thorn (*Caesalpinia decapetala*) and *Chlomoraena odorata* constitute the latter threatening ambient living conditions of many habitats. Local population relies on natural stands for firewood, but current resource has seriously been depleted.

3.1.6 Agriculture

Agriculture in the Study Area is characterised by the two land tenure patterns as well as the whole country, one is the Swazi Nation Land (SNL) and another is the Title Deed land (TDL). Farmers run a small-scale farming in the SNL as shown in the table below with food crops as mainly maize, groundnut, beans and sweet potato, which is subsistence agriculture (Refer to Annex A.1). They hold 0.95 ha of farm in Highveld and 1.04 ha in Middleveld on average. (Refer to Table 3-11).

And TDL farmers run a large-scale farming with capital intensive commercial farms of sugarcane, citrus and pineapple (Refer to Annex A.2). The SNL farmers are dominant in the Study Area except forested areas. Animals play important roles in farming as well as crops in the SNL, such as cattle, goat, sheep and poultry, and they are grazed on the communal land of the chiefdom except poultry.

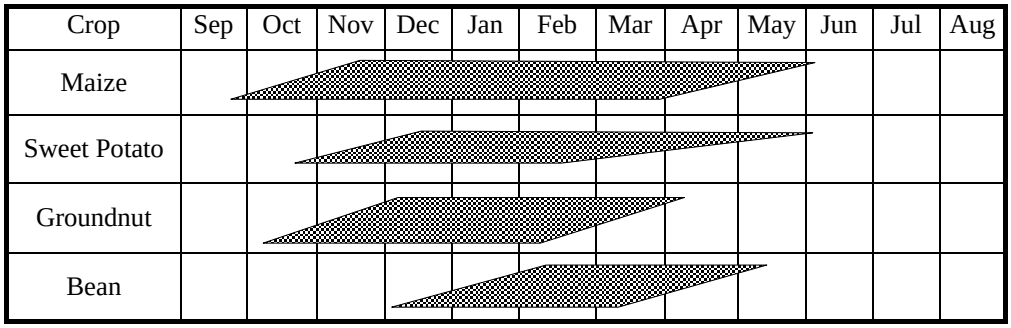
Table 3-11: Number of Farmers by Farm Size

Swazi Nation Land	Highveld	Middleveld	Total	%
Less than 1 ha	14,877	18,963	33,840	65.1%
1-2 ha	5,066	8,430	13,496	26.0%
2-3 ha	1,276	1,689	2,965	5.7%
3-4 ha	194	659	853	1.6%
4-5 ha	49	168	217	0.4%
More than 5 ha	94	503	597	1.1%
Total	21,556	30,412	51,978	100.0%

Source: Excerpt from Swaziland Annual Agriculture Survey, 1999-2000, Central Statistical Office

Erosion hardly occurs on subsistence rain-fed arable land due to sustainable management by widespread contour ploughing and grass strips instructed by the King's Order in 1953. Farming in the SNL relies on the rainfall, and irrigation is scarcely found except a few micro-irrigation systems for vegetables. Thus, farm produces are always affected by weather conditions. On the other hand, irrigation is a usual practice in the TDL. All the SNL farmers grow maize in the Study Area, and more than 80% of cropland are devoted to maize growing. It is doubtless that maize is the most important crop for small-scale farmers. Though maize is a major crop among others, more than half of SNL farmers do not produce often enough maize, and they buy maize for families. Swaziland cannot produce enough maize for total population as a whole country (Refer to Annex A.3).

Typical cropping patterns in the Study Area are shown in the figure below. Crops are grown only in the wet season and farms are without crops in the dry winter throughout. Mixed culture with other crops is rarely observed but pumpkin is planted often in the maize field. Maize is mainly planted in November and harvested mostly in May. Sweet potato is planted in December and starts harvesting from March. It is not harvested at once, but harvested little by little according to the family needs. Groundnut is grown between November and April. Beans are planted in January and harvested in April and May.



Source: Interview Survey with farmers in the Target Areas by JICA Study Team

Figure 3-3: Cropping Patterns of Major Crops

There are a few farmers who grow vegetables with individual irrigation system. All of them are micro-scale irrigation systems that bring water from a stream or spring to the farm through open ditch. A few cases show that farmers pump up water directly from a river. They grow vegetables mainly for their families and sell some surplus to their neighbours. But some farmers grow a special type of vegetables to aim at a specific market as snow peas for Malkerns market. Those who grow vegetables with irrigation are taken as very active farmers. A few fruit trees

are grown only at the backyard garden, and orchards are hardly found in the Study Area. Fruit trees grown are banana, mango, avocado, orange, peach, mulberry, etc.

More than half (59%) of farmers in the SNL plow the farms with a hired tractor either from neighbouring farmer or RDA. They often complain that the tractor does not plow the farm in time, because when a farmer wants to plow, the other farmers want it also at the same time. The lease of a tractor is E100/ha by a private and E80/ha by RDA. Only 20% of the farmers plow the farms by their own oxen, and 17% by hired oxen. A new tractor costs from E 147,000 to 225,000. It is too expensive for most of the farmers to purchase such equipment for small-scale farming. About 4% of farmers own such equipment and some of them purchased it at second-hand.

Farmers buy maize seed of hybrid variety at E 90 to 130/10kg from a private dealer or CCU. The local variety seed is taken from own farm. Hybrid maize is grown by approximately 80% of farmers, and the local variety by about 60%. Among them, 39% of farmers grow hybrid maize alone, 20% local variety only, and 41% both varieties. The choice of varieties depends upon farmers with the reasons of high yielding, drought resistance, or seed price.

Most of farmers (87.2%) use fertilizer, either 2-3-2-22 or 2-3-2-38, mainly two types of fertilizer as basal application for maize. Both of them contain lime because the soils are highly acidic. They apply also other fertilizers, LAN or Urea as topdressing. But there are farmers who do not use fertilizer at all because of no money to buy it. Cattle manure is also used in the maize field by 38.5% of farmers. RDA recommends 10 bags/ha of 2:3:2:22 in Highveld and 8 bags/ha in Middleveld, and 7 bags/ha both in Highveld and Middleveld if it is 2:3:2:38 fertilizer (1 bag contains 50 kg). The amount of fertilizer used seems far less than required, because farmers tend to buy fertilizers as much as they can afford, moreover they do not measure the actual farm size. The maize field is tilled after maize grows up to a certain stage either by oxen or a hoe and, weeded by a hoe. Many farmers (82.1%) apply agricultural chemicals, mainly insecticides. Some farmers employ labours at the peak of work.

Since the farming is subsistence level, marketing of farm produces is not a major issue. Farmers who produce more maize than the family needs sell usually the surplus to the neighbours without enough maize. There are other farmers selling maize to National Maize Corporation (NMC). Buying price of maize at NMC in August 2001 is E 63.00/bag (1 bag is 70 kg, refer to Annex A.4). Since maize, the staple food of the people, is not produced enough in the country (refer to Annex A.3), its market has no worry for farmers to sell. Farmers' or women's Associations grow vegetables though the farm size is very small, they meet difficulties sometimes to sell the produces, while the other associations grow vegetables under a contract with National Agricultural Marketing Board (NAMBOARD) without worry of the market. Buying prices of vegetables and fruits at Encabeni Fresh Produce Market run by NAMBOARD are shown in Annex A.5. Production of vegetables does not fill the market demand very often according to the board. There is only one irrigation scheme within the target areas, i.e. Intamakhupila irrigation scheme at Velezizwini in TA3 with a total irrigation area of about 18 ha where 34 farmers are cultivating some vegetables.

3.1.7 Agro-forestry/Community forestry

a. General Condition

Swaziland is one of the lucky countries in Africa in terms of forestry resources, since about 45 % of its land is covered by forests. The indigenous vegetation, which accounts for 87 % of the total forest area, is not however legally gazetted for conservation. One major implication of this is the forest threat from other land uses. Currently, the overall forest area is gradually being reduced by expansion of agricultural activities such as sugar plantations (with an area of 38,000ha), land clearing for subsistence cropping and bush fires during the dry spell. According to the 1999 forest resource assessment by Forest Policy and Legislation Project (FPLP), indigenous forest cover about 37% of the country while plantation forest occupies

approximately 8%. Within the various vegetation types, relative size is indicated in Table below:

Table 3-12: Area of Major Vegetation Types in Swaziland

Major forest types	Area of Vegetation cover (ha)	Share of major Vegetation types (%)
Montane Forest	11,349	1
Riparian	25,207	3
Savannah	382,261	49
Bushland	232,954	30
Wattle woodlots	26,440	3
Industrial Plantations	110,222	14
Total Forest Area	788,433	100
Total Country Area	1,736,000	45

Source: Forest Resource Assessment, FPLG: 1999

Though the areas covered by the forest are extensive, most of the indigenous vegetation is low bush and very little of it is defined as closed forest. Area of Montane Forest and riparian vegetation, i.e. the two vegetation types with a resemblance of low closed forest, account for only 4 percent of the forest cover, while woodlands and bushlands are extensive, accounting for 79 % of forests. In the sense that these indigenous forests are not legally demarcated, they also do not have any specific management plan, which would stipulate level of use and conservation strategy. Some relevant forestry legislation (The Forest Preservation Act 14/1910; Natural Resources Act 71/1951 and Grass Fire Act 44/1955) could usefully be applied if these forests were demarcated and legally gazetted. Industrial plantations are privately owned and consist of mainly pines and eucalyptus at proportions of 60% and 40% respectively. It should be noted that Swaziland has one of the highest areas of man-made forest in Africa with per capita of 0.14ha of plantation.

These forests are very important in view of their environmental and economic roles: Environmentally, forests are important in protection of the country's water catchments and prevention of soil erosion. Additionally, the extensive and deep root network of tree resources improves soil structure and fertility through nutrient recycling and copious generation of organic matter. Studies done in India by ICRAF (Agro-forestry Today Vol.12 No.1) on rehabilitation of degraded watershed noticed ecological benefits of forestry included reduction in runoff water from 70% initially to 22 % of rainfall received in third year. Soil loss reduction was dramatic, from 41 to 1.9 metric tonnes per ha over the same period of three years rehabilitation work. Also depth of ground water table was reduced from between 6 and 15 m to between 2 and 9 metres. Economically, forests are source of firewood, building material and a host of non-timber products, all critically important to the local communities. Industrial plantation in Swaziland contributes about 15% of GDP through export of wood and generates employment for 8,000 people, a share which is approximately 12 % of the total formal employment.

At the Study Area, four (4) distinct kinds of forests resources are found: i) agro-forestry resources which include all the planted and retained trees in the fields; ii) Eucalyptus woodlots which are communally owned; iii) wattle woodlots privately owned; and iv) indigenous vegetation which are communally owned.

b. Agro-forestry

Agro-forestry includes both planted and natural trees, which are retained for direct economic and environmental roles on crops and livestock. On the whole, tree planting in fields was found to be very limited despite the great potential such trees have in provision of firewood, building

material, fodder and organic matter for soil fertility. On the average, each field had about 7 trees. Tree planting practices are not well developed in study area.

Generally, most fields have grass bands along contours and these bands have been very effective in preventing soil erosion in fields. It is one of the special features of soil conservation in Swaziland, which could usefully be copied by many other African countries.

With population increase however, need to produce more food has in fact meant expansion of cultivated area. Some of these bands have been encroached by cultivation, making them very narrow bands. In some cases, some bands have been removed altogether and their role in prevention of soil erosion greatly compromised. This is a situation where alley tree planting in field in combination with grass strips could be applied for stabilization of the contour bands and prevention of soil erosion.

The other general observation in fields is low crop yields. Some fields have also been abandoned due to soil infertility. Chemical fertilizer is generally too expensive for most farmers. Soil fertility improvement technologies such as improved fallow and inter-crop mixing are also lacking in the study area. Most of these technologies are cost effective in supply of organic matter whose physical and chemical effects not only leads to soil fertility but also reduced soil erosion.

c. Eucalyptus Woodlots

In the study area, there are 26 community woodlots with a total area of 61 ha or an average of 2.3 ha, where Eucalyptus is the main tree species. The eucalyptus woodlots are truly the communal woodlots in the sense that no one individual farmer can lay claim on them. The trees were mainly planted in 1992/1993 using Government resources (seedlings, poles and barbed wires for fencing) while the community provided labour and land. None of the plantation has been harvested. However, community people know that in the event of sale of the trees thus grown, the income thus generated will be used only for the benefit of the public purposes. The forests thus created through the said plantation in 1992/93 belong to the different local communities, where the woodlots are well managed by the community people and they are proud of it. It is considered that Eucalyptus is the most appropriate species to be adopted in the afforestation activities as many community people have the experiences of plantation of this species.

Though *Eucalyptus grandis* is the dominant species, a number of other eucalyptus species were planted as trial in a number of woodlots. The main species that were planted were *E. camaldulensis*, *E citriodora*, *E paniculata*, and *E cloriana*. In a few cases, a few plants of *casuarina* were also planted within the woodlots, mainly to monitor relative growth of various tree species.

Current survey of the woodlots within the study area indicates that there are no major encroachments and most of the fences remain effective though some openings to allow animal entry for grazing have been noted in some areas. Communities are aware that they cannot use these woodlots for their private purposes. During discussions in the workshops, it was found that the members of grazing committee are also dealing with forestry matters.

The main issue here is that, the entire eucalyptus woodlot plantations surveyed are not currently being actively managed. Already, some of them are mature for high added value products and a decision is yet to be made on, method of harvesting, marketing outlets and distribution of the products, use of the income thus generated, and coppicing regime to be applied for maximum growth.

Elaborate use rights rules also need to be defined, elaborated and communicated to the relevant communities. According to discussion with community, firewood collection of dead branches (no cutting of trees) can take place during the day between 10.00 am and 1.00 pm. Each household is entitled to 25 to 30 kg of firewood. In most cases, all the dead branches have been

collected and there is no more firewood left in the woodlots that can be collected. If someone cuts tree without permission, a chief can fine him/her. The amount of penalty, which can be imposed by a chief, varies considerably and people are not definite on nature of such penalties. When there is a public work such as fencing or boundary maintenance, each member of the community must participate, otherwise he or she is fined E5 for failure to turn up for communal work.

d. Wattle Tree Woodlots

These vegetation types are many with generally low and variable stocking. They were planted in early 1930s in many parts of Swaziland as a cash crop. Since then, the area under wattle has increased. According to the Forestry Section, in early 1970 the quoted total area covered by wattle trees was 7,000 ha with SNL having about 5,000 ha while Titled Land had about 2,000 ha. There was no systematic inventory of forest resources by then. In 1990, a systematic inventory under Swazi-Germany Forestry Project Forest Inventory indicated that the area under wattle tree was 25,000 ha. Reassessment of forest resources by Swazi-DANCED Forestry Policy and Legislation Project nine years later in 1999 indicated that the area under wattle trees had increased to 26,000 ha. According to the Forest section, the overall area of wattle could in fact be higher than 26,000 ha because some of the small units of less than one ha could have been omitted from the inventory exercise.

Wattle trees are invasive and have at times extended in areas where they are not needed and hence the policy has recommended that the trees should be confined. One way of confining wattle is to plant a barrier plantation of non-invasive trees around major wattle woodlots. Typically, a person who planted trees around homestead got shifted in times of resettlement, leaving his trees in the once field area and subsequently converted into communal grazing land. In the meanwhile, wattle tree continued expanding and ownership and user rights of such trees wherever they may have spread remained with the original planter and his heirs. The fact that other new comers cannot freely use such trees and that they have to buy them for firewood and other purposes has caused some resentments and jealousies, which are not very healthy for rural development.

According to the Forestry Section of MOAC, the wattle woodlots are not nowadays well managed in SNL because of difficulty in finding a good market for the bark. Recent resurrection of bark tannin for biological leather treatment has triggered opening of Swazi Wattle Industry in Shiselweni. It will contribute to the market development for bark. Development of market with assistance of Forest Companies in out-grower scheme would greatly lead to better management, if communities are well trained on modern management techniques of wattle trees. In fact, a discussion with a staff of the newly opened Swazi Wattle Industry (Pty) reveals that demand for tannin is quite high internationally and the major problem is lack of adequate supply. The factory is getting only 10 % of its requirements. The major implication here is that there is great potential for income generation to the Swazi communities particularly in High and Middleveld through active management of wattle woodlots which are currently neglected.

e. Indigenous Vegetation

Indigenous vegetation also exists in several places of the Study Area mainly along hill ridges and along river valleys. These vegetation types have been extensively used as a source of firewood, building material, and other forest products. They have also been an important source of livestock fodder, particularly goats. The vegetation type is particularly important in water and soil conservation. Field survey has also indicated that a number of gullies, which have stabilized are in fact covered by indigenous vegetation. Although one can argue that the gullies stabilized before onset of the vegetation, it is evident that vegetation is greatly contributing to prevention of further development of some gullies. On the whole, soil erosion under these indigenous forest types is minimal.

The main issue is that species diversity of these forests has drastically been reduced by invasive alien species such as *Psidium guajava (guava), Acacia mearnsii (wattle trees), Latana camara and Caesalpinia decapetala (Mauritius thorn).* Currently there are no significant initiatives to curb spread of alien tree species. Occasional bush fires also give the invasive species a chance to out-strips indigenous vegetation. In fact, one of the most effective way of promoting fast regeneration of wattle trees is burning and this practice should be discouraged where expansion of wattle tree is not wanted and vice versa. Also direct use of the scarce vegetation for construction material and fuelwood has also led to degradation of this particular vegetation. On the whole the remnant patches of indigenous vegetation are severely degraded. Annex B-9 on tree species surveyed during field visits indicates a great species diversity of the original vegetation.

f. Tree Nurseries

Review of status of tree nurseries indicate that they are all very small and were started within the last twenty years. With exception of a few small tree nurseries in urban areas specializing in ornamental plants, all other tree nurseries in this country have been initiated, supported and managed by the Government, the Forestry Section. Currently, there are only six tree nurseries in the study area all of which were established and maintained by the Forestry Section. These tree nurseries are located outside the Target Areas. In most cases, they are within vicinity of the respective RDAs.

Typically, the Forest Section nurseries have very few tree seedlings even though most of them were designed to produce about 0.5 million tree seedlings. Total number of tree seedlings has remained about the same over the last two years and on the whole amounts to 90,457 plants. Stocking of tree seedlings ranged from about 5,000 to 25,000 tree seedlings per tree nursery with an average of about 16,000 tree seedlings. As compared to the planned capacity, acual stocking percentage is very low ranging from 1 to 5 percent with an average of 3 percent, due mainly to budgetary constraint.

The tree species diversity in the tree nursery is usually a reflection of planted trees in the field. Tree diversity in the nurseries was found to be low with only about three tree species dominating. Generally, eucalyptus was the most dominant tree species accounting for about 36% of all trees in the nurseries. Other tree species found with relatively high occurrence, were *Casuarina* and *Acacia mearnsii*. The tree nurseries grow eucalyptus mainly because this is tree species that is demanded by the various communities and schools, which form the major markets. Table below indicates the tree nurseries in the study area:

Table 3-13: Location and Stocking of Tree Nurseries in the Study Area

Nursery Details	Malkerns Research	Central RDA	Luve RDA	Southern RDA	Sibovu RDA	Northern RDA
Geographical Location	S26-33.167 E031-09.982	S26-27.476 E031-18.095	S26-18.718 E031.28.228	S26-59.955 E031-23.565	S26-49.320 E031-04.651	S25-51.863 E031,20.170
Date started	1979	1980	1992	1981	1980	1980
Area reserved (ha)	1	0.5	0.2	0.36	0.3	0.75
Area occupied (ha)	0.3	0.12	0.11	0.34	0.24	0.15
Occupancy rate %	30	24	55	94	80	20
Annual capacity	0.5 million	0.5 million	0.5 million	0.5 million	0.5 million	0.5 million
Actual stock	12,910	20,000	4,500	26,147	17,900	9,000
Actual Stock %	3	4	1	5	4	2
Species frequency						
Eucalyptus %	31	86	67	38	20	44
Cassuarina %	31			23	40	
Acacia Mearnsii %		6		15	31	
Hakea Saligna %	15	5				18
Water sources	Piped	Borehole	Borehole	Piped	Piped	Piped
Major constraints	Soil	Water	Soil	Soil	Seed	Tools

Source: Annual report 2002 of Forestry Division, MOAC.

One main feature is that with such limited and far a part source of planting material, many farmers simply cannot access tree and fruit seedlings and this has also been confirmed during the various discussions in workshops and by individual farmer contacted.

3.1.8 Grazing and Range Management

a. Organization and Co-operation of Government Agencies

a.1 Organization

Within the Department of Veterinary And Livestock Services which is headed by a Director, there exist two Divisions, the Division of Animal Health headed by a Senior Veterinary Officer and is related to animal health and other veterinary matters, and the Division of Animal Production headed by a Senior Animal Husbandry Officer and which is related to matters such as animal production and pasture and range management. The Division of Animal Production includes the Range and Pasture Management Section headed by a Range Management Officer (Figure 3-4).

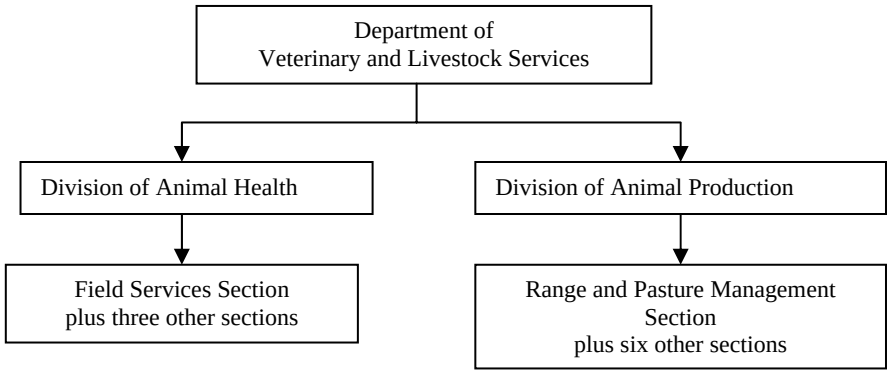


Figure 3-4: Diagram to Show Structural Organisation of Department of Veterinary and Livestock Services

Range and Pasture Management Section has three Range Management Officers, all based at Manzini. Two are responsible for communal area work and one for range management on government ranches. Livestock Officers in the regional offices give some advice on range management when requested by farmers. Extension is done by arrangement and liaison with the Extension Workers in the Department of Agriculture. Veterinary Workers do little with respect to range management and concentrate more on animal health and production.

a.2 Co-operation with Donors with Respect to Grazing/Range Management

At present there are no range management projects in cooperation with donors in Swaziland. There was the recent production of a study report on the range resources and grazing potential of Swaziland in 1994 as part of a livestock sub-sector review. There is also a small component of the IFAD sponsored Smallholder Agricultural Development Project, started in 1992 – the component aims to reduce stock numbers and increase and improve the quality of off-take. In 1993, there was a review of the Swaziland Livestock Development Strategies as part of the African Development Bank supported Institutional Support Project. In addition, indirectly related to the rangelands, were an EU sponsored study on beef production, processing and marketing in 1998, and a Japanese sponsored study to define a sustainable land management programme countering land degradation in Swaziland in 1999.

In addition, there have been at least two cooperative initiatives in southern Africa involving Swaziland to review and document natural resource planning and management (Mamba, 1991; Mamba and Khumalo, 1991; Critchley, 1996).

b. Present Activities of Government Agencies for Grazing/Range Management

At present there is little activity by the Range Management Section in the Department of Veterinary and Livestock Services, the reason may be attributable to shortage of finances to provide for inputs and to pay for costs of transport to the field. The Section tends to respond to requests for information and assistance rather than having its own projects. Activities as such relate mainly to advising the managers on the government ranches and participating in meetings in which range management and/or livestock are being discussed, for example resettlement due to the building of a big dam. In the past when funds allowed it, there was promotion and monitoring of group ranches, promotion of production and use of fodders, planning of grazing on title deed land, extension programmes, etc.

c. Policy

In Swaziland Livestock Development Policy Papers (first drafted in 1995), recognition is given of the importance of rangeland resources in the feeding of livestock, and also the total absence of stewardship, communal use, and uncontrolled high livestock population densities leading to declining range and livestock productivity.

It suggested that range improvement would be brought about by:

- Expansion and use of grazing management demonstration areas (GMDAs)
- Development of range and pasture rehabilitation packages
- Introduction of communal grazing areas and fencing schemes
- Establishment of [appropriate] stocking rates for communal grazing areas and to enforce such
- Develop range research programmes
- Monitor and control range and grazing areas shrinkage
- Development of joint government and community soil and water conservation efforts
- Development of range and pasture extension education programmes

Among others, the benefits to be expected include:

- Good range, pasture, soil and water management and conservation.

The said Livestock Development Policy has officially been endorsed recently, and some aspects have been put in practice.

d. Rangeland Grazing Capacity

The rangelands and the veld types of the study area are described briefly in Chapter 3.2.5 b., 3.3.5. b., and 3.4.5 b. In the past there has been considerable variation in the grazing capacity estimates (sometimes called carrying capacity estimates) that have been made for these veld types as shown in Table 3.14. The grazing capacity means the area required to carry one livestock unit for the duration of the grazing season without deterioration in condition of the grazing area or the animal. By definition in Swaziland, 1 LSU is a beast of 450 kg or equivalent in feed requirements]. From the wide ranges given (Highveld 1 LSU: 1.0 to 4.7 ha (or 0.22 to 1.00 LSU/ha), Middleveld 1 LSU:1.2 to 4.9 ha (or 0.20 to 0.83 LSU/ha)), it is apparent that there is no unanimity with respect to estimates of grazing (carrying) capacity.

Table 3-14: Grazing Capacity Rates Estimated for High and Middleveld Rangeland Types

Unit : LSU/ha

Year	Highveld	Middleveld	Author
1952		0.29:1 (1:3.5)	Hall, 1952
1960	0.28:1 (1:3.6)	0.33:1.0 (1:3.0)	Economic Mission, 1960
1967	1.00 to 0.56:1 (1:1.0 to 1.8)	0.83 to 0.42:1 (1:1.2 to 2.4)	I'Ons & Kidner, 1967
1977	0.37:1 (1:2.7)	0.79:1 (1:2.7)	World Bank
1977	0.36:1 (1:2.8)	0.78:1 (1:2.9)	Spargaaren,
1983	0.22 to 0.21:1 (1:4.5 to 4.7)	0.30 to 0.20:1 (1:3.3 to 4.9)	Hunting Technical Services, 1983
1994	0.59 to 0.35:1 (1:1.7 to 2.9)	0.44 to 0.23:1 (1:2.3 to 4.3)	Sweet & Khumalo, 1994
Range	**1.00 to 0.21:1 (1:1.0 to 4.7)**	**0.83 to 0.20:1 (1:1.2 to 4.9)**	

Source : Sweet and Khumalo, 1994

In 1994, Sweet and Khumalo estimated the stocking rates of the Swazi National Land in the Highveld and Middleveld areas to be of the order of 1 LSU:3.2 ha and 1 LSU:1.8 ha respectively. Other than in the more optimistic estimates it would appear that the areas were generally overstocked especially in the Middleveld or close to being overstocked in the Highveld.

e. Livestock Distribution and Holdings in The Study Area

Although the cattle herd structure varies somewhat from year to year depending on acquisitions and off-take, it remains fairly constant as shown in Table 3-15, and is similar across Agro-forestry-ecological zones in the SNL areas (ZIMKEN Management Consultants, 2001 quoting information from Ministry of Agriculture).

Table 3-15: Basic structure of cattle herds across Agro-forestry-ecological zones

Age Class	Range of composition (%)	Mean composition (%)
0 to 3-year olds	42.5 to 46.8	45
Bulls	3.2 to 4.4	4
Cows	30.7 to 36.9	33
Oxen	16.0 to 19.5	18

Source : ZIMKEN Management Consultants, 2001

The distribution of the cattle herds across the different zones and livestock holding patterns are further described in Annex C.1.

f. Problems with respect to Grazing/Range Management in the Study Area

The rangelands of Swaziland are beset by many problems – these are discussed in detail in Annex C.1 along with the stocking rate dilemma. They include:

- Technical issues due to overstocking, overgrazing, lack of rest, indiscriminate burning, lack of grazing management practices
- Ecological issues including soils being prone to erosion, grazing on steep slopes, grazing on land inappropriate for grazing, inappropriate land use practices, lack of protected access to water and stream banks and sponges and springs, lack of rangeland improvements, lack of range and soil rehabilitation practices

- Economic issues such as low input livestock systems yield higher marginal returns than more intensive systems, a lack of funds for inputs, poor market prices, lack of charges for livestock services, free-riding on communal natural resources, economic incentives favouring the keeping of livestock above carrying capacity of the land, lack of development of economically attractive and useful alternatives for the main uses of keeping livestock (draught, manure, investment, etc)

- Social issues such as a cultural proclivity to keeping cattle, simultaneous overstocking and yet being short of livestock to satisfy needs like paying dowry or schooling fee, lack of responsibility to rangeland resource, boundaries disputed and/or ill-defined, high human population levels

- Institutional issues relating to a lack of extension, lack of resources for research on range management, fodder production and soil conservation, lack of regulations to control stocking rates, lack of development of packages for intensification of livestock production for each of the Agro-forestry-ecological zones.

Sweet and Khumalo (1994) have looked at the issue of controlling stocking rate and concluded that improved range management practices cannot be viewed as alternatives to stock control, because only reduction of herd size can radically solve these issues. It may be pointless if the causal factors of degradation remain in place.

Land tenure also complicates the issue as there is an uneven availability of grazing areas between different communities, there is often grazing shared between more than one community, community boundaries are often disputed and, upon decree, are sometimes changed adding to the confusion. Further, there is no direct responsibility for managing rangelands by individuals within a community, not even by the *umsumphe* who is basically an advisor to the Chief.

In terms of land use, topographically, the rangelands in the High and Middleveld of Swaziland are found especially on the steeper parts of the landscape with cropping on the less steep areas. These areas are very sensitive to overgrazing and therefore erosion starts when the plant cover (litter and basal) is broken. This is particularly true of the study's target areas. In places there appears to be inappropriate land use with grazing being allowed to occur on land which is patently degraded and should be destocked – this results from a lack of application of land use planning principles.

Access to water for livestock can also cause problems especially where animals are walked to and from points at which water is available. Sometimes the animals have to get water from stream lines and in the process of entering the stream line erode the stream banks which can lead to the start of gullies from these places. Similarly, sponges are often puddled and become useless as they are not protected from trampling by livestock.

The "tradition" of indiscriminate burning the rangelands not only reduces the amount of forage available for livestock to feed on during the dry season, but also volatilises nutrients and reduces organic matter (carbon and nitrogen) which are essential for the health of the rangelands and rangeland soils.

Physical services such as dip tanks and cattle market places have been provided by government. Due attention should be paid to the choice of these facilities. Choice of siting of dips should take account of not only the need of the Department of Veterinary and Livestock Services to service the dip, but also that of the farmers, and consideration should be made on the heavy cattle tracking to and from dip sites as the animals that use the dips are fairly large in number and may be from a large area. Whilst market places have been set up to try to facilitate the off-take of animals, often these are old animals and/or of poor quality which only attract low prices, and this further discourages off-take. Technical advice on the marketing method of cattle should be properly made by the range officers of MOAC.

Other services include provision of extension and conduct of research. Although there is some advice given on animal health and production, there is limited extension on range management. This is also true of extension on development and production of fodder crops. Research on range management in Swaziland and in production of fodder crops has been very limited. As a result, it has not been possible to determine the most appropriate times at which different parts of the landscape should be used in order to avoid rangeland degradation, nor to determine the most appropriate stocking rates to use.

g. Present Activities by Cattle Holders to Protect Land

At present there are no activities designed to protect the land being broadly applied to the grazing areas across the study area.

Previously a number of grazing land demonstration ranches were established, but most of these have been collapsed for one reason or another, usually internal social reasons. These ranches have clearly demonstrated that where there is control and regulation of stock numbers and where there is some rest afforded to the grazing areas during the growing season, then rehabilitation of the grazing areas does take place, species composition improves, productivity improves, and gullies stabilise; however, sheet erosion whilst considerably reduced, seems to persist at least for some time after the other effects in improvement are being experienced – this is partly due to the fact that grazing is occurring on quite steep land, i.e. it is a topographic effect on soils prone to sheet erosion.

A few of the communities have received *ad hoc* allocations of fencing for parts of their grazing areas. In few cases have these been maintained and the primary motivation by villagers for having such fencing seems to have been to protect crops from cattle in the growing season rather than to allow management of the grazing resource, although from the government point of view it was supposed to have been to assist in grazing management.

There appears to be no effort by cattle holders to prevent burning of the land, and, indeed, it may well be cattle owners who are burning the grazing in winter to stimulate out of season flushes of green grass.

From workshops and interviews carried out with farmers it appears that there are few rules regarding the use and management of the grazing resources. What does occur is that farmers restrict their animals to recognised grazing areas, usually not too far from their homesteads, during the summer growing season. During winter however animals are allowed to roam fairly freely and consume what crop residues they can find over the whole of the landscape.

In quite a few areas, farmers are aware of what is going on in their grazing areas and they are concerned. Sometimes in these areas some attempts to discuss the means to regulate grazing are made. However, without appropriate, sufficient, sustained and continuing advice, support and extension, this has mostly come to nothing.

Farmers have indicated on a number of occasions a desire to learn more about commercialising their livestock keeping activities.

3.1.9 Land Degradation

Soil erosion and alien species' encroachment are two major forms of land degradation in Swaziland. In the light of causal factors that degrade land quality, the degraded areas have by far been limited to grazing fields because forests have been covered with thick understorey shrubs or fallen litters, while cropping arable fields unexceptionally have contour grass strips and are covered with well-thrived crop leaves throughout rainy season. Land degradation is induced and develops by various causes as listed in the following table. In short, too intensive land use may be blamed as triggering factors. Also, inhabitants' indifference or ignorance may have exacerbated degradation.

Overgrazing constitutes a typical man-made disequilibrium since such heavy grazing and subsequent heavy land degradation never occur under natural steppes / savannas where natural culling by predators and/or climatic calamities always regulates natural balance so that any destructive impacts against ground surface can be buffered. In other words, the tendency of cattle holders to try to keep as many herds as possible around them has incurred the heavy price of severe degradation of their grazing. Because the earth of Swaziland geologically consists of oldest (archaean) and most fragile rocks, special caution is required to conserve it properly, but in reality very few feel concern about due care for such fragility. 52% of grazing area in 3 TAs is already eroded.

Table 3-16: Major Causes of Different Types of Erosion

Erosion Type	Susceptible material	Major Causes
Sheet	all soil types over slope	overgrazing, field burning, deforestation, poor crop cover
Terracette	ditto on steep slope	a type of developed sheet erosion caused by cattle over-grazing over shallow rocky soils where exposed rock forms small terrace often in rhombic shape
Slip/ Slide	shallow soils on slope	cattle overgrazing over saprolites containing few rock/stone pieces where land slides over temporary impermeable layers
Rill	sandy soils / stony soils	runoff pathway often formed heavily sheet-eroded slope of cattle tracks, cart roads, borrowing areas or crop field
Gully	all types of soils, with highly erodible clay mineral like kaolin	rills are deepened to form gullies, or soil cleavage / holes can develop into gullies. starting from cattle paths or tracks, old termite mounds, borrow pits, scoured escarpment along stream banks etc.
Ravine type gully *	deep layers of weathered saprolites with sub-soil containing readily water suspendable kaolin	Mostly over old cattle tracks to dip-tanks, watering places like streams, sponges, reservoirs etc. Along roadside drain ditches, below drain culverts buried under trunk roads, Over borrow pits

Source: Study results by JICA Study Team

Note: * with plural heads, often developing into dendritic form, starting often from denuded cattle tracks, local paths. mostly accompanying with large loss of illuviated kaolin mass in lower saprolite layers dissolved and moved into groundwater seepage

Traditional habit of grass burning during dry season may be reproached as another detriment since it destroys precious shrub trees covering ground surface and deprives organic matter or humus that otherwise give higher water and nutrition absorptive / retaining capacity to topsoils. Soil clods in topsoil often become tiny clinker balls after ignition by wildfire, which repel water / reject roots.

Overgrazing affects eco-system in such a way that particular species of grasses or shrubs that are not palatable to cattle, or immune to adverse environmental conditions survive and proliferate, such as bracken, wattle, balloon willow (*Gomphocarpus fruticosus*), *Hymenolepsis parviflora* occupying sizable part of grazing space. It gives heavy damage on grass cover along cattle paths, tracks to watering spots or to dip tanks because cattle flock into a herd and hoofs of which tread the same tracks / paths every day. Once barren patches appear over these tracks / paths, rills occur and develop into huge dendritic gullies.

It should be emphasized that cropping tracts or arable fallow has much less eroded degradation or gully incision regardless of soils, geological formations or topographic conditions. This is attributable to thick leaf cover of crops especially maize during rainy season and grass contour strips in the cropped plots, and also owing to a respectful decree promulgated by late King Sobhuza II with faithful observance of farmers at large. This fact further implies that erosion more likely takes place through improper land use (in other words long-lasted artificial actions) rather than attributable to spontaneous causes or properties of soils / geologically derived

material. In fact, huge ravine type gullies are found on wider range of surface constituents, on steep to almost flat slopes, over ferralsols, vertisols, acrisols, regosols, lithosols, nitosols etc. as well over elluvium, colluvium and ecent alluvium, over saprolites derived from gneisses, pegmatitic granites, milonites, granodiorites, diorites etc. They tend to occur on highly weathered and thick, homogeneous elluvium where matrix textures have already become fragile through illuviation of finer constituent particles therein to subsola. Conditional factors affecting gully formation are summarized below.

Table 3-17: Conditional Factors Affecting Gully Formation

Considered / Assessed Factors	Conditions Leading to Frequent Occurrence of RTGs	Conditions Allowing Rare Occurrence of RTGs
1. Soil Type	Gullies develop wider ranges of soils but typiclly ferraltic ones	-
2. Surface Geology	Occurring wider range of acidic rocks like granites and gneiss, often clustering along big faults	Gullies less occur over alkaline rocks such as dolerite unless they are weathered
3. Physiography/ Topography	Elluvial ridges around granitic plutons, colluvial / fluvial deposit	Rocky and less weathered hills have only shallow gullies
4. Climate (Annual Rainfall)	Irrespective of whether moist or dry climate, gullies take place	-
5. Land Use	Almost all huge gullies occur on grazing fields	Arable land and forests seldom develop gullies
6. Land Holding Type	Mainly occurring on SNL	Rarely occurring over private or TDL, recently purchased SNL
7. Altitude / Slope Gradient	Irrespective of whether higher or lower elevation, gullies occur	Rarely taking place on steep slope but occur very flat plain

Source: Study results by JICA Study Team

Overgrazing is globally deemed as major cause of gullying process. As a result of site observation during 2001~2003 (Here, RTGs do not include organ-pipe or flute wall ones typical in colluvium), the PPMU identified this fact and assessed various other conceivable causes of gully formation and development, as shown in the previous and following summary table:

Table 3-18: Reasons of Higher Susceptibility to Erosion on Grazing Land

Related Factors	Effect on retaining consistency	Status on grazing fields	Status on arable / forest
Humus content	Role of glue to form soil aggregate that resists erosion by rain drops	Part lost by field burning, partly by grazing /thatching	Manure came from grazing & leaf litter supply humus
Vegetative cover	Curbing hitting force of raindrops	Overgrazing destroys cover	Thick cover protects ground
Length of slope	Longer slope accelerates runoff	Often located on long slope	Intercepted by grass strips

Source: Study results by JICA Study Team

Concerning sheet erosion, major part of soil loss takes place at sites affected by sheet erosion, mostly grazing land. Estimated and observed soil loss over ground surface is given in the table and figure below: these results indicate how range land contribute to soil loss. The reason why long overexploited grazing land is more susceptible to erosion is illustrated above. Grazing land has evidently been placed on worse status with less humus, less vegetative cover and longer slope. Among various factors, soil erosion has by far more bearing to geologic features, rather than soil morphology and the following table explains how the geological and topographical factors contributes to the occurrence of huge gullies.

Table 3-19: Relationships between Geologic Factors and Gully Formation

Geologic Factors/ Parameter	Relationships with Gully Formation and Development
1. Disturbing Ground Surface	Huge gullies are found on the past cattle tracks, cart roads, borrow pits, down from culverts where surface has been scarred
2. Aquifer, Hydrology	10% of huge gullies have perennial water flow at their bottoms. Inside gullies hollows are formed beneath relative aquifer layers.
3. Clay Formation, Illuviation	Clay has been formed through tectonic movement like faults and heavy metamorphozing, kaolin is always found in huge gullies
4. Groundwater scouring	Saprolite matrix from which clay was illuviated away is too soft to resist groundwater action, readily scoured to form cavity-hollows
5. Actively Developing Period	Incision and brachiation proceed on as long as readily scoured material matrix forms aquifer through which groundwater flows.
6. Site, Position, Surface Shape	Deep incision begins at ground scar with bare ground or heavily disturbed surface, not necessarily opening at the stream. Gully heads brachiate and proceed to upstream-ward of aquifers

Source: Study results by JICA Study Team

Table 3-20: Annual Soil Loss per hectare Estimated by SLEMSA Method

unit : ton / hectare / year, annual loss ; t/year/TA

T A	TA 1			TA 2			TA 3		
Land use / slope	Range land	Cropping field	Shrub woodlot	Range land	Cropping field	Shrub woodlot	Range land	Cropping field	Shrub woodlot
flat	5.7	0.19	-	3.2	0.37	-	4.2	0.27	-
gentle	11.3	0.38	-	7.3	0.55	-	9.2	0.45	-
moderate	20.7	0.45	1.87	17.9	0.72	4.79	17.7	0.57	2.44
steep	36.3	-	4.79	27.1	-	9.53	32.0	-	5.61
mean	18.5	0.34	3.33	13.5	0.55	7.16	15.8	0.43	4.02
Annual	158,010	2,252	1,156	98,464	2,325	895	180,604	3,820	9,913

Source: Study results by JICA Study Team

Total degraded land in 3 TAs account for 37%, including 83% of grazing acreage, as shown below.

Table 3-21: Current Land Degradation Status in 3 Target Areas

Unit : ha

Target Area	Sheet Erosion	Terracette Erosion.	Rill Erosion	Active Gullies	Slip Erosion
TA1 (19,500 ha)	5,150	2,330	50	460	30
TA2 (11,700 ha)	3,100	400	90	310	10
TA3 (30,600 ha)	6,870	1,710	90	820	130
Total (61,800 ha)	15,120(26 %)	4,440(7 %)	230(0.4 %)	1,590(3%)	170(0.3 %)

Source: Study results by JICA Study Team

Note: Total affected Area 21,550 ha, 37 % of 3 Target Areas, affected grazing land accounting for 52%

Cumulative soil loss was measured in three TAs by comparing soil profiles observed in two adjacent pits, each at adjacent forest (virgin soil) and grazing field. The results were shown in Fig. 3-5, indicating that 15 ~ 35cm of top~subsoil layer has been eroded away from grazing land for decades, otherwise two profiles should have the same thickness for corresponding layers.

Table 3-22: Plant Encroachment Found in Target Areas

Specie	Problem	TA 1		TA 2		TA 3	
		Site	frequency	Site	frequency	Site	frequency
Acacia mearnsii	Expel others	Shrub	60 %	Shrub	10%	Forest Gully	10%
Caesalpinia decapetala	Thorny	Roadside	20 %	Roadside	25%	Roadside	15%
Psidium guyava	Low value	Roadside	25 %	Shrub	30%	Shrub	20%
Lantana camara	Thorny, itchy	Roadside	40 %	Roadside	10%	Roadside	15%
Solanum mauririanum	Poisonous	Roadside	10 %	Valley	5%	Roadside	10%
Cassia siamea	Low value	Roadside	15 %	Roadside	20%	Roadside	10%
Hymenolepsis parviflora	Low value	Grazing	30 %	Grazing	0%	Grazing	5%

Source: Study results by JICA Study Team
Note: The sites indicate the places where encroachment most frequently occurs, and percentage refers to observed frequency of encroachment on the specified sites. Note that the area under encroachment is currently in a range of a few percent of total land area.

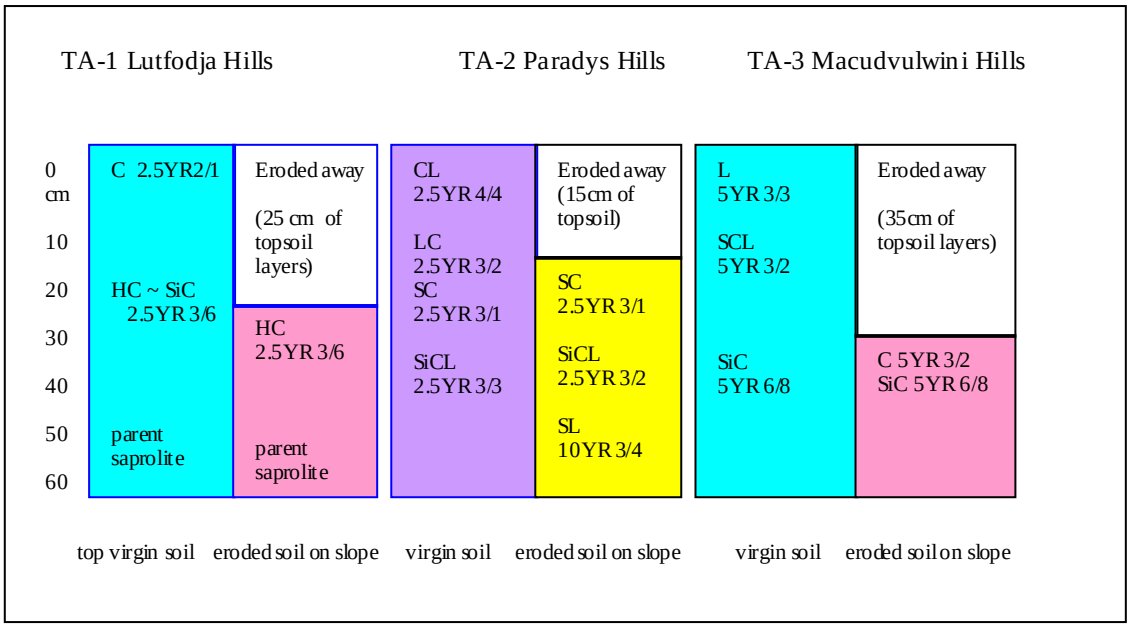


Figure 3-5: Proof of Soil Erosion from Grazing Fields

Source: Observation result of JICA Study Team

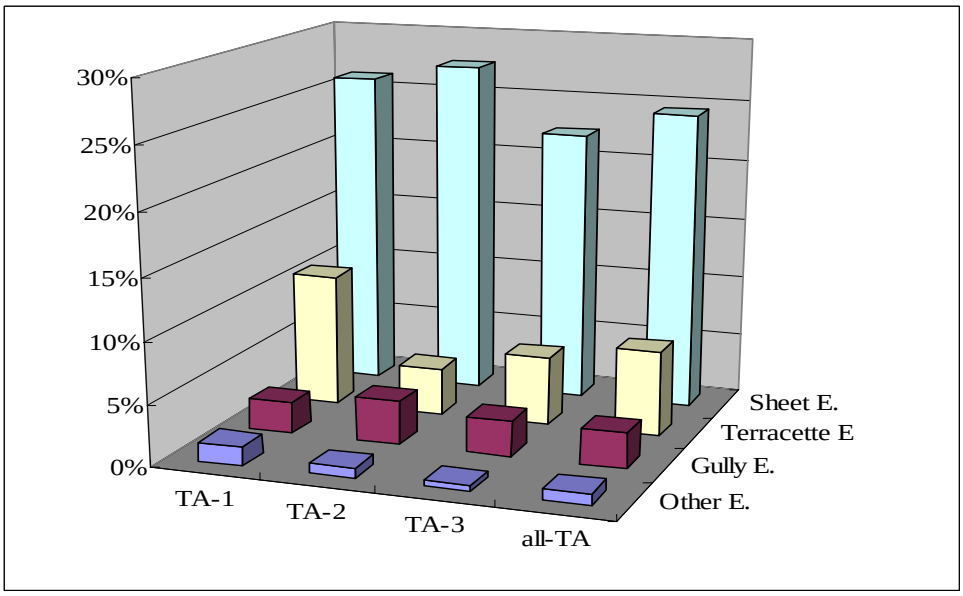


Figure 3-6: Degraded Rate by Erosion in 3 TAs

Source: Observation result of JICA Study Team

With regard to encroachment of alien plant species into grazing fields, indigenous forests and roadsides, this is undesirable from resource utilization point of view, because encroached species have less economic value or give hazards /detrimental effects on daily activities or on environment. The above table lists representative problem species identified in 3 TAs.

3.1.10 Rural Society and Gender Issues

a. Ethnic Group and Religion

In Swaziland, there is only single tribe called Swazi and almost all the people in the target areas are Christians (99.3%). Since these features make mutual cultural background, there are no conflicts or disputes originated by those cultural and racial issues within/inter communities.

b. Structure of Rural Community

b.1 Perception of "Community"

Perception on "Community" is diverse, especially in rural areas. Some people treat "community" as a church community, and others think it as neighbouring unit. In this report, "community" is regarded as a same unit as one chiefdom, which is lead by "chief".

b.2 Leadership and Chain of Command

Chiefdom, headed and supervised by a chief, is the most basic unit in the rural community. Traditionally, "chief" has absolute power in the community. Meetings for discussion in the community are called by the name of chief. Whatever disputes happen in the community, it is reported to the chief and elders who are surrounding the chief (traditional authority), and is solved by them. When community people want to start new things such as development activities, for example, it is indispensable to consult with the chief to get permission, and ask for the land to use for those activities.

People are mostly obedient to their chief, since the chief has the right to allocate the land to his subjects and to banish people from his land when his subject fails to follow his decision. Those cases are rare in practice and people are not necessarily feeling insecure-ness in their land tenure, however, the traditional authority is regarded as an ultimate authority which should be

always respected habitually. Many chiefdoms without chiefs, waiting for a next successor, are observed.

On the other hand, Tinkhundla system deals with development issues at Inkhundla level. However, even though Tinkhundla system was introduced and elected committee members discuss about development activities, chiefs hardly cooperate with neighbouring chiefs.

There have been many disputes over boundaries between chiefdoms. However, chiefs are generally reluctant to discuss the land problems with other chiefs, since as a chief, he feels that he is the only one who can rule his area and there is no one except the King who can make decision on such a problem.

Above all, there are many chiefdoms whose chiefs live away from his chiefdoms or successors are not decided after death of the former chief. It also limits the chance for constructive discussion and cooperation among chiefdoms against disputes. These disputes sometime spoil the development activities in the area

When any activities are planned, condition of the leadership and command system, which differs from chiefdom to chiefdom, should be taken into consideration.

b.3 Family Structure

"Household" is a smallest social unit, which is defined as the unit managing their earning and expenses, and eating together, in Swazi context. One household size ranges from one (1) to twenty five (25) with the average of 9.1, according to the Household Baseline Survey (HBS) conducted in February 2001.

Close relatives tend to live together in the same homestead or next-door to support each other in many ways. The average number of household per homestead was 4.5. However, accompanying with the reduction of land size of each homestead and farmland due to the increase of population, extended family has come to move out of the original homestead. It means the form of tight kinship is changing nowadays.

Another feature of family structure is characterized by a high number of female-headed-household (FHH), and male absenteeism for migrant works. Having less employment opportunity in the area, males seek for jobs in town or South Africa, and deaths of the male-head by diseases also increase the number of FHH. According to the HBS, 35.1% of the households are female-headed household (FHH), and 56.5% of husbands at male-headed household (MHH) are absent from home for seasonal or long-term migrant employment (66.6% of them work outside of their Inkhundla) and come home on weekends, once a month or even less.

b.4 Community Based Activities

Households in the study area are scattered. The reasons might be to have enough space for livestock keeping (mainly cattle), and they have not had needs to unite themselves to protect from attack of other tribes since they are almost homogeneous tribe. Due to the distances between households, communication and mutual cooperation among neighbours had been limited.

However, people have realised the necessity of group support system due to the eroded extended-family-support-system as mentioned above to survive in the changing living environment. For example, they have formed farmers' association to receive extension service, and community police was organised to protect from robberies and other crimes that have been increasing in number due to high unemployment rate. Another example can be seen in the custom of "Masingcwabisane" or "Let's bury together" which is the informal women's group to prepare for funerals. Each member contributes certain amount of money and when a family member of them deceases, certain amount of money is withdrawn from the joint account to use.

This system is more like insurance. Their relationship is based on the certain rules and non-member cannot be supported.

Community based group activities could be introduced if their objectives, benefit and rules are clearly defined.

c. Livelihood

Highveld and middleveld areas, where the study area locates, are relatively well off economically, comparing to lowveld in Swaziland, although around 50-70% of the population in those areas are categorising themselves as "poor" or "very poor", according to the poverty assessment done by Ministry of Economic Planning and Development in 1997[5].

According to the result of HBS, average income of the study area is around E13,760 per year, and average expenditure is E7,900 per year. The gap seen in the number might be exclusion of barter or duplication of means of income by wage labour and remittance. As it could be seen, major income source is from wage labour (52%) and remittance of money by migrant workers (24%) is placed in next. As for expenditure, education is the highest (37%), which becomes heavy burden for the people.

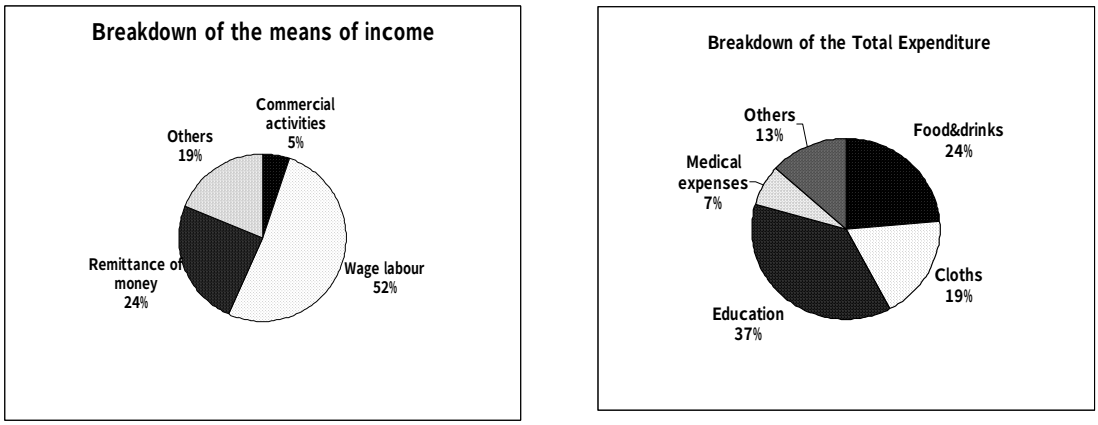


Figure 3-7: Breakdown of Income and Expenditure

Source: HBS by JICA Study Team

About the access to water source, most major water source in dry season is river (29%), followed by spring (22%), community tap (20%), and rest are shallow well, borehole and pond or reservoir.

Access to electricity is limited to 9.7% in HBS. Mostly candle are used for lightning the room (88.5%), followed by Kerosene (20.7%). The fuel for cooking is mostly firewood (95.3%), although there are people who use kerosene and gas together with firewood.

d. Gender Issue

Swaziland is a patriarchal society that tends to be male dominated. Women are considered as minors in relation to their husbands or socially in general.

[5] In the poverty assessment done by ministry of economic planning and development in 1997, poverty is defined as follows. (i) Inability to meet basic needs (hunger, begging for food, poor condition of housing and clothing, (ii) children not attending school, (iii) low crop yields because of lack of agricultural assets (livestock, good land, or access to inputs); and (iv) demographic categories (widows, the elderly living alone, the disabled, and large facilities).

At policy level, most remarkable example is the manner of land allocation. Land is allocated only to a homestead head (man), and a woman can have the right of access to land only through her male relative (mostly husband) or her boy child, but never in her own right. The incidence of poverty among FHHs is relatively high compared with the MHH. The reasons are not only lack of main income earner but also limitation for female head to control resources especially land.

At household level, money is mostly controlled by either men (56.6% in HBS) or under discussion of couple (33.3%) even though husbands are working outside. In case of need in big amount of cash, many people sell their cattle, however women have no right to sell cattle without consultation with her husband. On the other hand, women have control to utilise small benefit from what they earn by themselves, such as selling sweets, chicken, and so on.

Gender-related cultural taboo

Woman whose husband has deceased cannot participate in any community activities for two years due to the mourning rite.

Several women wearing mourning, sitting far aside of the participant group were recognized during the workshops in the study period. Though the cultural taboo was there, they had tried to find out what was going on by sitting far aside. This kind of cultural custom has been changing little by little, but these women who are standing more vulnerable condition should be also involved and benefited from the development activities.

At communal activities level, women have less opportunity to become a representative in the community based group or constituency structure, unless women are the majority of members. Because of socio-cultural perceptions and inhibitions, men are considered as a decision-maker even though women are the actual conductor of any kind of activities due to the high absentee rate of men in the community. Cultural taboo such as the case shown in box also limits their potentials.

However, it is observed that there are some cases of women empowered as a committee member of constituency structure or chairperson of community based group. In these cases, it is proved that women could be great contributors for community activities with responsible actions, if they have opportunities to participate in.

Considering above condition, any activities should be organised and planned with carefully involving all stakeholders of the activities, including women and men from decision making process to implementation.

e. Jealousy

One of the important cultural issues, which may negatively affect to community activities, is "jealousy". "Jealousy" occurs against not only visible in-equivalency, but also someone's success It is called "tall poppy syndrome", which means if there is someone who is growing taller than other poppies, it will be cut by others. It may prevent development of the community since it leads the tendency to keep each other away from succeeding. There are many cases of spoiled group or community activities recognised in the area because of "jealousy", such as seen in the following cases.

Case-1

An afforestation project was implemented in one of the communities in the study area. Since not all of people were interested in it, the project was started with the people who have interest in. However, when planted trees were grown and benefit became visible, one of the community members envied about it and set fire to the forest.

As it could be seen, people do not allow somebody in the group or community members of not working same as others, or having more benefits than the others in general. "Jealousy" influences not only within a community, but also the one between chiefdoms is found in the area.

Case-2

One chiefdom was chosen by a donor agency for an irrigation project. The construction and management went well and maize grew very well. But the field with maize almost ready to harvest was destroyed by the people from neighbouring chiefdom.

Since this is quite a human-natured issue, once it happens, it is difficult to restore the relationship among themselves and may extend the negative impact widely.

Some measures to prevent disputes by "jealousy" are observed as shown in the box. The common measures observed are analysed as follows:

Case Study of Measure to avoid "jealousy"

One farmers' association have been managing vegetable garden. The committee of the association allocated their land to each member plot by plot under discussion among the members. One plot has a shape of very long rectangular to have one side facing to the river to keep equal access to water.

About the kinds of growing vegetables in each plot, they will be changed every year in order to have equal and fair benefit.

Because of making clear the individual benefit among members, the association functions without problems, since if one did not work hard, benefit becomes less without bothering other members.

- Clarify the individual benefits and keep equality clearly.
- Include all stakeholders in the selection of the project site with full discussion until consensus will be made.
- During the implementation process, clear explanation should be given to the members beforehand to provide clear vision about project implementation.
- Concerning about the jealousy issue within the organised group, it might be indispensable to have certain and clear rules decided among members to keep equality among members.

f. Meaning of Cattle

"Cattle are Life". These are the words of a man in the Study Area when he was asked the reason why people have to keep cattle over carrying capacity of the communal land. Cattle is close to the life of people in the area; used for lobola (betrothal gift) and utilised for special ceremonial and social obligations, producers of meat and milk for the household, dung for manuring crops and draught power for ploughing, transport and so forth. They are also a part of savings, which is drawn on for special cash needs and contingencies, as well as investment for accumulation of wealth and financial security.

Contrary to its recognised value, everybody is not necessarily able to afford to keep cattle. According to the HBS, about 40% of the interviewed households were non-cattle holders, although many of them wish to have cattle in the future when they earn enough to buy one.

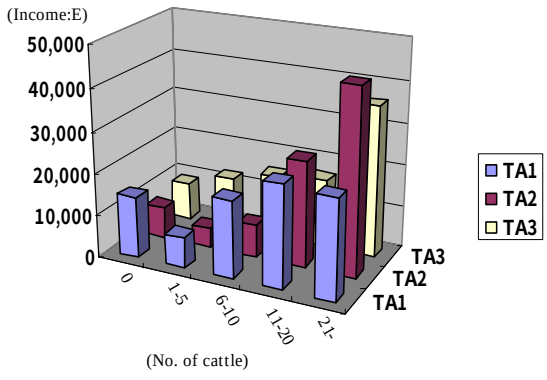


Figure 3-8: Income and Cattle Number

Comparing with the number of owned cattle and income, households with bigger number of cattle tend to earn more income, as seen in the Figure 3-8, although some dispersion is observed due to additional earnings by migrant works.

When it comes to the project of fencing their communal grazing land, normally each one of the homesteads supposed to contribute designated amount of money or labour even for those without cattle. According to their notion, all of the community members are benefiting from the cattle, even non-cattle holders; they enjoy milk or utilise them for draught power of ploughing. Another reason for non-owners to be involved in the project is that all of them intend to own cattle in the future.

Considering the fact that those who keep bigger number of cattle are richer and have more responsibility for eroded grazing land, it is necessary to find out the mechanism, which mitigates negative impact to the poorer homestead when the contribution to grazing scheme will be discussed. For example, standard payment is set in low amount and it increases in accordance with the number of cattle owned.

Since cattle are important asset and the most efficient way to keep their property, people hardly agree on reducing its number even though they have realised that their grazing area is not enough for the number of cattle they have at present. However, the way of thinking among younger generations has been changing. They can easily access to the bank in town rather than keeping their asset in the form of cattle, and they have to hire somebody to graze cattle since they are busy working outside and children are enrolled in the school.

It might be difficult to change the mind of elder generation, however if the benefit introducing alternative activities is realised, or disadvantage of having many cattle are recognised, the situation could be changed in a long run.

3.2 General Conditions of Target Area 1 (TA1)

3.2.1 Agriculture

It was found by an interview survey that 60% of the farmers in the area produce enough maize for home consumption and can afford to sell surplus. They cultivate one third of the land under SNL and graze cattle on two thirds thereof. A household holds 2.82 hectare of arable land, 6.8 heads of cattle and three heads of smaller livestock that are grazed on 4.3 hectare of grazing field. Arable land area per person 0.36 hectare where average maize yield of 2.8 ton / annum is harvested in ordinary years. Though maize is staple, farmers also grow other field crops as tabulated below.

Table 3-23: Household Cropping Composition and Farming Status in TA – 1

Crop	frequency	area	production	Livestock	Head/ hh*	Head bought	Head sold	Holding rate
Hybrid Maize	75.3%	1.24 ha	2.1 ton	Cattle adult	6.0	0.3 (8.6%)	0.5 (26.9%)	52.7%
Local Maize	31.2%	0.51 ha	0.7 ton	Calf / Heifer	0.8	-	-	37.6%
Sweet Potato	39.8%	0.66 ha	4.6 ton	Goat	3.4	0.2 (5.4%)	0.1 (4.3%)	29.0%
Groundnut	23.7%	0.30 ha	0.2 ton	Sheep	0.4	0.0 (0.0%)	0.0 (1.1%)	5.4%
Pumpkin	52.7%	0.02 ha	50 nos	Pig	0.6	0.1 (3.2%)	0.2 (5.4%)	21.5%
Jugo Bean	29.0%	0.03 ha	25 kg	Chicken	14.0	7.3 (14%)	0.7 (13%)	87.1%
String Bean	11.8%	0.02 ha	15 kg	Duck	0.5	0.0 (1.1%)	0.0 (2.2%)	12.9%

Source: Interviewed figures by JICA Study

Note: crop name indicates major species in wet season, area estimated for household (hh), Production is estimated for average year. (): rate of household that bought or sold. Team * fowls in case of chicken, hh: household

However, few horticultural activities are seen due to very limited availability of irrigation sources. Judging from this farming basis, food self-sufficiency is met but detrimental impact of heavy overgrazing are almost inevitable. Almost all arable plots have grassed contour strips that have guarded them from erosion. As regards cultivation, tractors held by Ludzeludze RDA can

be hired but cannot cover all the demand for hiring within this area. Cropping composition and livestock held and traded in TA – 1 are tabulated above.

As concern farm income, gross income is too low to sustain the family, as tabulated below, so farm households always seek for job opportunities out of their home villages to offset income deficit. Horticultural production has been very limited due mainly to low availability of irrigation water sources. However, a few percent of farm households have been engaged in vegetable growing using pipes to convey water from sponges / fountains as water source to harvest produce for sale in Manzini / Matsapa. Fruit trees like banana and avocado have only been planted in homestead yards.

Table 3-24: Example of Farm Economy in TA 1

Family Size of Farm Household 6 Annual living cost : 6×2,500 = 15,000		Area per Farm(ha)	Mean Yield t / ha	Production Ton/yr	Unit price E / ton	Crop Value E
Output	Staple : Maize	1.7	1.7	2.9	900	2,600
	Subsidiary : Sweet potato	0.7	6.5	4.6	1,100	5,000
	Livestock : Chicken			15	25	400
		Area(ha)	Quantity / ha	Amount	Unit price	Cost in E
Input	Fertilisers & chemicals	2.4	0.4	0.96	2,800	2,700
	Seed and material :	2.4	0.1	0.24	1,000	240
	Machinery hire & labour	2.4	3 hrs /ha	7.2	300	2,160
Net Return :E2,900	Gross income : E 8,000	Input cost : E 5,100	Annual deficit : 2,900-15,000 = E12,100			

Source: The result of the site survey by JICA Study Team

3.2.2 Agro-forestry / Community Forestry

a. Agro-forestry Practice

A major observation in TA1 indicates that level of Agro-forestry practice is very low indeed. A survey of 36 representative fields indicated that the number of trees planted or retained in each field was quite few, ranging from 0 to 38 with an average of 9 trees per field. Discussion with farmers indicated that there were problems in getting tree seedlings and the few who planted trees said that they obtained them from distant sources as there was no tree nursery in TA1. Other Agro-forestry practices such as Alley Cropping, Intermixed cropping and Riverine planting were conspicuously lacking. The only significant Agro-forestry practices found were boundary-planting and homestead planting which accounted for 8% and 41 % of the fields sampled. Though the technologies were practiced, there were only very few planted trees.

Live fences were also not encountered in the study area. Considerable number of fences, which were erected to separate grazing areas from fields have been run down and are usually no longer effective. Most people spend considerable number of hours herding their livestock due to lack of effective fences, a practice, which distracts other productive household activities. It was also noticed that farming practices have gradually encroached on the grass band strips and in some cases, such band strips have been cleared altogether. Alley cropping tree planting along such grass strips could greatly fortify the grass bands to retain soil conservation role.

b. Community Forests

Target Area 1 has five Eucalyptus community woodlots as indicated in Table below. Most of the woodlots are very small while a few of them are ready for harvesting (Ntunja and Nkiliji). On the whole the woodlots are well maintained and communities respect the role the forests are supposed to form. Yield of standing stock ranged from 28m3/ha to 274m3/ha. Assuming a 8 years rotation average yield was about 24 m3/ha/yr (this excludes Bhekinkoshi which was a very young plantation). The yield compares well with yield in other countries.

Table 3-25: Eucalyptus Community Woodlots in TA1

Target Area	Wd No	Average Dbh cm	Height metres	Area ha	Volume m3/ha	Total Vol m3	Yield M3/ha/yr	GPS Location Coordinates
TA1	Ntunja	13	15	2.5	274	685	34	S26,21,47.8/E031,23,33.2
TA1	Nkiliji	11	16	4	183	733	23	S26,21,47.8/E031,23,33.2
TA1	Nyakeni	14	20	2	180	360	22	S26,23,800/E031,24,210
TA1	Ngazini	14	22	1	138	138	17	S26,21,436/E031,24,818
TA1	Bhekinkoshi	6	10	2	28	55	4	S26,20,464/E031,27,916

Source: The result of the site survey by JICA Study Team

There are also several wattle woodlots in the area. Most of the wattle woodlots are found on high altitude ridges and there are cases where their expansion into rangelands has been resented. Inventory of some sample woodlots indicated very variable yields. Some of the woodlots are highly degraded while a few others had moderate stock. Area of wattle woodlots, which can easily be delineated on the maps, was 292 ha. Average of moderately stocked woodlots was 9m3/ha/yr. Hence sustainable supply from wattle trees approximates 2673m3/yr. As in other areas, wattle woodlots are privately owned. Owners of woodlots next to Inkhundla (S26,21,47.8 and E031,20, 26.9) have for example been reluctant to remove wattle trees for the area to be used for other purposes.

Indigenous vegetation has greatly been degraded. Unlike wattle woodlots, the remnant natural vegetation is used truly for communal purposes such as firewood collection. Most of large trees have long been harvested and only small trees have been spared. In fact the vegetation type cannot correctly be called woodland but rather scrub and on better areas as low bush. On the basis of vegetation area cover, the area can generally be classified as Moderate with forests over 25%, Low with forest cover of 5 to 24% and Poor with forest cover of less than 5%. Areas with moderate forests are few and include Lutfoja hills, Ngwazini/Bhekinkoshi slopes, Lububu hills and Mtilane/Sigombeni hillslope. Among the areas, which can be classified as poor are Mangcineni plain, Nkiliji Plain, Mdayane Plain, and Ngwazini upland. Other areas can be classified as low. Wood yield is extremely variable and low. In most cases, there were no measurable trees. Quava encroachment was noticed in many places such as Nyakeni plain, Lutfoja hills and Swaceni upland.

c. Firewood Consumption and Supply

As a result of these low forest resources (even though cover may look reasonable, detailed examination of stocking indicates very low yields of wood resources), the community is increasingly finding it difficult to obtain firewood and wood for construction purposes. Survey of firewood consumption in three chiefdoms as indicated in table showed that, on the average per capita consumption was 409 kg per annum. Using that average for the whole population in TA1, the total firewood requirement was 8193 tonnes (11,470m3) compared to sustainable supply of 4,168 m^3. Comparison of supply with consumption indicates a deficit of 7,302m^3 per annum in TA1which translates into a per capita deficit of 255kg/person/year (For details of firewood survey see annex B.) Intensive harvesting of firewood has been identified as one of the major causes of land degradation and unless corrective measures (more firewood supply and use conservation strategies) are put in place, harvesting of the remaining vegetation will lead to even more soil erosion.

Table 3-26: Consumption of Firewood in TA1

Chiedom Name	HseSize Average	Total Hseholds	Fwcons kg/hse/yr	Fwcons kg P.capita	Population	Chiefdom consumption Tons/yr	Fwexp E/hse/yr
Nkiliji	6.8	250	2,842	417	1,704	711	585
Eni	6.9	59	2,924	425	406	173	207
Ngcayini	6.8	81	2,627	385	552	213	270
Avergage	**6.8**		**2,798**	**409**			**354**

Source: The result of the site survey by JICA Study Team
Notes: Fwcons = Firewood consumption; Hse = household; Fwexp = Firewood expenses; E/hse/yr = Emalengani per household per year.

3.2.3 Grazing and Range Management

a. Approximate Numbers of Livestock per Chiefdom and Stocking Rates

a.1 Livestock Numbers

The numbers of livestock in TA1 were originally determined for each chiefdom in a survey. As it was found that there was a closer correlation between numbers of livestock collected by the Department of Veterinary and Livestock Services at dip tanks and results of some livestock censuses in the pilot areas, it has been necessary to adjust estimates of these livestock numbers to better reflect the actual situation; these are presented in Table 3-27 for TA1 with chiefdom data presented in Annex C.3

Table 3-27: Livestock Numbers in TA1

	Cattle	Goats	Sheep	Horse	Donkey
Total TA1	15,707	8,278	605	10	217
Mean	1,047	552	40	1	14
Range	84 to 7760	43 to 2251	0 to 495	0 to 6	0 to 46

Source: The result of the site survey by JICA Study Team

a.2 Estimate of Stocking Rates

In order to establish the stocking rates (by stocking rate is meant the numbers of livestock per unit area), it is necessary to adjust the value of area of grazing for each chiefdom to take into account the area of each chiefdom outside the target area and to divide this into the calculated value of the number of livestock units in each chiefdom area. These are shown in Table 3-28 for TA1 – stocking rate distribution by chiefdom is shown in Annex C.4. The importance of the stocking rate estimates is that it enables a determination as to whether an area of grazing is overstocked or not. Values of 0.625 LUE (livestock unit equivalent) per head of cattle, 0.125 LUE per head of goats and sheep and 0.625 LUE per head of horses and 0.525 LUE per head of donkeys were used in these calculations – these LUE values may be large for the average size of animals, both young and old, in Swaziland, which would tend to over exaggerate the level of stocking.

Table 3-28: Livestock Stocking Rates in TA1

	Adjusted total LSUs	Adjusted total area (ha)	SR LSU/ha total area	SR ha/LSU total area	SR LSU/ha range area
Total for TA1	11,047	17,380	0.64	1.57	*0.99
Mean per chiefdom	737	1,159	0.64	1.57	*0.99
Range per chiefdom	65 to 5221	308 to 4110	0.04 to 1.3	0.8 to 24.5	0.07 to 1.8*

Source: The result of the site survey by JICA Study Team

Note : overstocked when compared with Table 3-14

From Table 3-28, it is evident that there is considerable variation in stocking rate in different chiefdoms – the proportion of land used for grazing does not seem to have any correlation on the level of stocking rate. Assuming the stocking rate for these areas should be of the order of 1 LSU:3.3 ha (0.3 LSU/ha) for rangeland in "fair" condition (Sweet and Khumalo, 1994, Table 3-14) and lower for rangeland in poor or very poor condition i.e. 1 LSU:>>3.3 ha (<<0.3 LSU/ha), the rangeland stocking rates with an asterisk in Table 3-28 and Annex C.4 are overstocked – these include the Eni and Ngcayini Chiefdom areas.

a.3 Mean Livestock Holdings per Household

On the basis of information gathered previously in the study concerning numbers of households per chiefdom, it is possible to determine the mean holding of livestock per household in TA1 (Table 3-29) – values for each chiefdom are shown in Annex C.5. Across the different chiefdoms it is apparent that there is some considerable variation in mean holdings across the target area.

Table 3-29: Mean Household Livestock Holdings in each Chiefdom in TA1

	Cattle	Goats	Sheep	Equines
Mean per chiefdom	3.5	1.2	0.1	0.0
Range per chiefdom	0.2 to 15.0	0 to 3.4	0 to 0.7	0 to 0.2

Source: The result of the site survey by JICA Study Team

As not all households have livestock, it is important to note as well the mean livestock holdership patterns across households (Table 3-30). This Table shows that ownership of most livestock in the TA1 is mainly in the hands of a few, and that many households have few and often none. Only around one half have cattle and one third have small stock. This gives an idea of the immediacy of interest that might be shown in livestock and rangeland development activities in TA1. Eni people have far fewer livestock as compared to those in Ngcayini.

Table 3-30: Household Livestock Holdership Patterns in TA1

	Cattle	Goats	Sheep	Equines
Households with livestock (%)	52.7	29	5.4	0
Holding mean of all families	5.9	3.4	0.4	
Holding mean of holders only	11.2	11.7	8	

Source : Survey by JICA Study Team in 2001

b. Grazing Situation

b.1 Major Land Use for Livestock and Grazing

The area of land given to various livestock and grazing activities is shown in Table 3-31. The proportion of land allocated to grazing is highly variable between chiefdoms, as indeed is the allocation of land to different activities by farmers in different chiefdoms.

Table 3-31: Land Use for Livestock and Grazing in TA1

Land use category	Area (ha)	Proportional area (%)	Range of proportional areas within chiefdoms
Livestock and grazing	**12,489**	**64**	**39 to 82**
- extensive communal grazing	4,735		
- extensive communal grazing on plateaux and crests (B1a)	837		
- extensive communal grazing with extraction and community forestry	1,443		
- extensive communal grazing with extraction, community forestry, conservation and marginal use	5,215		
- ranching	259		
Arable	**6,627**	**34**	**15 to 34**
Forestry	**336**	**2**	**0 to 9**
Amenities	**48**	**0.2**	
Total TA1	**19,500**	**100**	

Source: The result of the site survey by JICA Study Team

Given that the proportion of livestock to most household income is of the order of 20 per cent or less, and to food consumption as well, it can be appreciated that there is a disproportionate amount of land given to livestock rearing as opposed to crop production.

b.2 Land Use in Each Chiefdom

Land uses within the chiefdom areas of TA1 are shown in Table 3-32. The sizes of chiefdoms are highly variable (Annex C.6).

Table 3-32: Areas of Land Use in each Chiefdom (ha) within TA1

	Livestock and grazing	Cropping	Forestry	Amenities	Total area
Total area TA1	12,489	6,627	336	48	19,500
Mean per chiefdom	695	369	19	2.7	1,085
Areas (%)	64	34	2	0.2	
Range % areas	39 to 82	15 to 52	0 to 9	0 to 1	

Source: The result of the site survey by JICA Study Team

There is relatively less land used for grazing in Eni as compared to Ngcayini (i.e. there is more intensive cropping).

b.3 Description of Community's Problems with Respect to Grazing/Range Management

In workshops designed to elicit the thoughts of farmers with respect to development, it was evident that there are many problems that beset the small scale farmers which they would like to address – these have been summarized elsewhere, but only 1 % of farmers in TA1 felt that

rangeland management was a problem and only 12 % felt that range management was a priority area for improvement. What was also evident was that some of their more pressing priorities are of a rural development nature rather than a degraded land (rangeland/grazing land) related issue. This is important as, if the degraded land related issues are of lesser immediate importance, farmers will pay less attention to them than to other issues and this could affect the level of input the farmers make to solving land (rangeland/grazing land) related issues.

Nonetheless, after discussions and description of alternative grazing land management options and options with respect to livestock commercialisation, it would seem that there is at least some interest that could be fostered into rangeland rehabilitation activities.

During an inkhundla workshop to discuss problems of soil erosion and solutions to overcome these, the farmers displayed a good grasp of what was happening. With respect to rangelands and grazing management they perceived that the main problems were:

- Cattle tracks leading to dip tanks which they felt were far away
- Overgrazing which occurred as there was no fencing, the grazing area was “too small”, there were too many cattle
- Range burning the causes of which were regarded as being more to do with carelessness that anything else.

In order to overcome these problems and to return the soil to a normal condition on the rangeland areas, they felt there was need for:

- Allowing enough grass to grow, and that this would only occur if the rangelands were “properly” managed by introducing a [controlled] rotational grazing system and people were trained on how to manage the grazing areas
- Having additional dip tanks
- “Destocking” cattle and this could be done by commercialising livestock management, and by introducing family planning to control the human population [thereby reducing the need for so many cattle].

From informal discussions, it appears that sisa arrangements are common, in terms of loans to other farmers and also to so-called government sisa ranches (of which there are four). The so-called government fattening ranches are not popular as the animals are not returned to the village once fattened and as it costs money to fatten the animals (which is deducted from the sale price!).

c. Carrying Capacity

c.1 Range Condition

Following the provisional assessment of actual erosion and land degradation and preparation of map to show overall status of erosion, a rapid assessment of range condition based on species composition, litter cover, basal cover, soil erosion and compaction and plant vigour and productivity was carried out. Range condition was rated as being either excellent, good, fair, poor or very poor. The assessment of range condition for each of the erosion/degradation units is summarised and presented in the summary describing the erosion/degradation units shown in Annex C.7.

c.2 Carrying Capacity

An initial estimate of the carrying capacity can be broadly made for each of the erosion/degradation units by using the carrying capacity calculated by Sweet and Khumalo (1994) for each of the Highveld and Middleveld areas (see Table 3-14) and adjusting for the present condition of the rangeland (see Annex Table C.7). For TA1, this is shown in the table of carrying capacities for erosion/degradation units (Table 3-33).

Table 3-33: Carrying Capacity of Erosion/Degradation Units in TA1

	Total area (ha)	% grazing	Range condition	Grazing area (ha)	Range type *	Grazing capacity (ha/LSU)	Carrying capacity (LSU)
Total/ Mean	20,812	60		12,467		3.9	3,219
Range	138 to 1463	15 to 95	Very poor: 2 Poor: 21 Fair: 9 Good: 2	23 to 1134	UM3:34	2.8 to5.3	5 to 313

Source: The result of the site survey by JICA Study Team

Note : Range type *UM3 Upper Middleveld hill grassland

From the column of "Range condition" in the above table, it is clear that the range is generally regarded in quite poor condition. From inspection this is due to overgrazing which has resulted in the depletion of the more palatable and productive species, a reduction in vigour, basal cover and this has led to sheet and other types of erosion. The field burning on almost annual basis has also led to the reduction of litter cover. Thus, the grazing capacity (1 LSU:3.9 ha) is reduced and the carrying capacity (estimated at 3,219 LSU) is reduced to far below its potential (approximately 6,233 LSU at 1 LSU:2 ha – see Table 3-14, e.g. I'Ons and Kidner) compared with if the range was in excellent condition. Nonetheless, current stocking rates are way above this (11,047 – see Table 3-14and Annex C.4) by about double (0.99 LSU:1 ha as opposed to 0.5 LSU:1 ha).

d. Pilot Area Livestock Profile

d.1 Ngcayini

On the basis of a census carried out of livestock holdings in the planning area (Table 3-34), it was found that there were some major discrepancies with data originally obtained in an earlier survey (total cattle 1,500 – Annex C.3).

Table 3-34: Ngcayini Chiefdom Livestock Holding Profile

	Cattle actual	Cattle %	Goats actual	Goats %	Sheep actual	Sheep %	Donkeys actual	Donkeys %	Horses actual	Horses %
Total number of animals	504		247		11		0		0	
Numbers of holders	44		29		2		0		0	
Total households	76		76		76		76		76	
Mean holding	6.63		3.25		0.14		0.00		0.00	
Maximum holding	32		38		7		0		0	
Minimum holding	0		0		0		0		0	
Holding size										
0	32	42	47	62	74	97	76	100	76	100
1 to 2 beasts	3	4	6	8	0	0	0	0	0	0
3 to 5 beasts	5	7	10	13	1	1.5	0	0	0	0
6 to 10 beasts	15	20	5	7	1	1.5	0	0	0	0
11 to 15 beasts	11	14	5	7	0	0	0	0	0	0
16 to 20 beasts	5	7	0	0	0	0	0	0	0	0
>20 beasts	5	7	3	4	0	0	0	0	0	0

Source: The result of the site survey by JICA Study Team

d.2 Eni

On the basis of a census carried out of livestock holdings in the planning area (Table 3-35), it was found that there were some major discrepancies with data originally obtained in an earlier survey (cattle total 500 – Annex Table C.3).

Table 3-35: Eni Chiefdom Livestock Holding Profile

	Cattle actual	Cattle %	Goats actual	Goats %	Sheep actual	Sheep %	Donkeys actual	Donkeys %	Horses actual	Horses %
Total number of animals	270		106		0		23		1	
Numbers of holders	26		15		0		3		1	
Total households	40		40		40		40		40	
Mean holding	6.75		2.65		0		0.58		0.03	
Maximum holding	25		20		0		10		1	
Minimum holding	0		0		0		0		0	
Holding size										
0	14	35	25	63	40	100	37	93	39	98
1 to 2 beasts	0	0	0	0	0	0	0	0	1	3
3 to 5 beasts	7	18	10	25	0	0	0	0	0	0
6 to 10 beasts	9	23	1	3	0	0	3	8	0	0
11 to 15 beasts	4	10	3	8	0	0	0	0	0	0
16 to 20 beasts	3	8	1	3	0	0	0	0	0	0
>20 beasts	3	8	0	0	0	0	0	0	0	0

Source: The result of the site survey by JICA Study Team

3.2.4 Land Degradation

As far as erosion is concerned in this TA, western/northern side of the main road running between Manzini and Luve has severer status than eastern/southern side. Arable land, especially that distributed in the eastern side of Kukhanyeni has been well-conserved and grazing land in between arable patches and at the foot of Lutfotja Hills has been less degraded than that of Sigombeni side. Whereas, western and northern area where main stream Mbuludzi River and its tributaries Mhlambanyoni, Labandzi, Phowe Rivers flow has severely been eroded through overgrazing. The marked difference in erosion status observed between these two areas stems partly from land use and partly from physiography. Grazing predominates in land use in the western side where Ferralsols, Cambisols and other soils with less surface stone/rocks overlie on Gleysols and Fluvisols. Deforestation and subsequent overgrazing for decades with recurrent field burning has resulted in severe terracette and slip erosion triggering huge ravine gullies started from tiny rills along barren cattle tracks. Current erosion status has been observed as in the following table.

Table 3-36: Current Erosion Status in TA1

Unit : ha and area % of total TA1

Degree/Type	extreme	severe	moderate	slight	Total
Sheet erosion	-	1,130	3,900	120	5,150 (26%)
Terracette erosion	-	200	2,130	-	2,330 (12%)
Rill erosion	-	50	-	-	50 (0%)
Gully erosion	360	100	-	-	460(2.4%)
Slip / Slump erosion		30	0	-	30 (0%)
All types total	360 (2%)	1,510 (8%)	6,030 (31%)	120 (0%)	8,020 (41%)

Source: results of field survey by the Study Team employing AELDA evaluation criteria by FAO

As regards gully erosion, it has occurred by far along Mhlanbanyoni River basin where a geologic fault lies, but also along Mbuludzi river, with huge ravine ones counting 99, or one gully per $2km^2$.

Besides, encroaching of thorny or useless but fire-resistant shrub species like *Caesalpinia decapetala*, *Lantana camara*, *Psidium guava*, *Acacia mearnsii* and *Hymenolepsis parviflora* have been invading into stream basin, roadsides, grazing fields, and are found often inside gullies.

3.2.5 Natural Resources and Environment

a. Meteorology

Annual rainfalls in TAs are characterized by its fluctuation. Therefore, drought sometimes occurs in TAs, leading to damage by cattle. According to the data recorded at Matspha Station located near TA1, average annual rainfall ranges around 900mm, between 523.6mm minimum and 1,292.6 mm maximum. Rainfall is recorded mainly during the period from October to March in TAs.

Table 3-37: Annual Rainfall in TA1

	Rainfall
Average	902.7mm
Maximum	1,292.6mm
Minimum	523.6mm

Period : 1968-2001

Source: Data of Meteorology Bureau

Daily rainfall rarely exceeds 50mm, on only 9 days it rained more than 50mm per day within the past five years in TA1. That is to say, it doesn't rain so intensively in TA1.

Besides, annual mean maximum and mean minimum temperature are 25.7℃ and 14.5℃ respectively and it can be said that it is a relatively mild climate.

b. Topography

TA1 falls in Upper Middleveld hill grassland (UM3) in terms of Vegetation Units in Swaziland. The feature of the Vegetation Unit is as follows.

Table 3-38 Summary of Vegetation Unit in TA1

Vegetation unit	Topography	Slope	Soils	Classification
UM3	Rolling to hilly	15-30 %	Sandy loams with patches of acid clay	Upper Middleveld hill grassland

Source: Swaziland Natural Resources Survey, 1995

c. Condition on Grazing Land and Its Management

In rangeland, grasses such as *Sporobolus africanus. Aristida spp. Melinis repens, Cynodon dactylon* and *Erforestrystis spp*., which show sign of overgrazing, are often observed. They are common species in three TAs.

Current erosion status in TA1 is the most severe in three TAs, showing largest rate of eroded area and degree of gullies development according to the survey by the Team.

As mentioned above, people perceive land degradation in their surroundings and make every effort to prevent land degradation by construction of fences and so on. In this case they have obligation to pay for fence construction in Nkiliji Chiefdom by chief's order, and even those who do not own cattle have to pay for it. But fence is not necessarily effective for prevention from degradation. For example, in Sankolwehi Chiefdom placement of fence keeps pasture from overgrazing within, but it promotes overgrazing outside of the fence.

On the other hand, people don't have any rules for grazing in some communities. But, there is grazing land near Nkiliji Chiefdom, where people from several Chiefdoms share and discuss on the establishment of new rules for the protection of the grazing land. That is to say, the rules for management of land are common for the people who share that certain grazing land but not in chiefdom.

d. Condition on Forest and its Management

Trees presently remain only along the rivers and valleys, but even they show decreasing tendency. According to people, *Acacia Davyi* that is an indigenous tree in the area, has almost disappeared by use as firewood mainly. The following species are characteristic on the trees observed in TA1.

Syzygium cordatum, Combretum spp., Sclerocarya birrea, Euclea Crispa, Melia azedasach, Vaugueria infausta, Bequaertiodendron magalismontanum Canthium inerme, Cussonia sphaerocephala, Erythrina lysistemon

Self-sufficiency of firewood in the area is only 36%, and people experience shortage of fuel wood. Decreases of forest area are regarded as serious problem. Those who do not have individual forest or communal forest are obliged to purchase or steal tree branches from other owners. As a result, for even the owner of individual forest, it becomes difficult to get woods because of thief.

Chiefs have set some rules that prohibit cutting of trees or allow cutting only of twigs and penalties for offenders; for example, people can confiscate offender's possessions in Eni Chiefdom. On the other hand, there is no regulation for cutting trees in some communities. Thus, awareness of chief concerning natural resources deterioration influences all people in the chiefdom and encourage them to do efforts for environment protection.

e. Trend in Fauna

Generally, wild life show tendency of decrease in number in Swaziland, but people in some part of Nkilizi Chiefdom and Ngayini Chiefdom say that the number of hares, rabbits and bucks has increased. It may probably be due to the order from their Chiefs not to hunt wildlife. Therefore, presence of chief who understand the Game Acts plays important role for wild life protection.

On the other hand, fish in Mhlambanyoni River have decreased in number due to over-fishing and soil sedimentation at pools beside the rivers caused by the heavy rain according to interview results. In other word it shows erosions affect the aqua life in the river, becoming a big problem within the country.

3.2.6 Land Use

Present land use in TA1 is summarized below.

Table 3-39: Present Land Use in TA1

Unit: ha, 2000 basis

Target Area	Chiefdom	Grazing Area	Arable Land	Forestry	Amenities	Total
TA1(Kukhanyeni)	Eni	224	163	9	0	396
	Mdayane	359	205	24	0	588
	Butfongweni	484	316	29	0	829
	Maliyaduma	755	418	24	0	1,197
	Ngwazini	587	307	0	4	898
	Mbeka	658	229	0	0	887
	Swaceni	143	184	14	16	357
	Mkhulamini	788	431	123	8	1,350
	Sankolweni	563	169	24	0	756
	Ngcayini	713	668	0	0	1,381
	Ntunja	809	130	30	0	969
	Nkiliji	1,107	875	30	0	2,012
	Nyakeni	3,346	1,400	18	5	4,769
	Bhekinkoshi	1,164	765	4	5	1,938
	Nsenga	789	367	7	10	1,173
	(15 Chiefdoms)					
	Sub-total	12,489	6,627	336	48	19,500
	Percentage (%)	(64.0)	(34.0)	(1.7)	(0.3)	(100.0)

Source: The result of the map interpretation by JICA Study Team

3.2.7 Social Services and Rural Infrastructure

a. General Social Conditions

Administratively Target Area 1 (TA1) belongs to Kukhanyeni Inkhundla. The Inkhundla consists of 15 chiefdoms. The number of the total homesteads is estimated at 2,468 with a total population of 18,492 in 1997. At an estimated population growth rate of 2.7%, the population will be increased to 22,885 in 2005 and 34,128 in 2020. Out of 15 chiefdoms, Nyakeni has the largest population size. Arable crop farming and livestock is the main activity of the people in TA1. The basic social indicators of TA1 obtained from the Household Baseline Survey, conducted by the JICA Study Team in February 2001, are summarized below.

Table 3-40: Social Indicators in Target Area 1

Items		Percentage or Average Figure
Religion	Christianity	97.8%
	Others	2.2%
Family size (average)		8.8
Female-headed family		31.2%
Household annual income		E 16,758
Participation to groups	Village committee	11.8%
	Farmers' group	34.4%
	Women's group	51.6%
	Religious group	5.4%
	Youth club	2.2%
	Others	5.4%

Source: JICA Household Baseline Survey, February 2001

b. Education Facilities and Enrolment

There are 10 primary schools in Target Area 1, of which one is private, two are government, and the remaining seven are aided schools. Number of pupils range from 209 (Salkazi Primary)

to 641 (Mpembekati Primary). Number of teachers range from 8 (Salukazi Primary, etc.) to 24 (Kukhanyeni Primary).

Table 3-41: Primary Schools in Target Area 1

Chiefdom	School Type	School Name	No. of Pupils	No. of Teachers
Maliyaduma	Government	MALIYADUMA CENTRAL PRIMARY	585	17
Ngwazini	Aided	NGWAZINI CATHOLIC PRIMARY	243	8
Swaceni	Government	KUKHANYENI PRIMARY	566	24
Mkhulamini	Aided	MPEMBEKATI PRIMARY	641	16
Sankolweni	Aided	SANKOLWENI COMM. PRIMARY	301	8
Nkiliji	Private	NKILIJI PRIMARY	400	16
Nyakeni	Aided	SALUKAZI PRIMARY	209	8
Nyakeni	Aided	SEVEN HOLY FOUNDERS	572	15
Bhekinkoshi	Aided	BHEKINKOSI NAZARENE PRIMARY	514	17
Nsenga	Aided	NEW MBULUZI PRIMARY	484	14

Source: Census Office

There are only two secondary schools and one high school. Number of secondary and high schools and enrolment are presented in the following table.

Table 3-42: Secondary/High Schools in Target Area 1

Chiefdom	School Type	School Name	Female	Male	Total
Swaceni	Government	KUKHANYENI HIGH SCHOOL	21	12	33
Nkiliji	Aided	NKILIJI SECONDARY SCHOOL	66	71	137
Nyakeni	Government	MALUNGE SECONDARY SCHOOL	n.a.	n.a.	n.a.

Source: Census Office

Needs assessment made by the Household Baseline Survey 2001 indicated that need for improvement of education facilities was the lowest among the infrastructure needs such as drinking water supply, road improvement, medical facilities, electricity and transportation. Only 4.3% of the respondents ranked the education facilities improvement as the top or second priority.

c. Health Facilities

There are only two clinics in Target Area 1, one is in Mkhulamini (Nyakeni chiefdom) and another in Bhekinkosi (Bhekinkosi chiefdom).

Needs assessment made by the Household Baseline Survey 2001 indicated that need for improvement of health facilities was not very high if compared to other infrastructure needs such as drinking water supply and road improvement. About 17% of the respondents ranked the health facilities improvement as the top or second priority.

d. Existing Rural Water Supply Systems

d.1 Water Sources

Rural water supply systems have been planned and implemented utilizing available water resources. The main water resources for local water supply systems are; 1) springs, 2) streams, 3) boreholes, and 4) boreholes with pumps. JICA Household Baseline Survey indicated that 34.4 % of the respondents were using community tap as the main source of domestic water. In addition to community tap, the people also use other water sources such as spring, river, shallow well, borehole, etc. as indicated in the following table.

Table 3-43: Water Source in Target Area 1

	Community tap	Spring	River	Shallow well	Borehole	Pond	Others
Wet Season	34.4%	24.7%	15.1%	12.9%	9.7%	1.1%	2.2%
Dry Season	34.4%	24.7%	16.1%	12.9%	9.7%	1.1%	0.0%

Source: Household Baseline Survey, JICA, February 2001

Average distance to water sources is 3.6 km in wet season and 3.7 km in dry season. People spend about 24 minutes for water collection both in wet and dry seasons.

d.2 Budget and Funding for Rural Water Supply Systems

Department of Rural Water Supply (DRWS) under Ministry of Natural Resources and Energy and Ministry of Health (MOH) are the responsible agencies for the planning and construction of rural water supply. In addition to the national budget, financial assistance has also been provided by foreign donors and some NGOs such as Japan, UK (United Kingdom), USAID (United States Aid for International Development), UNDP (United Nations Development Programs), and Red Cross in Swaziland. The construction cost for these previously implemented rural water supply systems ranges from E2,000 to E300,000 depending on the size of water supply systems. The size of rural water systems is generally small. Construction of rural water supply systems is carried out on the basis of request from community people to the development committee.

d.3 Existing Funded Water Supply Systems in TA1

Table 3-44 shows the existing water supply systems in Target Area 1.

Table 3-44: Existing Water Supply Systems

Location	Water Source	No. of public Stand posts	Pipeline Length	Year Completed	Total Cost (E)	Population	Source of Funds
Sigombeni	Spring	0	0	n.a.	2,480	648	MCC
Sigombeni	Spring	0	0	1985	2,201	55	MCC
Bhekinkosi	Groundwater	32	19.4km	n.a.	n.a.	2,500	Japan
Ngwazini	Groundwater	60	34.9km	n.a.	n.a	4,000	Japan

Source: DRWS n.a. = Data are not available

e. Existing Road Conditions in TA1

Main road No. 3 (MR3) connecting Mbabane and Manzini is running a few kilometers south of the boarder of the Target Area 1 (TA1). After MR3 passes Manzini town, MR5 branches off to the northern direction. District road No. 29 (D29) branches off MR3 at the point of a few kilometers before the road enters the Manzini town and passing through the central part of TA1 up to Luve. Although the district road is not paved, road are well maintained. In addition to the district road, there are some feeder roads connecting the communities within TA1. It is estimated from the existing map that total length of feeder roads is about 140 km. These feeder roads are not well maintained and are generally in bad conditions.

In order to address the issue of feeder roads, Roads Department (RD) initiated a feeder road rehabilitation and maintenance programme and decided to establish a Feeder Roads Unit (FRU) in the Department. The first year budget for the programme includes; i) training of FRU staffs, NGOs, community committee, and contractor; ii) fact finding tours; iii) rehabilitation works; and iv) upgrading works.

Due to the fact that Roads Department intends to carry out feeder roads rehabilitation and maintenance programme from 2001 fiscal year, no projects on rural roads was planned in the Master Plan.

3.2.8 Rural Society and Gender Issue

a. Relatively High Income

According to the HBS, TA1 had much higher rate for the migrant workers among three target areas; 76.7% of male-head is working and living outside of their Inkhundla while the rate was 42.9% and 50.0% in TA2 and TA3, respectively. The area is located near Mbabane town and has more employment opportunities. It is even possible to commute to their working places in town for those who are living in the southern part of the TA. Due to the high employment opportunity, their income is relatively high as E16,758, according to the result of HBS.

b. Bigger Number of Cattle per Household

The HBS showed that the average number of cattle owned per household in the TA1 is bigger than the one of other areas. In TA1 average number of cattle per household was 11.2 cattle, 9.5 in TA2 and 8.5 in TA3. Comparing with the number of owned cattle and income, it could be said that the households with bigger number of cattle tend to earn more income in general. However the income for non-cattle holders is not necessarily low in TA1. The reasons are presumed that people can access to the bank easily to keep their property instead of saving it as cattle, or some people might realised the disadvantages of keeping cattle and decided not to keep them even though they can afford to buy them

c. People's concerns

According to the project planning workshop conducted in February 2001, people in the area were more concerned about the development of infrastructure, especially domestic water supply, road/bridge and electricity, while the poverty was main issue in other areas. Due to advanced job opportunities and relatively advanced natural condition for cultivation and grazing, people in the TA1 are more endowed with the condition to stabilise their livelihood, compared with the other areas.

d. Gender Issue

Women in the TA1 are more empowered and have relatively equal access and control toward resources.

For example at household level, the rate of women's involvement in decision-making is high in general at household level. In general, cattle are considered as the men's property in the Swaziland society, but 43.9% of households make decision to sell cattle by discussion between wife and husband, while the figures were only 9.1% in TA2 and 25.0% in TA3, according to the HBS.

In addition to that, women representatives and many active women, who expressed their ideas in front of the participants including many men, were observed during the series of workshops.

One of the reasons could be education level of the people. The rates of household head that completed higher than secondary school was high compared with the other two areas (11.4% in total, 12% for male and 10% for female in HBS). In addition to that, people in the area have been having more close relation to city and are getting to be modernised, instead of keeping their traditional way of thinking. They might have more information and opportunities to be gender sensitive.

3.2.9 Projects by Foreign Donors toward Land Degradation

There has been no particular project or activity as to land conservation or environment care so far reported or observed within the TA1.

3.3 General Conditions of Target Area 2 (TA2)

3.3.1 Agriculture

Farmers have been engaged in sedentary farming with limited land holding of 2.47 ha per household. Farming in this area is characterized by susceptibility to drought, and this may be guessed from the fact that a few farmers still raise sorghum and no wet season cultivation is seen. Ferralsols and Vertisols with murram concretion derived from pegmatitic granite, difficult to till and manage, are distributed over wide area. Soil fertility and water retention capacity of these soils seem low judging from yield performance and observed acreage of abandoned fallow around Mantambe. Grazing area has become too small to feed current herds. Recently piggery has been becoming popular in this area, for off-farm income chances are rare within rural area. About 81% of farmers have been engaged in off-farm earning activities. Horticultural activities have seldom been observed due to ephemeral water supply from major streams. Fruit trees are rarely seen except indigenous Marula trees, the fruit of which has been used to ferment local wine. Cropping composition and livestock holding / trade in TA – 2 is tabulated below:

Table 3-45: Household Cropping Composition and Farming Status in TA – 2

Crop	frequency	area	production	Livestock	Head/ hh*	Head bought	Head sold	Holding rate
Hybrid Maize	76.7 %	1.35 ha	1.9 ton	Cattle adult	4.8	0.1 (6.7%)	0.4 (6.7%)	50.0 %
Local Maize	6.7 %	0.12 ha	0.1 ton	Calf / Heifer	1.0	-	-	18.3 %
Sweet Potato	26.7 %	0.47 ha	3.6 ton	Goat	2.6	0.2 (5.4%)	0.1 (6.7%)	36.7 %
Groundnut	16.7 %	0.29 ha	0.2 ton	Sheep	0.4	0.0 (0.0%)	0.0 (1.1%)	6.7 %
Pumpkin	73.3 %	0.03 ha	60 nos	Pig	1.0	0.3 (10%)	0.2 (6.7%)	33.3 %
Jugo Bean	30.0 %	0.02 ha	17 kg	Chicken	13.5	0.2 (10%)	0.3 (10%)	90.0 %
String Bean	13.3 %	0.01 ha	9 kg	Duck	0.8	0.0 (0.0%)	0.1 (3.3%)	16.7 %

Source: Interviewed figures by the Study Team Note: crop name indicates major species in wet season, area estimated for household (hh), Production is estimated for average year. (): rate of household that bought or sold, * fowls in case of chicken, hh: household

Table 3-46: Example of Farm Economy in TA 2

Family Size of Farm Household 6 Annual living cost : 6×2,200 = 13,200		Acreage per Farm (ha)	Mean Yield (ton/ha)	Production (ton/ha)	Unit price E / ton	Crop Value E
Output	Staple : Maize	1.5	1.4	2.1	900	1,900
	Subsidiary : Sweet potato	0.5	7.2	3.6	1,100	4,000
	Livestock : Chicken			13 fowls	25	300
		Acreage	Quantity / ha	Amount	Unit price	Cost in E
Input	Fertilisers & chemicals	2.0	0.4	0.80	2,800	2,200
	Seed and material :	2.0	0.1	0.20	1,000	200
	Machinery hire & labour	2.0	3 hrs /ha	6.0	300	1,800
Net Return : E 2,000	Gross income : E 6,200		Input cost : E 4,200		Annual deficit : 2,000-13,200 = E11,200	

Source: The result of the site survey by JICA Study Team, Note: maize yield measured by weight per cob

3.3.2 Agro-Forestry / Community Forestry

a. Agro-forestry Practices

There are also very few Agro-forestry practices in Target Area 2. Field survey of 36 representative farmers indicated that level of tree planting in the fields was low, ranging from 1 to 31 trees and with an average of 6 trees per field. Other Agro-forestry practices such as Alley Cropping, Improved Fallow, River Planting etc were lacking. The only significant Agro-forestry

practice was homestead planting with an occurrence of 75 % of fields, but with very few trees indeed. Some fields had been abandoned on account of infertility and discussions held with farmers on possible way of rejuvenating such fields indicated that they were not aware of potentials of Agro-forestry in enriching such soils, which have been degraded as a result of constant cropping without application of mineral or organic fertilizers.

b. Community Woodlots

Community eucalyptus woodlots have been planted as indicated in Table below. Examination of the woodlots indicates that stocking was low ranging from 8 to 125 m3 per hectare. Fencing of plantations was not well maintained and there were cases of stray cattle, which destroyed some of the trees. Establishment was not also good as considerable number of trees died soon after planting. With better community support, in form of advice and training, the trees could have grown better. Most of the trees have reached sufficient height for harvesting. The woodlots in Zikhoteni Chiefdoms were the oldest and are relatively well stocked. Not too far from the area, are two successful eucalyptus plantations in Paradys. One of them ((GPS position South 27,11,75.8 and East 031,26,50.6) is 6 ha while the bigger plantation (GPS position South 27,11,40.0 and E031, 26 56.5) is approximately 20 ha. The local community in Zikhoteni claims that they bought the farm in which the two plantations are located. It is however understood that there was no such sale and that the land belongs to Government now, and by implication, the two eucalyptus woodlots are Government.

Table 3-47: Eucalyptus community Woodlots in TA2

Target Area	Wd No	Average Dbh cm	Height metres	Area Ha	Volume m3/ha	Total Vol. m3	GPS Location Coordinates
TA2	Zikhoteni	12	15	4	79	316	S27, 11, 562/E031, 24 , 43.3
TA2	Ecandwini	17	15	2	125	250	S27, 11, 274/E031, 24,51.8
TA2	Galilee	5	12	0.5	8	4	S27, 12, 15.5/E031, 24,17.2

Source: The result of the site survey by JICA Study Team

There are limited wattle woodlots in TA2 mainly on hill ridges of Matsiphula. Estimated total area is only about 65 ha. Field measurements of representative samples indicated a low average yield of 4m3/ha/yr, which implies sustainable supply of 263 m3/yr. The few wattle trees are not well managed even though they are privately owned.

Most of the area can be classified as Poor in regard to indigenous vegetation. The only places with moderate indigenous vegetations are Mlokotwa hill, Mahanga escarpment Msila low hills and Mantamba river valley in the northern parts of the Target Area. The Southern parts of the Target Area is mostly devoid of significant amount of natural vegetation. In fact, most of the natural vegetation can be classified as sparse scrub.

c. Firewood Consumption and Supply

This is one of the areas where purchasing of firewood is quite common due to shortage of wood resources. Survey of firewood consumption in the TA indicated that on average, each household spends E 1,225 annually to buy firewood. Most of the firewood is sourced from private farms on the Western side of Zikhoteni Chiefdom. Per capita Average consumption was found to be 576 kg per annum. When the total population in TA2 is taken into account, total firewood consumption is 9191 tonnes (12,867m3) against a sustainable supply of 2234m3/year. Comparison of supply and consumption indicates a deficit of 10633m3/year, which is equivalent to a per capita deficit of 467kg per year. Compared to the other Target Areas, TA2 has the highest firewood deficit.

Table 3-48: Firewood Consumption in TA2

Chiefdom Name	HseSize Average	Total Hseholds	Fwcons kg/hse/yr	Fwcons Kg /capita	Population	Chiefdom cons Tons/yr	Fwexp E/hse/yr
Manyandzeni	8.1	300	4,061	500	2,435	1,218	1,440
Zikhoteni	6.8	721	3,200	469	4,918	2,307	767
Mahagane	6.8	357	5,183	760	2,435	1,850	1,467
Average	**7.3**		**4,148**	**576**			**1,225**

Source: The result of the site survey by JICA Study Team

3.3.3 Grazing and Range Management

a. Approximate Numbers of Livestock per Chiefdom and Stocking Rates

a.1 Livestock Numbers

After comparing data on livestock numbers gathered in a target area survey to information obtained in a census of livestock holdings in pilot areas and information gathered by the Department of Veterinary and Livestock Services, it has been necessary to adjust estimates of livestock numbers for the chiefdoms for TA2 as shown in Table 3-49 and Annex C.3 for chiefdoms.

Table 3-49: Livestock Numbers In TA2

	Cattle	Goats	Sheep	Horse	Donkey
Total TA2	11,902	5,232	811	3	195
Mean	2,380	1,046	162	1	39
Range	87 to 9497	98 to 3056	10 to 612	0 to 3	6 to 106

Source: The result of the site survey by JICA Study Team

a.2 Estimate of Stocking Rates

In order to establish the stocking rates (livestock per unit area), it is necessary to adjust the value of area of grazing for each chiefdom to take into account the area of each chiefdom outside the target area and to divide this into the calculated value of the number of livestock units in each chiefdom area. These are shown in Table 3-50 for TA2 using adjusted livestock numbers – individual values for chiefdoms are shown in Annex C.4.

Table 3-50: Livestock Stocking Rate in TA2

	Adjusted total LSUs	Adjusted total area (ha)	SR LSU/ha total area	SR ha/LSU total area	SR LSU/ha range area
Total for TA2	8,299	22,909	0.36	2.76	0.56
Mean per chiefdom	1,660	4,582	0.36	2.76	0.56
Range per chiefdom	86 to 7320	1951 to 6776	0.04 to 0.9*	1.1 to 26.6*	0.06 to 1.6*

Source: The result of the site survey by JICA Study Team

Note : overstocked when compared to Table 3-14.

As with TA1, there is considerable variation in stocking rate. Assuming that the stocking rates for these areas should be of the order of 1 LSU:4.3 ha for rangeland in "fair" condition (Sweet and Khumalo, 1994,Table 3-14), and lower for rangeland in poor and very poor condition i.e. 1 LSU:>>4.3 ha (<<0.23 LSU/ha), the rangelands marked with an asterisk in Table 3-50 and Annex Table C.4 are overstocked, including the Zikhoteni area.

a.3 Mean Livestock Holdings Per Household

On basis of information gathered previously by the study concerning numbers of households per chiefdom, it is possible to determine the mean holding of livestock per household (Table 3-51) for each chiefdom. Across the different chiefdoms it is apparent that there is some considerable variation in mean holdings across the target area.

Table 3-51: Mean household Livestock Holdings in each Chiefdom in TA2

	Cattle	Goats	Sheep	Equines
Mean per chiefdom	1.9	0.5	0.2	0.0
Range per chiefdom	0.2 to 3.3	0.1 to 8.3	0 to 5.0	0 to 0.1

Source: The result of the site survey by JICA Study Team

As shown in the table below, it is important to note that not all households have livestock (Table 3-52). Only around one half have cattle and one third or so have small stock. Besides, cattle holdings per household are relatively high in Zikhoteni compared to other Chiefdoms as tabulated on Annex C.5.

Table 3-52: Household Livestock Holdership Patterns in TA2

	Cattle	Goats	Sheep	Equines
Households with livestock (%)	50	36.7	6.7	0
Holding mean of all families	4.8	2.8	0.4	
Holding mean of only holders	9.5	7.5	6.5	

Source: The result of the site survey by JICA Study Team

b. Grazing Situation

b.1 Major Land Use For Livestock And Grazing

The area of land given to various livestock and grazing activities for TA2 is shown in Table 3-53.

Table 3-53: Land Use for Livestock and Grazing in TA2

Land use category	Area (ha)	Proportional area (%)	Range of proportional areas within chiefdoms
Livestock and grazing	**7,341**	**64**	**35 to 80**
- extensive communal grazing	2,501		
- extensive communal grazing on plateaux and crests	708		
- extensive communal grazing with extraction and community forestry	1,827		
- extensive communal grazing with extraction, community forestry, conservation and marginal use	2,305		
- ranching	0		
Arable	**4,226**	**34**	**20 to 63**
Forestry	**125**	**1**	**0 to 2**
Amenities	**8**	**0.1**	
Total	**11,700**		

Source: The result of the site survey by JICA Study Team

b.2 Land Use In Each Chiefdom

Land use within TA2 is as shown in Table 3-54 and for each chiefdom as shown in Annex C.6. The grazing area accounts for 7,341 ha or 62.7 % of the total area. Out of 5 chiefdoms, Mabona has the largest grazing area (3,217 ha), and Zikhoteni the second largest grazing area (2,673 ha). (Refer to Table 3-59)

Table 3-54: Land Use within each Chiefdom in TA2

	Livestock and grazing	Cropping	Forestry	Amenities	Total area
Total area TA2	7,341	4,226	125	8	11,700
Area (%)	64	34	1	0.1	
Mean per chiefdom	1,245	665	24	1.5	1,937
Range % areas	35 to 80	20 to 63	0 to 2		

Source: The result of the site survey by JICA Study Team

b.3 Description Of Community's Problems With Respect To Grazing/Range Management

In workshops designed to elicit the thoughts of farmers with respect to development, it was evident that there are many problems that beset the small scale farmers which they would like to address – these have been summarized elsewhere, but only 1 % of farmers in TA2 felt that rangeland management was a problem and only 10 % felt that range management was a priority area for improvement.

During an inkhundla workshop meeting to discuss the core problem of soil erosion, farmers observed that with respect to rangelands:

- cattle eat all the grasses as there were too many cattle and this was because people did not commercialise their cattle keeping and there were no alternatives for the way to keep their livestock
- the grazing area is too small
- cattle make tracks as the dip tank is far away
- grass is burnt in the dry season, as people are careless or have negative feelings about development.

To overcome these so that there is no erosion, they suggested

- building a new [another] dip tank
- introducing zero grazing through training and the growing of fodder grasses
- having water points for cattle
- destocking cattle to the carrying capacity by starting alternative livestock and other [equally lucrative] enterprises, receiving training on commercialisation of livestock keeping, getting to know the carrying capacity, introducing other farm implements [than livestock drawn ones]
- managing the grazing areas "properly", by forming an "association", setting up bye-laws, fencing paddocks and taking care of local rangelands within communities.

c. Carrying Capacity

c.1 Range Condition

Following the provisional assessment of actual erosion and land degradation and preparation of map to show overall status of erosion, a rapid assessment of range condition based on species composition, litter cover, basal cover, soil erosion and compaction and plant vigour and productivity was carried out. As for rating, range condition was rated to be excellent, good, fair, poor or very poor. The assessment of range condition for each of the erosion/degradation

units is summarised and presented in the summary describing the erosion/degradation units shown in Annex C.7.

c.2 Carrying Capacity

An initial estimate of the carrying capacity can be broadly made for each of the erosion/degradation units by using the carrying capacity calculated by Sweet and Khumalo (1994) for each of the highveld and middleveld areas (see Table 3-14) and adjusting for the present condition of the rangeland (see Annex C.7). This is shown in the table of carrying capacities for erosion/degradation units (Table 3-55) for the target area and for each chiefdom in Annex C.7.

Table 3-55: Carrying Capacity of Erosion/Degradation Units in TA2

	Total area (ha)	% grazing	Range condition	Grazing area (ha)	Range type	Grazing capacity (ha/LSU)	Carrying capacity (LSU)
Total/Mean TA2	12,748	54	Poor	6,943	UM3	4.2	1,672
Range per chiefdom	50 to 1561	0 to 100	Very poor:10 Poor:13 Fair:7 Good:1	5 to 937	UM2: 4 UM3:24 LM3: 6	2.8 to 5.8	2 to 284

Source: The result of the site survey by JICA Study Team, classified by classification criteria of livestock division
Note : Range type : UM2 Upper middleveld plateau wooded grassland
UM3 Upper middleveld hill grassland
LM3 Lower middleveld hilly broadleaf savanna

From column of "Range condition" in the above table, it is clear that the range is generally regarded in quite poor condition. From inspection this is due to overgrazing which has resulted in the depletion of the more palatable and productive species, a reduction in vigour, basal cover and this has led to sheet and other types of erosion. The use of fire on rangeland on almost annual basis has also led to the reduction of litter cover. Thus, the grazing capacity (1 LSU:4.2 ha) is reduced and the carrying capacity (estimated at 1,672 LSU) is reduced to far below its potential (approximately 3,472 LSU at 1 LSU:2 ha – see Table 3-14, e.g. I'Ons and Kidner) compared with if the range was in excellent condition. Nonetheless, current stocking rates are way above this (8,299 LSU (Annex C.4) – note this value may contain animals from outside the target area).

3.3.4 Land Degradation

Soil erosion in this TA shows milder status than TA1. The affected area concentrates mainly in northwestern part of the area. It also develops in southeastern dissected plateaus. However, only mild degradation is observed in the central part including Paradys farm, owing to long period under private holding, gentle slope or low-lying basin and humid environment. Low annual rainfall seems to play buffer role to erosion development.

Arable land, distributed all over the area has partly been eroded with rills invading up from grazing land located below arable plots. Generally, serious erosion develops over rangeland along Ngwade River basin where population density has reached high level among the chiefdoms in TA2. Likewise, upper stream basins of Ncotshane River and Manzimhlophe River has been subject to overgrazing, where gullies take place, in parallel ascending from these streams.

Grazing land dominates in land use and is scattered throughout the TA, the eastern and central-southern parts have less eroded than other parts, partly because these parts have escarpments and steep slopes that may hinder intensive cattle grazing.

Gullies develop over elluvial foothills of granitic saprolite where Ferralsols, Acrisols and Regosols with less surface stone/rocks overlie on Gleysols and Fluvisols. Incessant overgrazing

with recurrent field burning has eventually brought serious sheet and terracette erosion that has led to the appearance of huge ravine gullies developed from rills along barren cattle paths to dip tanks. Current erosion status was observed as in the following table.

Table 3-56: Current erosion status in TA2

Unit : ha and area % of total TA2

Degree/Type	extreme	severe	moderate	Slight	Total
Sheet erosion	-	690	2,130	280	3,100 (27%)
Terracette erosion	-	0	400	-	400 (3%)
Rill erosion	-	90	-	-	90 (1%)
Gully erosion	270	40	-	-	310 (3%)
Slip / Slump erosion		10	0	-	10 (0%)
All types total	270 (2%)	830 (8%)	2,530(21%)	280 (3%)	3,910 (34%)

Source: results of field survey by the Study Team employing AELDA evaluation criteria by FAO

As regards gully erosion, it has occurred by far along Ngwade River basin (fault delivered) but also along Ncotshane river, with huge ravine ones counting 131, or 1.1 gullies per km^2.

Besides, encroaching of thorny or useless shrub species like Caesalpinia decapetala, Aloe flevia, Psidium guava and Acacia nilotica has spread along stream basins, roadsides and invading into grazing area, found often in and around ravine gullies.

3.3.5 Natural Resources and Environment

a. Meteorology

The data recorded at Dwaleni Station located near TA2 indicates that average annual rainfall ranges around 800mm, between 288.3mm minimum and 1,172.2 mm maximum, showing the lowest average among TAs. Judged from rainfall and plenty aloe (*Aloe marlothii*) in the area that has tolerance to aridity, it can be said TA2 is more arid than other TAs.

Table 3-57: Annual Rainfall in TA2

	Rainfall
Average	783.0mm
Maximum	1,172.2mm
Minimum	288.3mm

Period:1915-2000

Source: Data of Meteorology Bureau

Daily rainfall rarely exceeds 50mm as in TA1, only on 6 days it rained more than 50mm per day within past five years in TA2. Lower rainfall and less intensive rain seems to contribute to moderate soil erosions.

Besides, annual mean maximum and mean minimum temperature are 23.5℃and 12.0℃ respectively. It is a little lower than that in TA1.

b. Topography

TA2 falls in Upper Middleveld hill grassland (UM3) and Lower Middleveld hilly broadleaf savanna (LM3) in terms of Vegetation Units in Swaziland and area of UM3 is predominant in TA2. The feature of the Vegetation Unit is as follows.

Table 3-58 Summary of Vegetation Unit in TA2

Vegetation unit	Topography	Slope	Soils	Classification
LM3	Hilly, part undulating	10-30 %	Shallow sandy loams with rock outcrops	Lower Middleveld hilly broadleaf savanna
UM3	Rolling to hilly	15-30 %	Sandy loams with patches of acid clay	Upper Middleveld hill grassland

Source: Range resources grazing potentials in Swaziland, FAO, UNDP, 1994

c. Grazing Land Rehabilitation and its Management

People are aware of serious degradation in grazing land and they say the number of palatable or useful grasses for thatching roof such as *Hyporrhenia hirta* has been decreasing.

Some attempts to rehabilitate against such land degradation have been implemented in past. People have experience of the planting of trees inside gully for prevention from erosions, for example. Furthermore, some persons in Zikhotheni are planning to restrict number of cattle for control of overgrazing and to sell some of them for money income. In another part of the same Chiefdom the elder and people have already set rule that limits the number of cattle browsing in less than ten and requires fence management fee and they - began the attempt. Nevertheless, most of them do not follow their rules even though they agreed to such rule at the meeting. That is to say it is very difficult to execute restriction of the number of cattle and fence management.

Besides, even if they construct fence for grassland conservation, there often occurs theft of the fence by some people for example, in Zikhotheni and Manyandzeni Chiefdoms. However, lately it becomes difficult to steal the fence under keen vigilance in Manyandzeni by instruction of the chief. This is a good example to understand importance of community solidarity and chief's leadership for protection of common resources.

d. Natural Condition on Forest and its Management

Forest area is very scarce in TA2 and number of natural trees has decreased due to cutting and range fire. People point out especially *Sclerocarya birrea* (used in alcohol making) and *Acacia Davyi* (used as firewood) show decreasing tendency in number. On the other hand, following species are characteristic on the trees observed in TA2.

Aloe marlothii, Acacia tortilis, Sclerocarya birrea, Syzygium cordatum Combretum apiculatum, Melia azedasach, Vaugueria infausta, Canthium inerme, Euphorbia ingens, Dispyros lycioides

People suffer from shortage of firewood terribly as compared to other TAs because of smaller forest area. Self-sufficiency of fuel wood in the area is only 17%, showing the lowest figure in three TAs. Some people have neither individual forest nor communal forest; accordingly they mainly rely on the purchase of fuel wood, which requires about two hours to get it. Besides, as people have used dried Aloe (*Aloe marlothii*) as fuel due to shortage of fuel wood in Zikhoteni Chiefdom, even the number of Aloe has decreased in number according to interview results.

There are rules for forest conservation in some communities, which restrict cutting of seedlings, fruit trees, medicinal trees and so forth. They are traditional rules and penalties set by Chiefs or elder persons, which provides that offenders are under obligation to shoulder the work for fences construction if they are caught cutting down young trees in Manyandzeni Chiefdom, for example.

e. Trend in Fauna

According to interview results, fish in Mantanbe River has decreased in number due to over-fishing and sedimentation at rivers caused by the heavy rain as in TA1.

Besides, Common Duikers (*Sylvicapita grimmia*) that have ranged in the area have almost faded away by hunting for domestic meal. Such decline may also be the result of its easiness to hunt due to the reduction of grass cover where the animals hide.

3.3.6 Land Use

Present land use in TA2 is summarized below.

Table 3-59: Present Land Use in TA2

Unit: ha, 2000 basis

Target Area	Chiefdom	Grazing Area	Arable Land	Forestry	Amenities	Total
TA2(Shiselweni)	Manyandzeni	634	339	1	4	978
	Mchinsweni	82	146	0	0	228
	Mabona	3,217	1,423	112	1	4,753
	Dumenkhungwini	735	179	2	3	919
	Zikhoteni (5 Chiefdoms)	2,673	2,139	10	0	4,822
	Sub-total	7,341	4,226	125	8	11,700
	Percentage (%)	(62.7)	(36.1)	(1.1)	(0.1)	(100.0)

Source: The result of the site survey by JICA Study Team

3.3.7 Social Services and Rural Infrastructure

a. General Social Conditions

Administratively Target Area 2 (TA2) belongs to Shiselweni Inkhundla. The Inkhundla consists of 5 chiefdoms. The number of the total homesteads is estimated at 1,966 with a total population of 14,731 in 1997. At an estimated population growth rate of 2.7%, the population will be increased to 18,230 in 2005 and 27,186 in 2020. Out of 5 chiefdoms, Mabona has the largest population size. Arable crop farming and livestock is the main activity of the people in TA2.

Table 3-60: Social Indicators in Target Area 2

Items		Percentage or Average Figure
Religion	Christianity	100.0 %
	Others	0.0%
Family size (average)		9.6
Female-headed family		30.0%
Household annual income		E 10,642
Participation to groups	Village committee	13.3%
	Farmers' group	36.7%
	Women's group	53.3%
	Religious group	3.3%
	Youth club	3.3%
	Others	3.3%

Source: JICA Household Baseline Survey, February 2001

b. Education Facilities and Enrolment

There are 11 primary schools in Target Area 2, of which one is private and the remaining ten are aided schools. Number of pupils range from 122 (Themba Primary) to 610 (Welcome Primary). Number of teachers range from 8 to 18.

Table 3-61: Primary Schools in Target Area 2

Chiefdom	School Type	School Name	No. of Pupils	No. of Teachers
Manyandzeni	Aided	MANTAMBE PRIMARY SCHOOL	336	12
Manyandzeni	Private	MANYANDZENI PRIMARY SCHOOL	224	8
Zikhoteni	Aided	ST ANSELM PRIMARY	280	8
Zikhoteni	Aided	GALILE COMMUNITY SCHOOL	291	8
Mabona	Aided	BEERSHEBA PRIMARY	237	8
Mabona	Aided	THEMBA PRIMARY SCHOOL	122	8
Mabona	Aided	MIZPER PRIMARY SCHOOL	301	8
Mabona	Aided	ASLO PRIMARY SCHOOL	423	12
Dumenkhungwini	Aided	WELCOME PRIMARY SCHOOL	610	11
Dumenkhungwini	Aided	ST. JULIANS PRIMARY SCHOOL	286	8
Dumenkhungwini	Aided	OUR LADY OF SORROWS PRIMARY	342	18

Source: Census Office

There are only one secondary school and three high schools in TA2. The names of these schools and the enrolment are presented in Table 3-62 below.

Table 3-62: Secondary/High Schools in Target Area 2

Chiefdom	School Type	School Name	Female	Male	Total
Manyandzeni	Aided	MANTAMBE SECONDARY SCHOOL	84	86	170
Mabona	Government	MASIPHULA HIGH SCHOOL	151	147	298
Dumenkhungwini	Aided	OUR LADY OF SORROWS HIGH SCHOOL	229	139	368
Zikhoteni	Aided	FRANSON CHRISTIAN HIGH SCHOOL	188	159	347

Source: Census Office

c. Health Facilities

There are only two clinics in TA2. One is in Emaromeni (Dumenkhungwini chiefdom) and another in Mhlosheni (Zikhotheni chiefdom). Needs assessment made by the Household Baseline Survey 2001 indicated that need for improvement of health facilities was considerably high among infrastructure needs. About 30% of the respondents in TA2 ranked health facilities improvement as the top or second priority.

d. Rural Water Supply

d.1 Water Sources

Rural water supply systems have been planned and implemented utilizing available water resources. The main water resources for local water supply systems are; 1) springs, 2) streams, 3) boreholes, and 4) boreholes with pumps. JICA Household Baseline Survey indicated that 50 % of the respondents were using river as the main source of domestic water. In addition to river, the people also use other water sources such as spring, shallow well, borehole, etc. as indicated in the following table.

Table 3-63: Water Source in Target Area 2

	Community tap	Spring	River	Shallow well	Borehole	Pond	Others
Wet Season	0%	20.0%	50.0%	13.3%	6.7%	6.7%	3.3%
Dry Season	0%	13.3%	60.0%	13.3%	6.7%	3.3%	3.3%

Source: Household Baseline Survey, JICA, February 2001

Average distance to water sources is 0.5 km in wet season and 0.6 km in dry season. People spend about 24.5 minutes in wet season and 28.7 minutes in dry season for water collection.

d.2 Budget and Funding for Rural Water Supply Systems

Department of Rural Water Supply (DRWS) under Ministry of Natural Resources and Energy and Ministry of Health (MOH) are the responsible agencies for the planning and construction of rural water supply. In addition to the national budget, financial assistance has also been provided by foreign donors and some NGOs such as Japan, UK (United Kingdom), USAID (United States Aid for International Development), UNDP (United Nations Development Programs), and Red Cross in Swaziland. The construction cost for these previously implemented rural water supply systems ranges from E2,000 to E300,000 depending on the size of water supply systems. The size of rural water systems is generally small. Construction of rural water supply systems is carried out on the basis of request from community people to the development committee.

e. Existing Road Conditions in TA2

Main road No. 9 (MR9) is connecting Matsapa and Nhlangano, from where MR11 is heading for Lavumisa. MR11 is dividing TA2 into the northern part and southern part. Out of 5 chiefdoms, Zikhoteni and Mchinsweni are located in the northern part of MR11 and other chiefdoms are located in the southern part of the same. Paradys farm is located between these chiefdoms.

MR12 branches off MR 11 at Galile to northern direction. At the point of about 3 km south of the junction of MR12 and MR11, district road No. 68 (D68) branches off to the north direction, passing through Zikhoteni chiefdom. In the southern part of TA2, D49 branches off MR11 nearby Masiphula High School. Road conditions in TA2, particularly feeder roads, are not well developed and need rehabilitation and upgrade works.

In order to address the issue of feeder roads, Roads Department (RD) initiated a feeder road rehabilitation and maintenance programme and decided to establish a Feeder Roads Unit (FRU) in the Department. The first year budget for the programme includes; i) training of FRU staffs, NGOs, community committee, and contractor; ii) fact finding tours; iii) rehabilitation works; and upgrading works.

3.3.8 Rural Society and Gender Issue

a. Limited Income Generating Activities

According to the HBS, TA2 had the highest ratio of household having a head living at home (non-migrant worker). Another figure shows that the average income is low compared with other two. Since the area has fewer opportunities of income generating activities, people have to find a job outside of their area, however they do not have much chance to find a migrant work. Many of them used to work in the South Africa and such sign could be found in the nice concrete houses, which were built during the golden age. However most of them came back to their hometown due to economic recession in South Africa, which led to closedown of mines, factories and other companies. According to the workshop, poverty was the most severe problem and needs for the employment opportunity was high in the area.

b. Communal Activities

In the area, participation rate of group activity is low. According to the HBS, the ratio of interviewees who belong to any group was low compared with other two areas. The reasons are mostly 1) lack of interest, 2) no organisation existed in the area, and 3) people cannot afford to pay joining or operation fees.

It might be said that the traditional culture remains in this area; men are authority figures, people prefer to keep some distance from neighbouring homesteads, chiefdoms are more independent and there is no coordination among them.

c. Disputes within the Community

During the interview survey, some disputes over boundary and the chief's successors were recognised. The former was common between chiefdoms. Especially the people of three chiefdoms under Shiselweni 1 Inkhundla were claiming that Paradys area belongs to them. There is even a community in Swaziland which stretches over the territory of South Africa and people are coming and going freely. The latter case was found in the chiefdom where dispute over the next successor arose after the former chief passed away. One chiefdom has two "incoming" chiefs and the situation has not been solved more than a decade later. People in this area are adapting their social life to such vague boundaries and uncertain leadership.

d. Gender Issue

Since men stay at home, livestock, especially cattle are taken cared of by men, and they have more control on selling animals. Decision on the timing for selling cattle is made by husband without discussion with his wife at 81.8% of the households while the figures were 51.2% and 70.8% in TA1 and TA3, and goat and sheep are controlled only by men.

On the other hand, there was observed several women who have been more active than male members in the pilot projects in Zikhoteni chiefdom. In those cases, male members also respect their positive participation.

3.3.9 Projects by Foreign Donors toward Land Degradation

USAID extended an activity of trying to improve range management in Zikhoteni during 1990s, with fencing to divide grazing field into five rotational units. However, the fencing was partly removed or dilapidated without proper maintaining activity by the stakeholders. Besides, Yonge Nawe, an NGO supported by various foreign aids dedicated to environmental conservation, guided villagers in Zikhoteni to plant indigenous saplings around active gully heads attempting to stabilize them in 1999 ~ 2000, though the trial didn't seem to have been successful.

3.4 General Conditions of Target Area 3 (TA3)

3.4.1 Agriculture

Farmers in this area can enjoy more annual rainfall than other areas in favourable topographic position. In addition, the area has thinner population density and this aspect gives advantage for their farming, for a farm household holds 2.84 hectare according to the interview survey, but aerial photo data and household survey result gave us 4.4 ha as holding area by household. Vast grazing area is also available to cattle herds here. Similarly, the area has largest grazing field in 3 TAs but livestock herds of proportional size have also been kept. Character of monoculture in farming has been the most typical among three target areas. Despite the fact that relatively readily available water sources, horticulture has not yet promoted on account of poor access to farm markets and some chances to work in economic activities rendered from pulp processing and forestry product sale. There has been two on-going irrigation schemes, i.e., an 18ha scheme run by Intamakuphila Irrigation Association and the other 5ha one by Phaphamani Farmer's Association. They grow dry season vegetables for marketing in Malkerns and Manzini, though confronting harsh competition with imported vegetables from S.A. This area has been endowed with comparatively fertile soils under relatively humid climate. Cropping composition and livestock holding / transaction in TA–3 is tabulated below and an example of farm household economy is illustrated in the next table.

Table 3-64: Household Cropping Composition and Farming Status in TA – 3

Crop	frequency	area	production	Livestock	Head/ hh	Head bought	Head sold	Holding rate
Hybrid Maize	81.7 %	1.34 ha	2.0 ton	Cattle adult	11.3	0.2 (8.3%)	0.2 (12%)	75.0 %
Local Maize	35.0 %	0.58 ha	0.7 ton	Calf / Heifer	1.1	-	-	51.7 %
Sweet Potato	30.0 %	0.49.ha	4.4 ton	Goat	6.1	0.1 (6.7%)	0.3 (10%)	53.3 %
Groundnut	15.0 %	0.25 ha	0.2 ton	Sheep	0.1	0.1 (1.7%)	0.0 (0.0%)	3.3 %
Pumpkin	58.3 %	0.04 ha	70 nos	Pig	0.5	0.3 (3.3%)	0.3 (3.3%)	16.7 %
Jugo Bean	16.7 %	0.01 ha	10 kg	Chicken	16.7	0.2 (10%)	0.3 (6.7%)	93.3 %
String Bean	30.0 %	0.02 ha	18 kg	Duck	1.3	0.0 (1.7%)	0.0 (0.0%)	25.0 %

Source: Interviewed figures by the Study Team Note: crop name indicates major species in wet season, area estimated for household (hh), Production is estimated for average year. ( ): rate of household that bought or sold. * fowls in case of chicken, hh: household

Table 3-65: Example of Farm Economy in TA 3

Family Size of Farm Household 7 Annual living cost : 7×2,000 = 14,000		Area per Farm	Mean Yield / ha	Production ton	Unit price E / ton	Crop Value E
Output	Staple : Maize	2.7	1.6	4.3	900	3,900
	Subsidiary : Sweet potato	0.5	8.8	4.4	1,100	4,400
	Livestock : Chicken			16	25	400
		Area	Quantity / ha	Amount	Unit price	Cost in E
Input	Fertilisers & chemicals	2.4	0.4	0.96	2,800	2,700
	Seed and material :	2.4	0.1	0.24	1,000	200
	Machinery hire & labour	2.4	3 hrs /ha	7.2	300	2,200
Net Return : 3,600	Gross income : E 8,700		Input cost : E 5,100		Annual deficit : 3,600-14,000 = E10,400	

Source: The result of the site survey by JICA Study Team Note: maize yield measured by weight with cob

3.4.2 Agro-Forestry / Community Forestry

a. Agro-forestry Practices

Although Target Area 3 has relatively more forest resources, adoption of Agro-forestry practices is also low in the fields. Survey of 36 fields indicated that tree resources in fields ranged from 0 to 23 stands, with an average of only 5 stands per field. Main Agro-forestry practices were Boundary Planting and Homestead Planting, with an occurrence of 11% and 60 % respectively. Other than extensive wattle woodlots, there is not much tree planting in the fields.

b. Community Woodlot

Target Area 3 has only one fairly successful community eucalyptus plantation located near the Inkhundla and the RDA offices. The trees are already mature enough for most practical purposes. Average annual yield of the plantation was estimated as 20 m3/ha/yr.

Table 3-66: Eucalyptus community Woodlots in TA3

Target Area	Wd No	Average Dbh cm	Height metres	Area ha	Volume m3/ha	Total Vol m3	GPS Location Coordinates
TA3	Ngwempisi	11	18	2	160	319	South 26, 44, 34.4/ East 031,00,22.3

Source: The result of the site survey by JICA Study Team

Wattle plantations are quite extensive in most parts of TA3. Of the three Target Areas, TA3 has the highest forest formation with an estimated 910 ha of wattle plantation and another 1491 ha of wattle mixed with natural vegetation. Already some farmers are organizing themselves to harvest and sell wattle poles. Most of the wattle plantations are in Mbulungeni Hills and on

the ridges in Khabonina chiefdom. Field measurement of wattle trees in TA3 showed a big variation of yield that ranged from 2 to 7.5 m3/ha/yr with an average of 4.8 m3/ha/yr. There are also a number of individuals, with wattle plantations, which were managed well.

Natural vegetation ranges also quite extensive although actual stocking seemed low. Classification of natural vegetation as moderate; >25%, Low 5~24%; and Poor less than 5%; indicates that the area is more endowed with forests (35% from photo-interpretation), particularly in Macudvulwini Chiefdom, as compared with other TAs. Ngwempisi lower valley is, however devoid of canopy cover (by nature steppe field) while northern escarpments have moderate forests.

c. Firewood Consumption and Supply

Survey of firewood consumption indicates that per capita consumption is 631 kg per annum. Compared to the other Target Areas, this is the highest consumption, indicating that people are less constrained by lack of firewood. Close examination of consumption data indicates that nearly wasteful consumption is experienced in Macudvulwini chiefdom, with a per capita consumption of 1005 kg per annum, while in Mgazini chiefdom per capita consumption of 256 kg implies acute scarcity of firewood. Taken as a whole, the firewood consumption in TA3 is estimated at 18,928 tonnes (26,500m3) against sustainable supply of 10,325 m3 and this result in a deficit of 16,174 m3 or per capita deficit of 377 kg per annum.

Table 3-67: Firewood Consumption in the Sampled Chiefdoms

Chiefdom Name	Hse Size Average	Total Hseholds	Fwcons kg/hse/yr	Fwcons kg P.capita	Population	Chiefdom cons. Tons/yr	Fwexp E/hse/yr
Mgazini	6.8	595	1,749	256	4,058	1,041	1,365
Macdvulwini	6.8	595	6,856	1,005	4,058	4,079	0
Average	**6.8**	**595**	**4,303**	**631**	**4,058**	**2,560**	**683**

Source: The result of the site survey by JICA Study Team

3.4.3 Grazing and Range Management

a. Approximate Numbers of Livestock per Chiefdom and Stocking Rates

a.1 Livestock Numbers

After comparing data on livestock numbers gathered in a target area survey (Annex C.3) to information obtained in a census of livestock holdings in pilot areas and information gathered by the Department of Veterinary and Livestock Services, it has been necessary to adjust estimates of livestock numbers per chiefdom for TA3 as shown in Table 3-68 and Annex C.3. [Note: data adjusted to allow for census data (Macudvulwini), field observations (Bhadzeni I) and royal cattle (Mgazini)].

Table 3-68: Livestock Numbers in Chiefdom Areas of TA3

	Cattle	Goats	Sheep	Horse	Donkey
Total TA3	21,040	12,448	758	64	273
Mean	2,104	1,245	76	6	27
Range	78 to 7,837	62 to 8,411	0 to 405	0 to 27	3 to 124

Source: The result of the site survey by JICA Study Team

a.2 Estimate Of Stocking Rates

In order to establish the stocking rates (livestock per unit area), it is necessary to adjust the value of area of grazing for each chiefdom to take into account the area of each chiefdom

outside the target area and to divide this into the calculated value of the number of livestock units in each chiefdom area. These are shown in Table 3-69 for TA3 using adjusted livestock numbers – individual values for chiefdoms are shown in Annex C.4. [Note: data adjusted to allow for census data (Macdvulwini), field observations (Bhadzeni I) and royal cattle (Mgazini].

Table 3-69: Stocking Rate in Chiefdom Areas of TA3

	Adjusted total LSUs	Adjusted total area (ha)	SR LSU/ha total area	SR ha/LSU total area	SR LSU/ha range area
Total for TA3	14,984	30,584	0.49	2.04	0.78
Mean per chiefdom	1,498	3,058	0.49	2.04	0.78
Range per chiefdom	111 to 7,316	826 to 6,353	0.03 to 1.9	0.53 to 36.3	0.05 to 3.2*

Source: The result of the site survey by JICA Study Team

Note : overstocked compared to Table 3-14

The rangelands marked with an asterisk in Table 3-69 are overstocked. Macudvulwini would appear to be under-stocked on the basis of livestock reported to be kept there (Annex C.3) although range condition suggests otherwise. However, if dip tank data are considered, then the area is stocked at about the recommended rate for rangeland in fair condition, but as most of the area is regarded as poor or very poor condition, it is concluded as overstocked from the viewpoint of current condition of the rangeland.

a.3 Mean Livestock Holdings Per Household

On basis of information gathered previously by the study concerning numbers of households per chiefdom, it is possible to determine the mean holding of livestock per household for TA3 (Table 3-70) for each chiefdom. Across the different chiefdoms it is apparent that there is some considerable variation in mean holdings across the target area. Details of holdings at chiefdom level are shown in Annex C.5.

Table 3-70: Mean Livestock Holdings per Chiefdom in TA3

	Cattle	Goats	Sheep	Equines
Mean	3.3	3.1	0.1	0.0
Range	0.2 to 10.0	0.4 to 19.6	0 to 0.5	0 to 0.1

Source: The result of the site survey by JICA Study Team

The livestock holdership patterns across households (Table 3-71) indicates that the percentage of households keeping cattle and goats in TA3 is higher (75% and 53%, respectively) than other TAs. This will give an idea that the livestock and rangeland development activities in TA3 can be conducted more efficiently as most households (75 %) are presently keeping cattle. It should be noted, however, that in Macdvulwini chiefdom, i.e. pilot project area, farmers have relatively smaller livestock numbers compared to most of the rest of the chiefdom, although such data are not shown in Table 3-71.

Table 3-71: Household Livestock Holdership Patterns in TA3

	Cattle	Goats	Sheep	Equines
Households with livestock (%)	75	53.3	6.7	3.3
Holding mean of all families	6.4	6.1	1	0.1
Holding mean of only holders	8.5	11.5	14.5	2

Source: The result of the site Survey by JICA Study Team in2001

b. Grazing Situation

b.1 Major Land Use For Livestock And Grazing

The area of land given to various livestock and grazing activities is shown in Table 3-72.

Table 3-72: Land Use for Livestock and Grazing in TA3

Land use category	Area (ha)	Proportional area (%)	Range of proportional areas within chiefdoms
Livestock and grazing	19,246	**63**	**49 to 73**
- extensive communal grazing)	9,859		
- extensive communal grazing on plateaux and crests (B1a)	1,477		
- extensive communal grazing with extraction and community forestry	1,883		
- extensive communal grazing with extraction, community forestry, conservation and marginal use	6,027		
- ranching	0		
Arable	8,752	**29**	**15 to 42**
Forestry	2,504	**8**	**0 to 27**
Amenities	98	**0.3**	
Total	30,600		

Source: The result of the site survey by JICA Study Team, classified by classification criteria of livestock division

b.2 Land Use In Each Chiefdom

Land use in TA3 is shown in Table 3-73 and for each chiefdom in Annex C.6. The relatively high proportion of land devoted to grazing and livestock may be indicative of the mountainous terrain of the area.

Table 3-73: Land Use (ha) in Each Chiefdom in TA3

	Livestock and grazing	Cropping	Forestry	Amenities	Total area
Total area TA3	19,246	8,752	2,504	98	30,600
Areas (%)	63	29	8	0.3	
Mean	1,833	850	236	9.6	2,926
Range % areas	49 to 73	15 to 42	0 to 27	0 to 25	825 to 6,276

b.3 Description of Community Problems with Respect to Grazing/Range Management

In workshops designed to elicit the thoughts of farmers with respect to development, it was evident that there are many problems that beset the small scale farmers which they would like to address – these have been summarized elsewhere, but only 3 % of farmers in TA3 felt that rangeland management was a problem and only 8 % felt that range management was a priority area for improvement.

At an inkhundla workshop, with respect to rangelands and soil erosion, people noted the following problems:

- grazing areas had bare areas, brought about by the grazing area being too small, cattle eating [continuously] on the same place and the keeping of too many livestock as there are no alternatives to "traditional" livestock uses
- lack of vegetation as trees have been over exploited and there is no grass due to cattle tracking and moving long distances to grazing areas and due to burning at the wrong time.

Thoughts put forward to overcome these so that there is no erosion included:

- allowing grass to grow by preventing animals eating in one place by introduction of rotational grazing in fenced schemes, by only burning at the right time, by controlling stock numbers through development of alternative enterprises, use of alternatives to using cattle (e.g. tractors instead of oxen, keep milk goats instead of milking cows), commercialising livestock production
- planting grass.

c. Carrying Capacity

c.1 Range Condition

Following the provisional assessment of actual erosion and land degradation and preparation of map to show overall status of erosion, a rapid assessment of range condition based on species composition, litter cover, basal cover, soil erosion and compaction and plant vigour and productivity was carried out. Range condition was rated as being either excellent, good, fair, poor or very poor. The assessment of range condition for each of the erosion/degradation units is summarised and presented in the summary describing the erosion/degradation units shown in Annex C.7

c.2 Carrying Capacity

An initial estimate of the carrying capacity can be broadly made for each of the erosion/degradation units by using the carrying capacity calculated by Sweet and Khumalo (1994) for each of the Highveld and Middleveld areas (see Table 3-14) and adjusting for the present condition of the rangeland (see Annex C.7). This is shown in the table of carrying capacities for erosion/degradation units (Table 3-74) for TA3 as a whole and in Annex C.7 for each unit.

Table 3-74: Carrying Capacity of Erosion/Degradation Units in TA3

	Total area (ha)	% grazing	Range condition	Grazing area (ha)	Range type	Grazing capacity ha/LSU	Carrying capacity (LSU)
Total/Mean	31,382	53	Poor	16,726	H4/H3	3.4	4,865
Range per unit	186 to 2,150	10 to 95	Very poor: 9 Poor: 23 Fair: 6 Good: 0	65 to 1,290	H3:12 H4:20 H5:7	2.0 to 4.6	4 to 416

Source: The result of the site survey by JICA Study Team
Note : Range type: H3 Highveld steep hill grassland
H4 Highveld valley grassland
H5 Highveld plateau grassland

From the column of "Range condition" in the above table, it is clear that the range is generally regarded in quite poor condition. From inspection this is due to overgrazing which has resulted in the depletion of the more palatable and productive species, a reduction in vigour, basal cover and this has led to sheet and other types of erosion. The use of fire on what appears to be an almost annual basis has also led to the reduction of litter cover. Thus, the grazing capacity (1 LSU:3.4 ha) is reduced and the carrying capacity (estimated at 4865 LSU)

is reduced to far below its potential (approximately 11,151 LSU at 1 LSU:1.5 ha – see Table 3-14, e.g. I'Ons and Kidner) compared with if the range was in excellent condition. Nonetheless, current stocking rates are above this (13,422 LSU – Annex C.4).

d. Pilot Area Livestock Profile

The livestock holding profile following a census of livestock in the Macdvulwini Pilot Area is shown in Table 3-75.

Table 3-75: Macdvulwini Chiefdom Livestock Holding Profile

	Cattle actual	Cattle %	Goats actual	Goats %	Sheep actual	Sheep %	Donkeys actual	Donkeys %	Horses Actual	Horses %
Total number of animals	1,873		1,461		88		66		23	
Numbers of holders	162	91	105	59	12	7	23	13	9	5
Total households	178		178		178		178		178	
Mean holding	10.5		8.2		0.5		0.4		0.1	
Maximum holding	50		60		23		5		5	
Minimum holding	0		0		0		0		0	
Holding size										
0 beasts	16	9	73	41	166	93	155	87	169	95
1 to 2 beasts	10	6	4	2	0	0	11	6	6	3
3 to 5 beasts	23	13	20	11	6	3	12	7	3	2
6 to 10 beasts	55	31	30	17	5	3	0	0	0	0
11 to 15 beasts	44	25	16	9	0	0	0	0	0	0
16 to 20 beasts	13	7	14	8	0	0	0	0	0	0
>20 beasts	17	10	21	12	1	1	0	0	0	0

Source: The result of the site survey by JICA Study Team

The above table shows that most households have cattle of above 10 heads and this situation favors for introducing range management activities because majority can participate therein with interest and concern.. Holding of smaller size livestock is less common than other TAs.

3.4.4 Land Degradation

Land degradation in this TA indicates mildest status among the three TAs. Here, soil erosion develops along Ngwempisi River that flows in the center of the TA from the west to the east. The heavily affected area concentrates in central part of the TA where alluvial fans develop along the stream basin. However, only slight degradation is viewed in the northern part adjacent to Usutu forest plantation, also in the southern part along Tsawela River, on account of ample canopy cover or well planned resettlement. Highveld is subject to higher annual rainfall, leading often to fast growing erosion, but surrounding large forests can mitigate against runoff discharge during storms.

Arable land, mainly distributed in stream basins has not been eroded with rills because of thick grass strips. Generally, serious erosion develops over rangeland along Ngwempisi River basin where population has concentrated. Heavy sheet erosion in this TA almost always accompanies with surface stone and pebble accumulation, inhibiting favorable growth of grazing grass. However, upper stream basins of Mbeka River and Ngwenpisana River have been less eroded where only few gullies are observed. Another highly gully-eroded area is found from Lushikishini to Nkanyezini. There observed few RTGs that have perennial water flow at their bottoms.

Grazing land dominates in land use, where gullies develop over alluvial fans as well on colluvial foothills where Ferralsols, Acrisols, Vertisols and Regosols with less surface stone/rocks overlie on Gleysols and Fluvisols. Overgrazing on slope with frequent field burning has resulted in serious sheet and terracette erosion that triggers occurrence of huge ravine

gullies developed from rills along barren cattle tracks to dip tanks. Current erosion status is given as in the following table

Table 3-76: Current Erosion Status in TA3

Unit : ha and area % of total TA3

Degree/Type	extreme	severe	moderate	slight	Total
Sheet erosion	-	1,270	2,790	2,810	6,870 (22%)
Terracette erosion	-	0	1,710	-	1,710 (6%)
Rill erosion	-	100	-	-	90 (1%)
Gully erosion	700	120	-	-	820 (3%)
Slip / Slump erosion		70	60	-	130 (0%)
All types total	700 (2%)	1,560 (5%)	4,560(15%)	2,810 (9%)	9,620(31%)

Source: results of field survey by the Study Team employing AELDA evaluation criteria by FAO

Clustered gully erosion has occurred along basins of Ngwempisi River and also that of Mtagane River, along a fault in granodiorite basin, with huge ravine ones counting 113, or 0.3 gully per km^2.

Besides, encroaching of useless or thorny shrub species like wattle (*Acacia mearnsii*), *Caesalpinia decapetala*, *Aloe marlothii*, and *Psidium guava* has spread along stream basins, roadsides and invading into grazing area, found often in and around ravine gullies. In particular, wattle escaped from old plantation in Usutu forest reserve, spreading into ridges of Mbeka and Ngwenpisana plateaus with heavy coverage over grazing space. Too slender tree stands have almost no economic value since they grow at a density of 40 or more stands per square meter. Other species like *Populus discolor* are locally found along streams and inside gullies, but the rate of invasion is minor and no detrimental effect has so far seen. Indigenous shrubs have been damaged by incessant field burning, where only fire resistant species like *Tricalycia capensis (lanceolata)* and *Croton gratissimus* and wattle barely survive.

3.4.5 Natural Resources and Environment

a. Meteorology

According to the data recorded at Mankayane Station located near TA3, average annual rainfall ranges from 415.3mm minimum and 1,769.9 mm maximum with the average of 900mm, which makes this area the richest in three TAs.

Table 3-77: Annual Rainfall in TA-3

	Rainfall
Average	877.9mm
Maximum	1,769.9mm
Minimum	415.3mm
Period	1961-2001

Source: Data of Meteorology Bureau

Daily rainfall occasionally exceeds 50mm, it rained more than 50mm per day for 18 days within past five years in TA3. On the other hand, 277.3mm of daily rainfall was recorded on 31st December 2000 at the station. It can be said that such heavy rain on the degraded land is one of the causes that develop soil erosion in this area.

And temperature measurement at the Station has not been conducted, but it could be said to be similar to the one of TA1.

b. Topography

TA3 is located in Highveld in terms of agro-ecological zones and the area falls in steep hill grassland (H3), Highveld valley grassland (H4) and Highveld plateau grassland (H5) based on Vegetation Unit in Swaziland. The area is characterized by its soils with rock outcrops.

Table 3-78 Summary of Vegetation Unit in TA-3

Vegetation unit	Topography	Slope	Soils	Classification
H3	Steep hills	>30%	Shallow sandy loams with rock outcrops	Highveld steep hill grassland
H4	Undulating valley	<15%	Sandy loam to clay, very stony	Highveld valley grassland
H5	Undulating to rolling	5-15%	Shallow sandy loams with rock outcrops. Acidic loams or clays on plateaus	Highveld plateau grassland

Source: Range resources grazing potentials in Swaziland, FAO, UNDP, 1994

c. A Trial of Range Management

As well as other TAs, land degradation has been serious problem in TA3, and some attempts have been implemented in past. One example of range management is presented below.

In 1976 the people (about twenty homesteads) started a trial of range management at Velezizweni area in Ngwempisi chiefdom. The land had been farmland formerly owned by South African white in the past and he left the land to people when he went back to his homeland. People established rules, which restricted the number of cattle per homestead and the person who owned more than certain number of cattle should sell his cattle. In addition, they had obligation to pay about E20 per homestead for maintenance of fences in every five years. They have been following the rule and as a result, conditions of rangeland and cattle have been kept better as compared to those in other areas, according to the interview.

Such a trial led to a desirable result, but it had not been diffused to other areas, possibly because of the unfavourable climate conditions in other areas that can not bring grass regeneration for the cattle raising.

d. Condition on Forest and its Management

According to interviews, some kind of trees such as *Acacia davyi, Acacia toritilis* and *Euclea crispa,* which are indigenous trees in the area, has almost disappeared due to felling for firewood. Following species are mainly observed in TA3.

Syzygium cordatum, Acacia ataxacantha, Bequaertiodendron magalismontanum, Dombeya rotundifolia, Vaugueria infausta, Aloe marlothii,

Self-sufficiency of fuel wood in the area is limited to 39%; however it is still the highest in three TAs. Fuel wood consumption per capita at 631kg is higher than other TAs (409kg, 576kg in TA1, TA2 respectively). Purchase of fuel wood was observed in all chiefdoms in all TAs except Macudvulwini chiefdom, according to the survey by the Team. Therefore, the chiefdom of Macudvulwini seems to enjoy richness of forest as compared to others that have difficulty to get fuel wood.

For the sake of forest protection, chiefs have set similar rules to other TAs', which restrict fruit trees cutting, medicinal trees cutting and so on. But the rules have not been diffused over the chiefdom, and some people do not know the rule even if they live in the same chiefdom.

e. Trend in fauna

Crocodiles (*Crocodylus niloticus*), which are one of the endangered species appear in the place adjacent to Ngwempisi River that runs throughout the area. However lately people have not observed them often as much as before. It assumes that crocodile might have moved to downstream of the river and as a result the number of them in the area is decreasing.

Besides, common duikers (*Sylvicapita grimmia*) in the area have been decreasing in number by hunting as well as in other TAs. The faunal biodiversity decline that caused by habitat destruction and illegal hunting is one of big problems in Swaziland, and this area also seems to face the similar problem.

3.4.6 Land Use

Present land use in TA3 is summarized in Table 3-79.

Table 3-79: Present Land Use in TA3

Unit: ha, 2000basis

Target Area	Chiefdom	Grazing Area	Arable Land	Forestry	Amenities	Total
TA3(Ngwempisi)	Bhadzeni II	1,371	675	635	20	2,701
	Dladleni	601	225	0	0	826
	Lishikishini	3,201	1,672	76	26	4,975
	Macdvulwini	3,977	826	683	5	5,491
	Mahhashini	534	308	2	0	844
	Bhadzeni I	1,382	701	756	1	2,840
	Mgazini	2,015	1,534	86	9	3,644
	Khabonina	646	255	20	0	921
	Ngcoseni	1,167	803	8	22	2,000
	Velezizweni	4,352	1,753	238	15	6,358
	(10 Chiefdoms)					
	Sub-total	19,246	8,752	2,504	98	30,600
	Percentage (%)	(62.9)	(28.6)	(8.2)	(0.3)	(100.0)

Source: The result of the site survey by JICA Study Team

3.4.7 Social Services and Rural Infrastructure

a. General Social Conditions

Administratively Target Area 3 (TA3) belongs to Ngwempisi Inkhundla in Manzini Region. The Inkhundla consists of 10 chiefdoms. The number of the total homesteads is estimated at 3,696 with a total population of 27,693 in 1997. At an estimated population growth rate of 2.7%, the population will be increased to 34,272 in 2005 and 51,109 in 2020. Out of 10 chiefdoms, Velezizweni has the largest population size. Arable crop farming and livestock is the main activity of the people in TA3.

Table 3-80: Social Indicators in Target Area 3

Items		Percentage or Average Figure
Religion	Christianity	100.0%
	Others	0.0%
Family size (average)		8.8
Female-headed family		40.0%
Household annual income		E 13,880
Participation to groups	Village committee	5.0%
	Farmers' group	13.3%
	Women's group	23.3%
	Religious group	5.4%
	Youth club	0.0%
	Others	0.0%

Source: JICA Household Baseline Survey, February 2001

b. Education Facilities and Enrolment

There are 18 primary schools in Target Area 3, of which two are private and most of the remaining schools are aided ones. Number of pupils range from 70 (Ndlaleni Primary) to 609 (Cana Primary). Number of teachers range from 8 to 17.

Table 3-81: Primary Schools in Target Area 3

Chiefdom	School Type	School Name	No. of Pupils	No. of Teachers
Bhadzeni II	Aided	MPONONO PRIMARY	273	10
Lishikisini	Aided	EMSENI PRIMARY	122	4
Lishikisini	Aided	ST. STEPHENS SCHOOL	581	16
Lishikisini	Aided	TENTELE COMMUNITY SCHOOL	247	8
Macudvulwini	Aided	MACUDULWINI PRIMARY	157	9
Macudvulwini	Private	NDLALENI COMMUNITY SCHOOL	70	5
Mahhashini	Aided	GUNDVWINI PRIMARY	574	16
Bhadzeni I	Aided	INGWEMPISANA PRIMARY	331	12
Bhadzeni I	n.a.	MBESAMANDLA PRIMARY	187	6
Ngcoseni	Aided	DZANYANA COMM. PRIMARY	346	12
Ngcoseni	Private	NGCOSENI PRIMARY	350	17
Ngcoseni	Aided	CANA PRIMARY	609	16
Ngcoseni	Aided	TSAWELA METHODIST PRIMA RY	232	8
Ngcoseni	n.a.	SIYENDLE COMM. SCHOOL	390	11
Velezizweni	Aided	MHLATANE PRIMARY	362	10
Velezizweni	Aided	MOUNT HERMON SCHOOL	562	17
Velezizweni	Aided	HOLY ROSARY SCHOOL	325	8
Velezizweni	Aided	MTIMANE COMM. SCHOOL	349	10

Source: Census Office

There are one secondary and five high schools. Number of secondary and high schools, and enrolment are presented in the following table.

Table 3-82: Secondary/High Schools in Target Area 3

Chiefdom	School Type	School Name	Female	Male	Total
Ngcoseni	Aided	NGCOSENI SECONDARY SCHOOL	105	114	219
Ngcoseni	Government	CANA HIGH SCHOOL	173	182	355
Velezizweni	Aided	MANKAYANE HIGH SCHOOL	169	130	299
Velezizweni	Aided	NCABANENI HIGH SCHOOL	145	161	306
Velezizweni	Aided	NDWANDWE HIGH SCHOOL	117	154	271
Lushikishini	Aided	NOKUTHULA/LUSHIKISHINI HIGH	156	139	295

Source: Census Office

c. Health Facilities

There are four clinics in TA3. Names of clinics are Nokuthula (Lishikishini chiefdom), Cana (Ngcoseni chiefdom), Mankayane and Encabaneni (both in Velezizweni chiefdom).

Needs assessment made by the Household Baseline Survey 2001 indicated that need for improvement of health facilities was not very high compared to other infrastructure needs such as drinking water supply and road improvement. About 11.7 % of the respondents ranked the health facilities improvement as the top or second priority.

d. Rural Water Supply

d.1 Water Sources

Rural water supply systems have been planned and implemented utilizing available water resources. The main water resources for local water supply systems are; 1) springs, 2) streams, 3) boreholes, and 4) boreholes with pumps. Household Baseline Survey conducted by the JICA study team indicated that 26.7 % of the respondents were using community tap as the main source of domestic water. In addition to community tap, the people also use other water sources such as spring, river, shallow well, borehole, etc. as indicated in the following table.

Table 3-83: Water Source in Target Area 3

	Community tap	Spring	River	Shallow well	Borehole	Pond	Others
Wet Season	26.7%	21.7%	21.7%	12.9%	5.0%	0.0%	6.7%
Dry Season	26.7%	21.7%	21.7%	12.9%	5.0%	0.0%	1.7%

Source: Household Baseline Survey, JICA, February 2001

Average distance to water sources is 0.4 km in wet season and 0.5 km in dry season. People spend about 23 to 25 minutes for water collection both in wet and dry seasons.

d.2 Budget and Funding for Rural Water Supply Systems

Department of Rural Water Supply (DRWS) under Ministry of Natural Resources and Energy and Ministry of Health (MOH) are the responsible agencies for the planning and construction of rural water supply. In addition to the national budget, the funding for rural water supply systems is also provided by foreign donors including some NGOs such as Japan, UK (United Kingdom), USAID (United States Aid for International Development), UNDP (United Nations Development Programs), and Red Cross in Swaziland. The construction cost for the previously implemented rural water supply systems ranges from E2,000 to E300,000 depending on the size of water supply systems. The size of the same is generally small. Construction of the systems is carried out on the basis of the request from community people to the development committee.

Table 3-84: Existing Water Supply Systems

Location	Water Source	No. of public Stand posts	Year Completed	Total Cost (E)	Popula-tion	Source of Funds
Velezizweni	Spring	5	1986	8,985	172	MCC
Ngwempisana	Spring	3	1984	6,411	193	MCC
Velezizweni	Spring	5	1985	10,517	166	MCC
Macdvulwini	Spring	10	1985	44,299	613	UK
Lishikishini	Borehole	0	1985	5,134	333	UK

Source: DRWS

e. Existing Road Conditions in TA3

Main road No. 4 (MR4) branches off MR18 nearby Luyengo, heading for Mankayane. Although MR4 is partly paved, most part of MR4 within TA3 is unpaved. Road conditions of MR4 in the southwestern part of TA3 are not very good. After MR4 passes Mankayane town, it

passes Ngwempisi, where D56 branches off to the southeastern direction. About 1 km south of junction of MR4 and D56, D91 branches off to the western direction passing through Khabonina chiefdom.

In addition to the district road, there are some feeder roads connecting the communities within TA3. These feeder roads are not well maintained and are generally in bad conditions. In order to address the issue of feeder roads, Roads Department (RD) initiated a feeder road rehabilitation and maintenance programme and decided to commence the new projects including; i) training of FRU staffs, NGOs, community committee, and contractor; ii) fact finding tours; iii) rehabilitation works; and iv) upgrading works.

Due to the fact that Roads Department intends to carry out feeder roads rehabilitation and maintenance programme from 2001 fiscal year, any projects on rural roads was not planned in the Master Plan.

3.4.8 Rural Society and Gender Issue

a. Cattle Holding Household

According to the HBS, the ratio of cattle holding household was highest in this area compared with other two areas; 75.0% of households in the TA3 keep cattle while it was 52.7% in TA1 and 50.0% in TA2.

The reason might be related to different working opportunities. Many people in TA3 are working for the commercial forestry farm, which is located within the area. The said HBS revealed that 71.7% of the income comes from wages from by labour work in the said firm, which are higher than the income from farming activities; also there are few migrant workers in TA3, which means that most people in TA3 have their life base on their homestead. Accordingly, it may be said that the said two advantages partially contribute to higher cattle holding ratio in TA3 compared to TA1 and TA2. Contrarily, the average number of cattle is lower since many of them own cattle in the limited pastureland. Thanks to the stable income from wage labours in the plantation firm as well as cattle keeping by most of the households, there is no huge gap of living standard among the people in TA3.

Another point which should be mentioned is that the participants of the workshop conducted in August 2001 and the leaders from each chiefdom were mostly cattle holders. Therefore, less chance was given to the non-cattle holders to talk about soil conservation. This situation should be improved and more opportunities should be given to these non-cattle holders in the process of project planning in the future.

b. Needs of the Community

During the workshop conducted in February 2001, the problems on social issues such as jealousy, no-united-community and breakdown of communication were scored highest. Needs for infrastructure improvement was low compared with other two areas. The needs on acquiring knowledge through adult education were almost as high as the need on domestic water supply.

c. Consciousness toward Environmental Issues

The problems on environmental issue including soil erosion and lack of trees have been realised by the people in TA3. Needs on environment conservation including fencing of grazing land, gully protection and tree plantation were higher compared with other two areas, though the level of needs for physical measures was lower than the other TAs in terms of infrastructure development, improvement of income and social security.

It could be said that people in the area are more aware of the problem of environmental degradation and have been feeling the needs on its conservation.

d. Gender Issue

Another characteristic is the higher ratio of the FHH in the area; it was 40.0% while TA1 was 35.2% and TA2 was 30.0%. Though the living standard of life is lower compared with the one of MHH, some empowered women were recognised in TA3 during the implementation of the pilot projects.

As for access to communal activities or meetings, there are women participating in the activities, however, women seemed less active and a bit behind men's participants in general compared to other TAs. It could be analysed that people in TA3 keep the tradition of male dominated culture since men stay at their homestead due to less migrant workers.

There is only one lady Bucopho and committee member of chiefdom in the TA3. She was elected as a representative of her chiefdom and has been attending the committee meetings with other male members.

3.4.9 Activities by Foreign Donors against Land Degradation

No particular activities has so far been supported by foreign donors or NGOs concerning soil conservation, for the Highveld soils are generally considered as well-protected by forests.

Chapter 4

Pilot Projects

4 Pilot Projects

4.1 Objectives and Methodology of Pilot Projects

4.1.1 Objectives

Pilot Projects (P/Ps) are the experimental implementation of some important components of the Master Plan (M/P) to be made in the study. Therefore, the objectives of the P/Ps are to draw lessons, to examine the potential drawbacks and countermeasures, and to make the M/P more practical.

4.1.2 Methodology

Many programs and projects have failed without involving beneficiaries from the planning stage. People might feel that the fence prepared through the range management project belongs to the donor agency, not to the community. Therefore, when the necessity of maintenance arises, they simply wait for the donor to come back, rather than taking action from their side. Project ownership should belong to the community for the sustainability of activities. For that reason, participatory planning was adopted for the pilot project.

4.2 Selection Process

There are three Target Areas and 30 Chiefdoms in three Target Areas. Therefore, the study team has investigated all the Chiefdoms in order to decide where to implement P/Ps at first. Then the team has decided what to implement later.

4.2.1 Basic Concept of the Selection of P/P Area

Pilot project are supposed to be monitored and experienced not only by the people of implementing area, but also by the people of other chiefdoms under same Inkhundla. Based on the above consideration, pilot areas were selected by the local leaders from the chiefdoms under the same Inkhundla. Through such procedure, people in the pilot area are expected to have responsibility to fully participate in the P/P as a representative of whole Inkhundla.

4.2.2 Selection Criteria and Method of Selection

a. Selection Criteria and Method

There are three Target Areas, which are remote from each other, and there exist 15, 5, and 10 chiefdoms in TA1, 2 and 3 respectively. Under such circumstances, it is very difficult to decide Pilot Project Areas within a limited time. Accordingly, following screening method was adopted to select the areas effectively. At first, the Team and C/P selected potential areas. After that workshops were held at each Inkhundla and discussions were held among the communities.

- First Screening

The Team narrowed down the potential project areas in the chiefdoms using 1/10,000 orthophoto and documentary records. The opinions of C/P also were considered important. As a result, 2 or 3 chiefdoms from each TA were tentatively selected.

- Second Screening

Based on the results of the first screening, the team investigated the selected areas and carried out in-depth field investigation, public opinion survey and organized some workshops. Under

this screening, the Team decided one or two best choices of Chiefdoms, where P/Ps could be implemented, in his mind. However this decision was not open to the communities until their decision came out in the third screening.

- Third Screening

This screening was conducted to determine the communities choices and workshops were held with the assistance of the Team and C/P. The communities selected one or chiefdoms from among pre-selected ones from the process of first screening. Where there were differences between the second and third screening results, further discussions were held to finalize the P/P area.

b. 1st Screening

The team initially evaluated all the chiefdoms using the following criteria:

- Seriousness of the conditions of soil erosions. (in case it is serious; 2 point, very serious;4 points)
- Previous projects financed by other donors. (in case there is no projects; 1 point)
- Dispute within or between chiefdoms. (in case there is no dispute; 1 point)

The team put double weight of points to the criteria of "seriousness of conditions of soil erosion". As a result, the Team has selected 7 chiefdoms and 1 area from three Inkhundla.

c. 2nd Screening

Second screening was conducted through interview survey, workshops and field investigations by the team at preliminarily selected chiefdoms. The team evaluated all chiefdoms using the following criteria

- Soil is seriously eroded or erosive
- The area has potential for land use improvement
- Rangeland is not properly managed or has potential for improvement
- The area has potential for Agricultural development
- Forest is not enough or the area has potential for Forestry/Agro-forestry-forestry development
- Community has willingness, unity and leadership (Social Aspect)
- Environmentally degraded area

Based on the criteria above, the Team put a score on each chiefdom. As for TA1, the Team found the condition for Eni and Ngcayini chiefdoms almost the same and as they are located adjacent to each other, so that it would be easier to work them as one unit when land use planning is considered. As for TA3, the Team found some potential water resources which other areas did not have, accordingly, an additional criteria "Water Availability" was added in order to differentiate this area from other two areas.

d. 3rd Screening

The 3rd screening was conducted through participatory selection procedures.

Local leaders from each chiefdom were asked to gather at Inkhundla centre and the team explained about the selection procedure. Then, selection criteria, which were prepared by the team, were presented. After going through all the criteria, an additional one which participants thought necessary to evaluate the P/P was added. Finally, total score was counted and the chiefdom which obtained the highest score was chosen as a pilot area.

4.2.3 Selected Area

a. TA1 (Kukhanyeni Inkhundla)

Both Chiefdoms of Eni and Ngcayini were selected as the P/P sites since they obtained the same score and results as shown in the Table 4-1.

Table 4-1: Final Results of the Site Selection in TA1

Criteria	**Eni**	**Ngcayini**
Soil is seriously eroded or erosive	1	1
The area has potential for land use improvement	1	
Rangeland is not properly managed or has potential for improvement	1	
The area has potential for Agricultural development		1
Forest is not enough or the area has potential for Forestry/Agro-forestry development	1	
Community has willingness, unity and leadership (Social Aspect)	1	
Environmentally degraded area	1	1
Water Availability (potential)	1	1
Location of Dip Tank	1	1
Total	**8**	**8**

Two selection criteria; 1) water availability and 2) location of dip tank, were presented from the participants and the team agreed to add these criteria for the evaluations. The team was very happy to hear that one of the participants from non-selected chiefdom commented that everybody should support the project since it was decided by all of them.

b. TA2 (Shiselweni Inkhundla)

Zikhoteni was selected as the P/P site and results of the scores among three Chiefdoms are shown in the Table 4-2.

Table 4-2: Final Results of the Site Selection in TA2

Criteria	Manyandzeni	Mchinsweni	**Zikhoteni**
Soil is seriously eroded or erosive			1
The area has potential for land use improvement			1
Rangeland is not properly managed or has potential for improvement	1		1
The area has potential for Agricultural development		1	1
Forest is not enough or the area has potential for Forestry/Agro-forestry development	1		1
Community has willingness, unity and leadership (Social Aspect)	1		
Environmentally degraded area		1	
Shortage of Water	1		
Topography			1
Shortage of Firewood	1	1	1
Total	5	3	**7**

Three selection criteria; 1) shortage of water, 2) topography and 3) shortage of firewood, were presented from the participants and the team agreed to add these ones to the selection criteria.

c. TA3 (Ngwempisi Inkhundla)

Macdvulwini chiefdom was selected as the P/P site after a long discussion since two chiefdoms obtained the same score. The results of the scores are shown in the Table 4-3.

Table 4-3: Final Results of the Site Selection in TA3

Criteria	**Macdvulwini**	Mgazini
Soil is seriously eroded or erosive	1	
The area has potential for land use improvement	1	1
Rangeland is not properly managed or has potential for improvement	1	
The area has potential for Agricultural development	1	1
Forest is not enough or the area has potential for Forestry/Agro-forestry development	1	
Community has willingness, unity and leadership (Social Aspect)		1
Environmentally degraded area		1
Water Availability (Potential)	1	1
Accessibility		1
Total	**6**	6

Major issues discussed were the leadership of local leaders and disputes within the community. At a series of discussions, Macdvulwini, which seemed to have no problem on leadership according to the participants, was selected.

Even though they did not speak out about the result, a few participants from the other chiefdom were unhappy about the result. It was decided to involve them into the monitoring of activities.

All the results obtained through the workshops were totally in accord with the intention of the team, including Kukhanyeni Inkhundla, where two chiefdoms were combined into one from the viewpoint of planning.

4.2.4 Selection of the Pilot Projects

a. Background and Methodology of Selection of P/P

Many programs and projects have failed due to not involving beneficiaries from the planning stage. People might feel that the fence prepared through the range management project belongs to the donor agency, not to the community. Therefore, when the necessity of maintenance arises, they simply wait for the donor to come back, rather than taking action from their side. Project ownership should belong to the community for the sustainability of activities. For that reason, participatory planning of the pilot project was adopted.

On the other hand, there is a limitation for the team side to leave planning open to the community needs. Considering about time schedule, size of input, balance of three pilot areas and objectives of this study, project planning should be done not “by the community”, but “with the community”. Therefore, the Project Cycle Management (PCM) Method was adopted as a tool for project planning and resource people were both community and the team.

Community people of each pilot area gathered at meeting points, which was decided by them, and Stakeholder Analysis (Workshop 1), Problem Analysis and Objective Analysis (Workshop 2) of PCM method, were carried out. Majority of the participants could read and write, and they had no problem of understanding the structure of problem/objective trees after showing the examples.

After objective tree was freely prepared by the community, study team provided additional information (Workshop 3) which were missing from the tree.

Finally, participants selected some of the components from the prepared means (Workshop 4). As a total, four workshops were conducted at each chiefdom for the formulation of pilot project.

b. Selection Procedures

The following were the procedures used to conduct each workshop.

b.1 Stakeholder Analysis

Though activities of the P/P were not apparent yet at this stage, participants were asked to write their ideas on cards about beneficiaries, negatively affected groups, decision makers, funding agency/group, implementing agency/group, community leaders/groups, potential opponents and supporting group. Results of the stakeholder analysis are shown in Annex I of this report. Outputs were to be considered while planning the project, so that the additional activities of shifting a negatively affected group to the beneficiary group could be discussed. Or measures to minimize the impact of potential conflicts. The result was typed in Swazi language and handed to the community.

b.2 Problem Analysis

To avoid preparing problem tree covering all difficulties in the community (for example, the core problem is poverty and the necessity of school, clinic, or telephone is discussed), the team explained about the objective of tackling degraded land.

Workshop participants were asked what they thought about the core problem in their area. Five to ten cards were submitted and they selected one of the cards as a core problem. Based on the core problem, they discussed about causes and effects.

Problem trees for each Target Areas are shown in Annex I of this report.

b.3 Objective Analysis

Based on the problem tree, objective tree was prepared at each site. Participants decided the core objective first, and means and ends of achieving it were discussed later.

b.4 Seminar on Additional Information

Stakeholder, problem and objective analysis were conducted during the workshops where all inputs came from the community side, with the facilitation of the Team. However, some of the practical measures based on the technical knowledge or overall resource evaluation were missing. Therefore, a seminar to provide additional information was conducted by the Team and in the case community decided to adopt the ideas to form their objective trees, they were added.

Topics of the seminar provided at each area were;

- Rehabilitation measures of soil erosion
- Range management and control of livestock number
- Tree species and management of invasive trees
- Farm management and soil fertility

- Improved cooking stove

Objective trees for each Target Areas are shown in Annex I of this report.

c. Proposed Components of Pilot Projects

c.1 Conditions of Project Selection

Project components were discussed based on the objective tree. Before election, the following conditions were explained by the Team.

- Most effective means to attain the core objective have to be selected.
- Project belongs to the community, not to the government or JICA, so that community has the responsibility to implement the selected projects.
- Although Japanese government support financially at the initial stage, the project will be managed by the community in a long term.
- This is a P/P, so all means listed in the objective tree are not going to be covered, and scale of each activity is limited.
- Their activities will be monitored by the whole Inkhundla since they were selected as a representative.
- Consultation with JICA headquarters is necessary for the final decision; therefore the result of discussion might be slightly changed or scaled down.

c.2 Selection of the Pilot Projects

Following the Problem/Objective Analyses conducted at several workshops, the selected means to overcome the problems in three Target Areas are summarized in Table 4-4.

Table 4-4: Summary of the Selected Means in three Target Areas

Location / Field	Target Area 1	Target Area 2	Target Area 3
Land Rehabilitation	Stabilization of Eroded Area	Soil Erosion is treated	Gullies are controlled
		Bare Ground (cattle track) to be covered by grass	
Grazing Management	Proper Grazing Management	Maintain Proper Grazing Size	Number of Livestock is controlled
		Spring is protected	Improve Pasture
			Control Invasive trees
Agricultural Management	Restoration of Fertile Soil	Restoration of Fertile Soil	Farming is properly managed
Forest Management	Conserve Indigenous Trees	Conserve Indigenous Trees	Conserve Indigenous Trees
	Save Firewood	Save Firewood	Save Firewood
Education and Training	Environmental Management	Knowledge on land use	

These means should be materialized under the JICA scheme, so that the Team has proposed the contents of Pilot Projects as shown Table 4-5 together with C/P under the criteria of follows;

- The projects shall be technically practical
- The project can be completed within the timeframe
- The project shall be cost effective.

Table 4-5: Relation between the Objectives agreed and Selected Projects

Fields	Direct Means selected by Community	Materialized Pilot Projects
Land Rehabilitation	Stabilization of Eroded Area	Gully Training
	Soil Erosion is treated	
	Gullies are controlled	Contour Terracing
	Bare Ground (cattle track) to be covered by grass	
Grazing Management	Proper Grazing Management	Fenced Grazing Scheme
	Number of Livestock is controlled	
	Improve Pasture	Beef Fattening using fodder
	Spring is protected	Water Source Protection
	Control Invasive trees	
Agricultural Management	Restoration of Fertile Soil	Improved Fallow
	Farming is properly managed	Irrigated Community Garden
Forest Management	Conserve Indigenous Trees	Integrated Tree Nursery
	Save Firewood	Afforestation Improved Cooking Stove
Education and Training	Environmental Management	P/P Management Unit Training
	Knowledge on land use	

c.3 Priority Pilot Projects in each Target Area

In this study, pilot projects will be implemented in three Target Areas. There are following particulars in each Target Areas in terms of geographical and social features. Therefore, in consideration of these different circumstances, priority project will be proposed and determined in each Area as shown in Table 4-6. These experiences will be utilized for both C/P and Communities during implementation of M/P.

Table 4-6: Priority Projects in each Target Area

Location	Particulars in the area	Priority Project
TA1	• There are two types of grazing yards, which one is fairly flat and the other is steep. • Grazing is the hot topic among communities • Community has given priority to implement properly managed grazing land	Range Management Project
TA2	• Most severely erode area in Swaziland • Community has experienced with projects supported by other donor agencies. • Community has given priority to the implementation of tree planting • There is a place suitable for nursery.	Forest Management Project

TA3	• Remote area and no experience about supported projects from other donor agencies. • A lot of water resources are available but not fully utilized at this moment. • Community has disagreed with reducing numbers of cattle. • Community is requesting alternative incomes in case of need to control numbers of cattle.	Simultaneous implementation of Agricultural Project and Range Management Project

Since land conservation is the core problem and key issue in this study, a land rehabilitation project shall be implemented in three Target Areas.

c.4 Selected Pilot Projects

After the several considerations mentioned above, following Pilot Projects were selected at each Target Area.

Table 4-7: Selected Pilot Projects in each Target Area

Description of P/P	Location		
	TA1	TA2	TA3
Soil Conservation Project Gully Training and Contour Terrace	○	○	○
Range Management Project Rotation Grazing and Feed Lot	○		○
Forest Management Project Nursery and Afforestation		○	
Agricultural Management Project Community Garden		○	○
Improved Cooking Oven Project	○	○	○
Water Source Protection Project	○	○	○

4.3 Soil Conservation Project

The selected 3 Target Areas have been more seriously eroded than other SNL and there are few other areas that have comparable degree of land degradation within High veld and Upper Middle veld. The pilot project aims at establishing a sustainable model to rehabilitate the deteriorated land in these target areas through a participatory approach planned and assisted by relevant Inkhundla and PPMU with related official network. NGO also assisted its implementation under subcontracts.

4.3.1 Objective

The objective of the proposed soil conservation pilot project is to improve seriously degraded land to moderately serious situation through stabilization of sheet erosion by way of contour terraces and gully training. In addition to these physical countermeasures, the project also includes such supporting activities as the enlightenment and awareness raising of stakeholders concerned on the importance of soil conservation through the technical training programme as proposed under the capacity building plan.

4.3.2 Implementation

As to technical aspect, PPMU worked out the design of implementing preventive and rectifying measures in each Target Area based upon survey results. The brushed up design was then introduced to stakeholders in workshops to reach an agreement with those who live in the degraded environment on PPMU's proposal to implement the design as their own participatory project. As to the procurement of material and technical services, an NGO undertook the design and mobilized stakeholders into the implementation. Such a persevering procedure was prerequisite to begin any works on SNL on which many stakeholders have traditional usufruct right for land use.

Contour terracing was chosen as major countermeasures for sheet erosion just because it has been effective on arable plots, and check structures, i.e. heap of sandbags, stone pieces, tree branches that are readily available without incurring prohibitive cost around the target sites installed inside gullies were selected from cost effectiveness and workability points of view. The following table summarizes the works designed for land conservation in each Target Area. Details of the designs and works, coordinates of sites (location) etc. are given in Annex D.

Table 4-8: Soil Conservation Works Designed in Three Target Areas

Target Area Site	Sheet Erosion Measures		Gully Training	
TA 1	Site:	Seriously eroded surface on grazing-land	Site:	Inside contour terracing, shallow gully
	Area:	120m × 180m = 2.16 ha	Size:	L = 48m, w = 12m, d = 3.5m
	Works:	Contour terracing by machine / manual	Works:	6 checks with sandbags and branches
TA 2	Site:	Quasi-denuded patches of grazing field	Site:	Inside contour terracing, shallow gully
	Area:	180m × 150m = 2.7 ha	Size:	L = 75m, w = 2m, d = 2.5m
	Works:	Contour terracing by machine	Works:	5 checks filled with stone pieces/blocks
TA 3	Site:	Heavily eroded cattle track to a stream	Site:	Inside contour terracing, shallow gully
	Area:	188m × 147m = 2.76ha	Size:	L = 53m, w = 1.3m, d =1.5m
	Works:	Contour terracing by bulldozer	Works:	4 checks filled with stone pieces

The sites for three demonstration works in each TA were selected through workshops where consultations were made by all stakeholders including chief of Chiefdom, villagers, NGO concerned. Because there are many beliefs on the cause of erosion development, it was decided that demonstration of the proposed works should include couple of mutually contradicting designs, or hitherto used methods (such as sill to intercept surface water running down to gullies) and newly proposed ones were simultaneously displayed at the same sites so that the effect coming out from these trials can be compared later. Note that no definite theory has so far been affirmed as to the cause of huge gullies, where two major inconsistent hypotheses, one attributable to surface runoff and the other to action of groundwater, are alleged as to causatic factors of gully development.

- In the light of the fact that erosion occurs both spontaneously and artificially and eroding process has continued for decades or century (some active gullies has age of a hundred), a huge scale gully can hardly be healed in a year or two even if economically unfeasible earth filling were carried out. Taking this into account, only small and young gullies were selected to train with low-cost and readily workable structures in order to stabilize them. Widely performed earthworks with gabion net were not employed from the aspect of cost burden and low performance observed outside the Target Areas.
- Earthworks should be manually operated from the viewpoint of least surface disturbing during works. However, if sluggish participation of stakeholders in manual field works hampers progress of the proposed works, the NGO can resort to mechanical alternative by mobilizing hired earth-work machinery.
- As regards contour terracing to minimize soil loss from grazing slopes, the interval of

terraces is designed as follows:

Table 4-9: Proposed Intervals and Widths of Grassed Contour Terraces

Slope gradient (%)	5	7	9	11	13
Terrace interval (m)	41	37	32	28	Better re-forested
Stone-piece strips (m)	25	22	20	17	15
Width of terrace (m)	0.5	0.7	0.9	1.1	1.3

Note: Minimum height of terraces or cordon-pierre (stone strips) must be 10cm (9%) to 15cm (> 11%). It is advised to minimize the cutting section to achieve least disturbing surface.

- The initial trial should be confined to minimal scale but after evaluation the works can be added depending on the effect thereof . For example, height of sandbags to be heaped along lateral section of gully bottom can initially set at 1 meter only but after rainy season upheaval of more sandbags may be worked if effective sedimentation has taken place.

4.3.3 Achievement

The proposed design has been completely implemented on schedule, with the help and cooperation of participated stakeholders, counterparts and NGOs concerned. Post-implementation monitoring has also been conducted by the stakeholders concerned, with self evaluation on what they have done through their participation. Individual works are described as follows:

a. Contour Terracing and other structures as countermeasures against surface erosion

a.1 TA 1

22 parallel contour terraces with length 33 ~ 47m, interval 12 ~ 34m and width 1.1 ~ 1.2m were cut over 2.16 ha of gentle grazing slope. Besides, a 122m long sill and a drainage evacuating spillway was installed just upstream side of huge and old gully located just above the treated young one. In addition, Eucalyptus plantation has covered over an old cattle track where rills have scoured with a density 1.5m × 2m and the area 50m × 100m (1,500 saplings). The terrace surface was covered with cut branches of thorny shrub trees (*Caesalpinia decapetala)* for the purpose of protecting from cattle trampling. Leveling and covering works over terraces were manually done by voluntary villagers. Although cattle invaded into the treated area after implementation, natural regeneration of grasses over the terraces are favourably going on, and planted *Eucalyptus grandis* showed fast growth at a rate 100cm per year. Siltation trapped along the created terraces has been widely observed over the treated area. No outstanding runoff was traced in surface water evacuation channel surrounded by sills and spillway, despite the old huge gully showed large wall slumps during last rainy season.

As regards contour terraces, the surface of cut belts has been covered with germinated and crept wild grasses, mostly *Cynodon dactylon*. These terraces also have caught runoff soil particles flowing down from upward slope, with deposit as thick as 25mm on average above the cut surface. The estimated soil volume trapped in the terraces amount to 13.2 m^3 flown from a catchment of 0.46ha equivalent to 29 m^3 or 43 ton per hectare.

a.2 TA 2

21 parallel contour terraces with length 48 ~ 60m, interval 10 ~ 14m, width 1.1 ~ 1.3m and height 0.9 ~ 1.2m, and horizontally ripping of ground surface with a bulldozer (horizontally 60m and along the slope 30m) were worked over 2.70 ha of grazing slope covered with innumerable barren patches and small rills. Two 120m long, 1.2m high parallel sills were created at upper boundary of the treated grazing field and just above the ripped part, with a view to evacuate surface runoff out of the treated area. The treated area was fenced with

barbed wire to keep livestock off there from. After rainy season, surface clay crust was observed as trapped by created terrace and sills, but no trace of surface flow caught by sills was observed. Grass recovery over the worked terraces was still weak possibly because strongly acidic nature of surface pegmatitic saprolite (soils had been completely eroded away for decades ago), and only Cynodon dactylon, tolerant to acidity, was found creeping into disturbed ground surface. No newly formed rills has so far been found over the ripped part, but grass has not yet been regenerated over the treated surface.

These terraces also have intercepted mud runoff from upward barren slope, where mean thickness of deposit was measured at 15mm above the cut surface level. The estimated soil volume trapped in the terraces amount to 9.9 m^3 flown from a catchment of 0.32ha, equivalent to 31 m^3 or 46 ton per hectare.

a.3 TA 3

17 parallel contour terraces with length 35 ~ 40m, interval 10 ~ 11m, width 1.2 ~ 1.5m and height 1 ~ 1.2m were worked over 2.76 ha of fairly steep (g = 10%) grazing slope. No sill was created but corners of terraces were protected with cement coating over heaped stone filling. Some parts of terraces were sown with ErAgro-forestrystis curvula (weeping lovegrass) to accelerate grass cover over denuded terraces. Wide siltation was traced over terrace surface after last rainy season and germination or growth of sown grass was found but showed weak growth without neutralization of acidity. This work was resulted in heavier surface disturbing due to steeper slope gradient and rough bulldozer works, damaging original natural grass cover to heavier extent than the works in other target areas. Fortunately, exposed barren saprolite surface has not been affected (scoured) by rains partly because of less precipitation during last rainy season, partly owing to higher clay content and compact surface layers. However, a huge ravine type gully is climbing up at the neighbour over the same slope as the treated grazing track, implying that beneath the hard surface there is very soft and fragile layers easily scoured by groundwater.

These terraces also have intercepted mud runoff from upward barren slope, where mean thickness of deposit was measured at 28mm above the cut surface level. The estimated soil volume trapped in the terraces amount to 10m^3 flown from a catchment of 0.25ha, equivalent to 40 m^3 or 64 ton per hectare. This value may be underestimated because turbid runoff was observed flowing down to the stream.

b. Gully Training

b.1 TA 1

The treated gully is located just above a huge, 70 year aged one, length of which is measured at 48m. This is an active gully with very few inner vegetation so far established, including Psidium Guajava, Diospyros lycioide, and some fern species. The southern wall is nearer to the summit of the hill that has many gullies at its foot range, so water seepage flow should descend from south down to north. In this connection, type of slumping observed at southern wall is quite different from that at the opposite. The former tend to form indented incision leaving ridges in between ditches just like fjord.

On the other hand, the latter shows a linear wall with limited collapse that forms cone-shaped sand fans at the foot. Since the onset of last rainy season, Gully head has proceeded at 2 meters with a big slump at its southern side. Two major waterways running down from the southern wall incised the wall by 1.2 ~ 2.5 meter, thus forming longer ridges. Volumes of deposits accumulated on gully floor are measured as follows; filling most sedimentable space the structures allow sediment above them. Though sandbags heaped over branch bundles have been mostly broken, the packed content, mixture of sand with cement, still keeps function of checking structure blocking leakage of sedimented deposits down to the mouth.

Table 4-10: Dimension and Observed Effect of Check Structure with Sandbags Packed with Cement/Soil Mixture and Tree Branches

No. of Structure	Height	Length*	Width	Length of apron	Volume of sediment; V = length×width×depth	Origin of sediment	Remaining space for sedimentation
No. 1	0.4	1.2	0.4	0.8	$\pi \times 3.1^2 \times 0.4 = 11.9m^3$	Wall slumping	0 m^3
No. 2	0.5	2.3	0.6	2.0	$3.2 \times 2.3 \times 0.5 = 3.7m^3$	Wall slumping	0 m^3
No. 3	0.7	3.5	0.8	2.5	$7.1 \times 3.5 \times 0.7 = 17.6m^3$	Wall slumping	0 m^3
No. 4	0.6	3.4	0.6	2.5	$15 \times 3.4 \times 0.6 = 30.6m^3$	Wall slumping	0 m^3
No. 5	1.1	3.3	1.5	-	$11 \times 3.4 \times 0.1 = 3.7m^3$	Wall slumping	$11 \times 3.4 \times 1.0 = 37.4\ m^3$
No. 6	-	-	-	-	$6 \times 3.4 \times 0.1 = 2.1m^3$	Wall slumping	$6 \times 3.4 \times 0.5 = 10.2\ m^3$
Total gully length = 48.5m, V/m = 0.72 m^3 / m					Total V = 69.6m^3		Total space = 47.6m^3

In addition to sediment deposits over the floor, the northern wall created two half-cone of collapsed sand accumulation above the floor deposits. One of them has height of 1.5m with base radius of 1.8m, the other measures 1.8m in height with that of 2.2m, and their volumes are totalled at 17.55m^3. Including all these, these five check structures made of sandbags and cut branch bundles could retain about 85 m^3 of earth deposited by wall slumping. Since the volume of lost wall is estimated to 127.5m^3, the effect of these structures in retaining slumping amounts to 67% or two thirds.

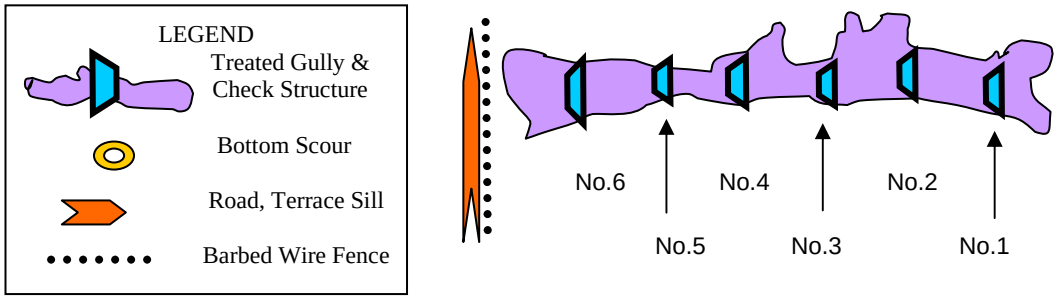


Figure 4-1: Appearance of Treated Gully in TA 1

b.2 TA – 2

The deposit is of the same nature as the above structure. Immediately above the structure the gully becomes a rill that measures 40m to the sill. The structure is located at the distance of 38m from No.2 confluence of the gully. Between these two structures depth of trench gully measures 2.5m at maximum and 1.9m at the surface of exposed muram (iron concretion) floor. The past slumping volume was estimated at (42 + 22)m × 0.05m × 2.2m = 7m^3, the rate of retention R = 4.9 m^3 / 7.0 m^3 = 70%

The surface soil is classified as a type of Oxisols with a Muncell colour 2.5YR 4/6 that is really a saprolite derived from pegmatitic granite exposed over ground surface, with poor grass cover where only Cynodon dactylon is remaining and denuded rate is measured at 65%.

Main materials are calculated as follows.
1. Roadside Silt Check: V = 0.6m × 4.5 m × (3.9 + 7.1) / 2 m ＝ 3.0 m^3
Accumulated and trapped sediment consists of surface clay coat and quartz pebble grains.
2. A check in confluencing point of trenching gully
0.5m × 1.4m × 4.5m ＝ 3.1m^3
Trapped sediment consists of only coarse quartz grain and surface clay falling from slumpingd wall.
3. A stone filling inside the left (northern) branch of the trench gully
0.6m × (1.5 – 1.0)m × 4.8m ＝ 1.4m^3
Also, deposit stems from slumpingd wall, but iron noduled surface began exposing itself over a part of the gully floor that is quite resistant against undergoing scour loss. The structure is

locate at the distance of 22m from No.2 confluence of the gully. Length of upstream measured at 30m. to the sill.

4. A stone filling inside the right (southern) branch of the trench gully

$0.5m \times (1.0 - 0.3)m \times 1.1m = 0.4\ m^3$

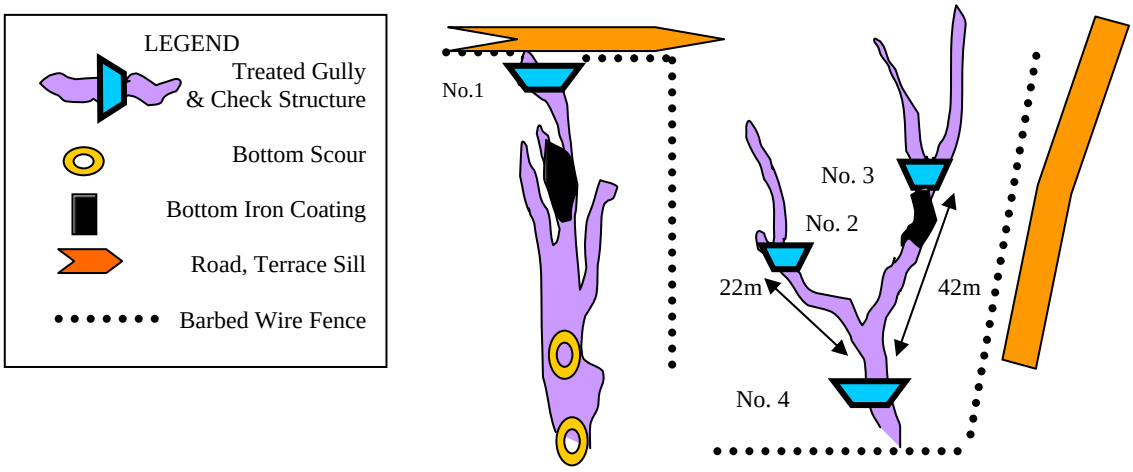


Figure 4-2: Appearance of Treated Gully in TA 2

Table 4-11: Dimension and Observed Effects of Check Structure in TA2

No. of Structure	Height	Length*	Width	Length of apron	Volume of sediment; V = length×width×depth	Origin of sediment	Remaining space for sedimentation
No. 1	2.0	4.0	0.25	2.5	0.6 × 4.5 × (3.9 + 7.1)/ 2 = 3.0 m^3	Rill surface flow flown from road	1.3 × 4.5 × 5.5= 32.2 m^3
No. 2	0.55	0.6	0.3	1.0	0.6 × (1.5– 1.0)× 4.8=1.4m^3	Wall slumping	15 × 0.6 × 0.5 = 4.5m^3
No. 3	1.1	1.1	0.4	1.4	0.5 ×(1.0 –0.3)× 1.1=0.4m^3	Wall slumping	20 × 0.5 × 0.6 =6.0m^3
No. 4	0.8	1.9	0.25	1.7	0.5 × 1.4 × 4.5 = 3.1m^3	Wall slumping	15 × 1.4 × 0.8 = 16.8 m^3
Total cumulative length of the trench gully = 75m					Total sediment V. = 4.9 m^3	V / m = 0.32 m^3	Total Room = 27.3 m^3

Note: unit of figures in meter and cubic meter, l; length, w; width and d; depth of sediments, length does not include excavated edge of abutment, that measures 40 ~ 50 cm for both sides of the structure. Structure No.1 and No.4 have a block wall each in front of which stone pieces are piled as apron. The above dimension shows wall size.

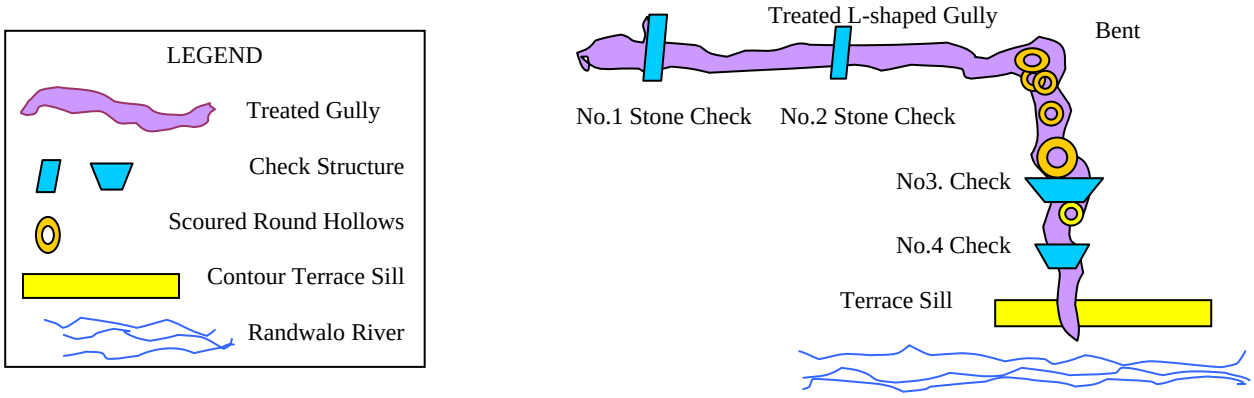
As to the development of gullies concerned, the dendritic one that has the head treated with sediment check structure has shown no measurable head growth during last rainy season, perhaps owing to scanty rainfall, though the width of .its branch has widened through further slumping of walls and some soil pillars standing inside the gully reduced their height by the same reason. In case of the treated trenched gully, the head of rill part right branch proceeded by 3 meter to the upstream side, but that of left branch remains the same as we observed before rainy season.

b.3 TA 3

Treated Gully has initial stage of development, with many scoured spot hollows in its course. These hollows are wet even in dry season where powdery clay~silt containing oxidized kaolinite has been dissolved away in running water. It runs along contour line up to a bent at about 29 meter from its head, a rill stemming from wattle shrubs. From the bent corner it stretches down for 19 meter to the stream (Randwana River) but disappear at 70 meter above it. Total length, then comes to 48 meter only. This southern slope of Randwana River has a

huge gully at the west of this treated young gully, developed presumably through river bank scouring, with a scale of 50 meter in length, 30 meter in width and 7 meter in depth. Inside the gully large lumps of white kaolin is visible and the surface soil layers shows the same profile as those found in the treated gully.

Due to scanty rainfall in last rainy season, sediment accumulated in front of the check structure is so far very little, filling only a sixth of total checking capacity of these four structures. Deposited sediment is originated from direct slumping of gully walls (accounting for 53%) and sediments flown into the gully from upward slope (accounting for 47%). Scoured product is negligible in sediments. This gully has not deepened nor extended during the rainy and post-rain period. On the reason why it has a bent, we have to take land use into consideration. It has been developed along a cattle path that turns a corner of existing wattle forest where the bent has appeared.



Distance: No.1 to No.2 = 25.5m; No.2 to Bent = 10.4m; Bent to No.3 = 11.4m; No.3 to No.4 = 5.5m; average width of treated gully = 1.1m; difference in elevation No.1 to No.4; 7.5m

Figure 4-3: Appearance of Treated Gully in TA 3

Table 4-12: Dimension and Observed Effect of Check Structure

No. of Structure	Height	Length*	Width	Length of apron	Volume of sediment; V = length×width×depth	Origin of sediment	Remaining space for sedimentation
No. 1	0.7	1.3	0.9	1.5	$2.1 \times 0.5 \times 0.2 = 0.2m^3$	Wall slumping	$0.5 \times 2.1 \times 0.5 = 0.5\ m^3$
No.1 ~ No.2	-	-	-	-	$13.0 \times 1.5 \times 0.12 = 2.3\ m^3$	Downward wash	$13 \times 1.5 \times 0.6 = 11.7\ m^3$
No. 2	0.9	1.1	1.0	1.4	$4.5 \times 1.2 \times 0.12 = 0.6m^3$	Wall slumping	$4.5 \times 1.2 \times 0.6 = 3.2m^3$
No. 3	0.7	1.2	1.0	1.8	$\pi \times 1.3^2 \times 0.4 = 2.1m^3$	Wall slumping	$21.8 \times 1 \times 0.5 = 10.4\ m^3$
No. 4	0.7	1.0	0.3	1.2	$\pi \times 0.3^2 \times 0.4 = 0.1m^3$	Wall slumping	$5.5 \times 1 \times 0.5 = 2.7\ m^3$
Total gully length = 52.8m, V/m = 0.05 m^3 / m					Total V = 5.3 m^3	Wall slumping 53%	Total space = $28.5m^3$

Note: unit of figures in meter and cubic meter, l; length, w; width and d; depth of sediments, length does not include excavated edge of abutment, that measures 40 ~ 50 cm for both sides of the structure.

This is a young gully just developed from a rill, and the head still remains as a rill. The gully head has not moved ahead since last onset of rainy season also because of scanty rainfall. However, the Study Team observed huge side-wall slumping in adjacent round shaped ravine gully with the drain into down-flowing stream, where both sides of walls have been widened by 2.5 meter on average.

4.3.4 Evaluation

a. Community Self-evaluation

As a first step for evaluating the piot project, the Study Team has conducted a community self-evaluation. The below table gives the result of the self-evaluation.

Table 4-13: Self-Evaluation by Stakeholders on Soil Conservation in the Pilot Project

T A	Villager's Participation	Effect of works	Problems arisen	Solutions	Future Plan
TA 1	Subcommitee member 17	Soil loss reduction proved	Fence maintenance	fortify maintenance	fruit trees on terraces
	Field manual works 77	Vegetative cover restored	Regular absentee	impose penalties	further training
	Monitoring/ follow-up ready	Written regulation not yet	Inert subcommittee	change chairman	weeding planted site
TA 2	Subcommitee member 43	Soil loss not well reduced	Low mobilization	avoid busy season	nursery utilization
	Field manual works 36	Vegetative cover yet grown	Termite damage	use resistant species	inside gully planting
	Monitoring/ followup planned	Written regulation not yet	Inert meeting	begin nursery work	constitution drafting
TA -3	Subcommitee member 19	Soil loss fairly reduced	Low mobilization	avoid busy season	fence improvement
	Field manual works 21	Grass cover not recovered	Trees not planted	procure saplings	fruit trees on terraces
	monitoring/ followup ongoing	Written regulation not yet	Training not done	ask help to NGO	additional gully work

Note: unit of participation person and man-day,

The self-evaluation results presented in the above table are summarized as follows.

(1) Villagers in TA1 evaluated the project to be effective as they felt that the soil loss was considerably reduced. They further expressed their need to maintain fencing facility and to plant fruit trees in the conservation area.
(2) Villagers in TA2 evaluated the project to be not so effective as they felt that the soil loss was not much reduced. They further expressed their need to plant tress inside the gully and to prepare the draft constitution for the sub-committee activities.
(3) Villagers in TA3 evaluated the project to be effective as they felt that the soil loss was fairly reduced. They further expressed their need to plant fruit tress on terraces, to maintain fence, and to make additional gully works.

b. Overall Evaluation

So long as soil conservation works are concerned, it takes at least several years until visible results are manifested, because erosion does not necessarily brings about visible changes within a year or two. However, for the convenience of reporting, an intermediate evaluation is quantitatively provided as the following table, with detailed check with PDM table shown in Annex D:

Table 4-14: Evaluation of Soil Conservation Component in the Pilot Project

Unit : % of initial target / anticipation

T A	Stakeholders Participation[a)]	Achievement of Works[b)]	Sheet Erosion Measures[c)]	Gully Trainings[d)]
TA 1	-	-	Trapped earth: 43 ton/ha	Ditto: 105 ton or 67%
TA 2	-	-	Trapped earth: 46 ton/ha	Ditto: 7.5 ton or 100%
TA 3	-	-	Trapped earth: 64ton/ha	Ditto: 5 ton or 53%
TA 1	Counterparts attendance 30 %	Contour terracing 100 %	Soil retention 70%	Soil retention 67%
	Villagers to field work 75%	Gully training 100 %	Using local material 30%	Using local material 70%
	Workshop attendance 70 %	Fencing 80%	Restoring surface cover 100%	Gully volume expansion 3%
TA 2	Counterparts attendance 40 %	Contour terracing 100 %	Soil retention 60%	Soil retention 70%
	Villagers to field work 25%	Gully training 100 %	Using local material 20%	Using local material 60%
	Workshop attendance 60 %	Fencing 90%	Restoring surface cover 30%	Gully volume expansion 2%
TA 3	Counterparts attendance 20 %	Contour terracing 100 %	Soil retention 65%	Soil retention 53%
	Villagers to field work 15%	Gully training 100 %	Using local material 10%	Using local material 90%
	Workshop attendance 80 %	Fencing 70%	Restoring surface cover 15%	Gully volume expansion 1%

Note:
a). Stakeholder's participation: i) Counterpart attendance = percentage of counterpart staff who participated in the project activities; ii) Villagers to field work = percentage of villagers who participated in the construction works; iii) Workshop attendance = percentage of the villagers who participated in the workshop
b). Achievement of works: Rate of the achievement against the target
c). Sheet erosion measures: i) The upper three rows give actually measured figures; ii) Soil retention = rate of trapping by structures to total runoff estimation; iii) Using local material = rate of using locally available material to total input to install structures; iv) Restoring surface cover indicates the rate of recovered grass coverage to total treated surface area. The lower rate in TA2 is due mainly to the poor climate and soil conditions. The same in TA3 is due mainly to the exploitation of the surface soils by heavy equipment.
d). Gully training: i) The upper three rows give actually measured figures; ii) Soil retention = rate of trapping by structures to total runoff estimation; iii) Using local material = rate of using locally available material to total input to install structures; iv) Gully volume expansion = rate of volumetric augmentation of gully space developed during pilot project period.

As for the villagers attendance rate in field works, TA2 and TA3 is quite low as 25 % and 15 % as compared with the one of TA1. In TA1, this soil conservation works were carried out at the initial stage before commencing other projects. Therefore, the motivation of the villagers was higher than the other area. Furthermore, there was a strong chairman of the development committee with leadership in TA1.

As for the using local materials, there was a lot of local materials available in TA1 such as tree branch, stone, sand, and so on. Bur there were less material available in TA2 and TA3, so that the rate of using local material is rather low.

Judging from overall results, the project purpose and outputs defined in the PDM (refer to Annex G.4) are considered to be mostly achieved as: i) soil conservation works were completed and maintained in three pilot areas; ii) awareness raising and sensitization on soil conservation has been promoted through the community workshops; iii) vegetation recovery at contour terrace areas has been observed in each conservation area; and iv) gully stabilization has also been observed in each conservation area.

Following table is the evaluation results which evaluated based on the five evaluation items.

Table 4-15: Evaluation of Soil Conservation Project

Evaluation Item	Evaluation
1. Efficiency	- Project output was mostly achieved as: i) the surface of cut belts in the contour terraces was covered with germinated and crept wild grass, leading to catching runoff soils; ii) sediment deposits were accumulated on gully floor; and iii) sub-committees were formed in each project area. - Reduction in construction costs was observed due to labour input through the voluntary participation of the community people. - Lower costs for construction of gully training were observed due to adoption of the cheaper construction method (e.g. use of sandbags instead of gabions)
2. Effectiveness	- Project objective was mostly achieved as: i) soil retention of 60 % to 70 % was observed at contour terrace areas; ii) soil retention of 50 % to 67 % was observed at gully training areas; and iii) participation of villagers to the construction works and maintenance works were considerably observed particularly in TA1. Participation rate was considerably higher in TA1 with 75%, but it was lower in TA2 with 25% and TA3 with 15%.
3. Impact	- Construction method adopted in the pilot projects will give strong impact to the similar projects to be conducted during the master plan implementation as the method proved to be cost effective. - Unfavourable impact was observed in the construction works in TA3 due to exploitation of surface soils by the heavy equipment.
4. Relevance	- The project is considered to be consistent with the national development objective as the soil conservation is one of the key component of the environmental improvement plan that Swazi government is pursuing. - Approach to the project planning is considered to be consistent with the people's needs

	as the participatory planning method was extensively utilized during the implementation of the project. The result of self-evaluation workshops indicates that the project is meeting the need of the community people as they have shown their keen interest to continue the project (e.g. maintaining the fence and planting of fruit trees).
5. Sustainability	- Although the soil conservation projects were implemented successfully through the participation of the community people, the community people still need the knowledge and skills for the maintenance works of the project. In this regard, the training programme should be prepared for the community people particularly on the maintenance of the soil conservation component.

4.3.5 Lessons Learnt

a. Invisible Process of Land Degradation and Necessity of Education

The Study Team acutely felt how difficult it was to make rural population fully aware of endangered land quality and to let them feel serious anxiety on soil loss and encroaching desertification. All the villagers are immune to looking heavily eroded scenery, taking it as a matter of course because they haven't seen less degraded or healthy land in and out of the country. For the majority, although they are coming to understand the importance to take due action to conserve land, it is so to speak a fire incident taking place in a town far from their place, too far to attach immediate priority. In the developed world, for instance in Japan, almost nobody pays attention in his daily activity to soil erosion and water conservation despite the fact that population is increasingly confronting acute shortage of urban water and electricity supply especially during summer.

Inevitable activities should be acknowledged if they are essential for rural population to sustain BHN. Since land degradation is caused by overstocking to keep one's surplus wealth and its substitution by saving in city banks, it is difficult to stop land degradation only by expecting generous action of the people. This is a matter of common courtesy that can be cultivated only through a long process of public school /adult education. For this reason, the Study Team would like to submit to GOS a guideline for wider use as a sub-textbook for school children or adult training, trying to improve basic attitude toward environment at large.

b. Land Degradation Measures as Public Works

The experiences during implementation of the pilot projects indicate that the soil conservation measures should firstly be conducted as the public works. The reason is that the project works require the various kinds of project activities including the procurement of funding sources, the selection of the sites, adoption of proper construction measures (e.g. design and technical aspect), arrangement of community workshops for the project activities, arrangement of training programme for the community people, sub-committee formation, arrangement of heavy equipment for the construction works, and so on. It will be absolutely difficult for the community people to conduct all these activities by themselves. It has been learnt from the pilot project that firstly the project should be conducted as the public works and after the completion of the project facility, the operation and maintenance works will be conducted by the sub-committee members who are selected in each project area under technical support from the concerned agencies.

4.4 Grazing/Range Management Project

4.4.1 Objective

As mentioned in the background of this Study (2.2.2.e), Swaziland National Action Program has asserted that land degradation is attributable to traditional grazing. The project proposed herewith has objective of verifying a proposed solution, namely rotation grazing in the TAs. It has also an indirect objective of enabling grazing people to experience other way of keeping cattle than the most primitive one, the rangeland grazing, thereby suggesting them to get rid thereof with an aim of minimizing progress of land degradation that will lead to poorer carrying capacity.

4.4.2 Implementation

a. Physical Appraisal Of Pilot Projects

a.1 Eni/Ngcayini (TA1)

There were two grazing schemes established in TA1, one in the Eni Chiefdom and the other in the Ngcayini Chiefdom. In size the schemes are somewhat similar as the scheme at Eni covers an area of approximately 90 ha, whilst that at Ngcayini covers an area of about 110 ha. The Eni scheme is on top of a large hill, which has steep-sloping often eroded sides. The scheme at Ngcayini is on a relatively flat piece of land that has steep sides going down to the Mbuluzi River on its northwest side and on of its western tributary. Both are five-paddock schemes. The fencing is sound, with straining posts at all major changes in direction.

Both schemes use five-strand barbed wire fencing on the perimeter and four-strand barbed wire fencing for internal sub-divisions and around protected erosions gullies to control movement of cattle – they are not goat-proof fences. Gates are strategically placed to allow easy access of livestock by farmers living around the scheme and to allow for easy rotation of livestock through the camps. All camps have access to year-round surface water.

The two chiefdoms share a single beef-fattening unit between them – this is positioned not far from the Mbuluzi River and just round the slope from the Ngcebo Dip Tank. This consists of a feedlot big enough to hold 10 fattening beasts. There are a feed trough, built of bricks and cement, a water trough, built of concrete and with running water supplied from a nearby perennial stream, and a wooden race for catching and handling animals that require attention. This is supported by a lockable brick storeroom in which supplementary feeds and veterinary medicines can be kept securely. Finally, there is a 4 ha plot for fodder production, consisting of a mixture of fertilised Napier fodder (*Pennisetum purpureum*) and bana grass (*P.purpureum x P.glaucum* hybrid), which is fenced with a five-strand barbed wire fence – again, this is not goat-proof fencing.

a.2 Macdvulwini (TA3)

There is only one scheme in Macdvulwini. It covers an area of about 280 ha and covers almost the whole the Ntabamhlophe Hill to the south and west of the Mhlatane River headwaters, plus some of the adjoining hillside to the south of the Ntabamhlophe Hill below and to the north west of Macdvulwini School and round to the east of this slope to the north west of the Landwado Dip Tank. A five-strand barbed wire fence is used in the perimeter and a four-strand fence is used internally – this is not goat-proof fencing. It covers an area of about 280 ha and is sub-divided into four paddocks. Fencing is sound. Gates are strategically placed to allow easy access in and out of the scheme and through the scheme. All camps have access to year-round surface water.

There is a feedlot similar to that shared by Eni and Ngcayini, but near the Nkundhla Dip Tank, near the top of the slope to the north east of the Ngwempisana River.

b. Project Design Matrix Used for the Final Evaluation

The final Project Design Matrix (PDM) Tables for the fenced rotation grazing management pilot project are shown in Annex C.4 for activities in TA1 and TA3 respectively. These show a summary of the projects' purposes, results and outputs as well as listing activities. These Tables are an amendment of the original design matrix tables and have been changed to reflect the different phases of the pilot project design, different target area locations as well as the alterations and fine adjustment of scheduling of implementation. These changes were made as the start of the projects in TA1 and TA3 was different. The construction of the facilities in TA1 was completed in October 2002, while the same in TA3 was completed in March 2003. So each PDM for each pilot project area was prepared for the final evaluation.

c. Implementing Agencies

Planning was undertaken with active participation of communities. Communities, in consultation and with the agreement of their elders and traditional leaders, selected sites from the communal land where project activities could take place. With facilitation of the project, communities elected leaders amongst themselves and formed management committees to undertake the various activities, including an overall development committee, grazing scheme committees and feedlot committees. The services of a NGO, active and experienced in development work in Swaziland, was used to train farmers in Siswati in erection of cattle fences, construction of beef fattening units, planting of fodder. Government provided general training on grazing management in Seswati and a small consulting company provided specific training on fodder production and management and feeding of cattle being fattened in a feedlot. Government also facilitated the holding of community workshops, and inter- and intra-site visits. Communities provided the manpower needed for development activities.

4.4.3 Achievement

Achievement are described briefly below whilst a summary of accomplishment have been prepared in PCM table format and is presented in Annex C.9.

From these it can be seen that there has been successful development of infrastructures using a participatory approach in both planning and implementation:

- Structure of fenced rotation grazing has successfully been completed at three sites, covering 90 ha, 110 ha and 280 ha respectively. They have already been stocked according to rotation plan. Since the engaged cattle owners in this practice have no experience on this grazing method, they have so far failed to keep records on numbers of head entered into camps. Control of herd to suitable size to let in camps at one time seemed difficult by the reason if the herd size was limited to allow rotation grazing, then the surplus heads must have been fed on other rangeland than they used to graze. This would be rejected by the range keeper concerned. Time for evaluating rotation performance is too premature because regeneration of grazing grass within camps can be observed from the onset of coming rainy season.
- Two fodder plots, each covering 4 ha, have been established, of which one located in TA-1 succeeded in fodder (napier grass) production A two ha fodder plot now feeds 4 heads of fattening cattle in TA1, but the other plot in TA3 has failed to produce the fodder because there was not enough rain during germination. In this connection, two fattening units, each capable of accommodating 10 cattle, are currently used to fatten 3 males and 1 female cattle so that the fattened cattle will be offered for sale.

In addition, management of these facilities and feeding resources has already began:

- 3 grazing management committees – there are men and women on these committees, assigned with various duties, and they are learning their tasks; these committees have had general training in grazing management
- As to 2 fattening management committees, one at TA-1 is now managing the feedlot there. While the other in TA-3 has currently no work due partly to failure of fodder cropping, partly to seasonal working out of village (casual labour for pulp wood logging). However, this doesn't mean liquidation of the committee and it can resume its activity as fodder grows up.
- 2 plans of operation have been prepared in consultation with and by the communities and their committees, along with constitutions and by-laws for the management of the grazing areas; the by-laws have still to be developed for the feedlots. Whilst the intention is to register these with the Department of Co-operatives to make them enforceable by law, this has not yet occurred
- Although not systematically done so far due in part to the hardships imposed by the recent poor rainy seasons, some funds have been collected from community members toward the maintenance of the facilities that have been erected and constructed. At TA3, this has been placed in a savings bank account, but not at TA1 who are in the process of opening such an account.

In terms of impact on grazing condition, species composition, litter cover, basal cover, erosion and compaction of soil surface, productivity all remain generally poor – this is in part due to unfavourable rains and slower than expected rate of implementation of the projects. There have been basically no impact on range condition as full benefits of the approach have yet to be realized – however it is anticipated these will materialize over time once the facilities have been running for some time and if management and use of the facilities is according to design and if there is the implementation of a sustained supportive training and extension programme by government staff. This participatory approach has been useful and should contribute to the sustainability of these projects.

A potentially negative aspect to progress so far is the desire by some influential members of the community to change the communities' objectives and purposes for the development of these infrastructures – namely, whether intentionally or not, to thwart the primary use of the facilities being to commercialize livestock production.

4.4.4 Evaluation

a. Community Self-evaluation

Following implementation of self-evaluation workshop was held to allow management committees to report back on progress of the pilot projects and for communities to make their comments.

Self-evaluation results have been summarized (Table 4-16), focusing on: a) advantages obtained by the activities as felt by the people, and b) constraints encountered and their possible solutions. The specific issues or comments raised in a particular TA are indicated with brackets and others are common issues.

Table 4-16: Self-Evaluation Result of Grazing, Feedlot and Fodder Plot Projects

Advantages Obtained By Activities
• learnt how to fence grazing land and now are able to maintain the facility; now just waiting for the rain to come to start using it • membership lists are prepared and the constitutions are written for all (3) grazing schemes • some subscriptions have been banked (TA3)

Difficulties Encountered	Countermeasures Proposed
• there is a problem of fence cutting at Ngcayini (TA1)	• those who cut the fence will be punished by the elders; it is necessary to ask the elders for more assistance and understanding of the matter
• many community people are still not yet sure how to use and manage the fenced area for the feedlot and grazing area	• need more training on how to use the feedlot and grazing area
• rotational use of grazing camps has not been well managed yet	• start again next summer (rainy) season

From this it is evident that there are two problems, both stemming from a common cause of lack of training. The first is leadership training and how to tackle the issue of discipline by the management committee. The second is a lack of specific technical training on use and management of the units. These can be addressed by a close watch and extension activities by the range management staff especially during the next rainy season. With respect to the feedlot, specific training has subsequently been given after these workshops and farmers are now actually using the fattening facilities at TA1.

b. Overall Evaluation

A summary of overall evaluation is presented in Table 4-17. Comprehensive evaluation summaries on different factors of evaluation using PCM table format are presented in Annex C.10. From these it can be seen that although the project purposes are not fully achieved (e.g. sale of livestock), the project is considered to be mostly successful. For the future successful implementation of the project, communities will need support from the government agencies in terms of the technical trainings.

Table 4-17: Evaluation of Grazing/Range Management Pilot Project

Evaluation Item	Evaluation
1. Efficiency	- Project output was mostly achieved as: i) 2 sets of plans of operation produced; ii) sub-committees formed; iii) 3 fenced rotation grazing schemes erected; iv) 3 constitutions/by-laws produced for fenced grazing; v) 1 fodder plots established; vi) 2 fattening pens constructed - Project output in TA3 was partly achieved as the construction of feedlot and fodder production were delayed due to bad access to the site.
2. Effectiveness	- Project purpose was partly achieved as: i) whilst various facility and management structures are in place, not all are fully operational; ii) rotational grazing in TA1 and TA3 are operational; iii) feedlot operation and fodder production in TA1 started but have not been fully operated; iv) feedlot operation and fodder production in TA3 are not operational.
3. Impact	- As the projects are partly operational, there is no discernable impact, neither positive nor negative, on achievement of the project purpose. - It is anticipated that once the projects will be fully operational and farmers become committed to a business approach to livestock keeping, soil erosion, at least on grazing areas, will be significantly reduced.
4. Relevance	- The project is considered to be fully consistent with the country's development strategy as the government's policy is to halt and reverse soil degradation in the country through the control of grazing schemes, and its policy and commitment remain unchanged. - Approach to the project planning is considered to be consistent with the people's needs as the participatory planning method was extensively utilized during the implementation of the project.
5. Sustainability	- The project includes the sub-components of rotational grazing, feedlot operation, and fodder production that are not familiar to the community people. It will be necessary for the community people to accumulate the experiences in conducting such projects. - Technical support and advice should be provided by the relevant government agencies continuously from now onwards for the sustainable operation of the project.

b.1. Erection of Structures

Although physical structures were generally built to high standards, this was due to the experience and the guidance given to the communities whilst these activities were conducted. It is felt that communities require this supervision if these kinds of structures are to be built to last a long time. Time required to complete erection was severely underestimated as was the labour requirement and the labour availability and this delayed the completion of structures in a timely fashion.

b.2. Change in MOAC/Community People's Capability through Implementation of the Pilot Projects

Counterpart staff have had the opportunity to engage in participatory interaction with farmers in the Pilot Project areas, taking farmers first through a series of workshops designed to identify problems and then determine alternative opportunities to plan use of their resources. These resulted in planning workshops and finally a self-evaluation workshop for the communities. Very clear from this was that farmers want greater participation of government staff in assisting them to overcome their knowledge deficits through provision of a regular training programme. Such training programmes would be of most benefit if government staff have been through the process with farmers as they have developed.

Not withstanding the above, it is important that there is regular supporting training provided to farmers and community members as part of an ongoing sustained implementation of a long-term extension and training programme from members of the Ministry's Range Management Section. In particular Range Management Officers need to provide assistance with respect to management issues and technical information. On-going leadership training for the committees' members is also important.

b.3. Organization/Constitutions Established Under Pilot Projects

Some considerable time has been spent with development and grazing management committees which has led to the development of written Plans of Operation. In future these need to be prepared in Siswati. Out of these have resulted the development of grazing scheme constitutions/by-laws for the three schemes for fenced rotation grazing management developed in these pilot projects. These constitutions give enough guidance for communities and committees to operate but need review at least and sometimes even revision.

b.4. Training Programmes Conducted

Training in identification of problems and solutions by communities has been provided through participation in guided workshops. Short training sessions have been held on developing plans of operation and production of a constitution and by-laws. Committee members have also had the opportunity to obtain some leadership training. Finally a short overview of grazing management and cattle production in Swaziland has been given as well. A formal session on beef cattle fattening and the management of feedlots given by an NGO has been well received – this needs back-up supporting extension and training from government staff.

So far all this training has been provided to the committee members and not to community members. There is need to develop a routine extension programme of visits which would provide training on a regular basis and no less often than once a month. Inter- and intra-site visits as well as the visit to Lesotho, to see and hear from other farmers what they are and can do goes a long way to stimulating confidence and an appetite to undertake new activities.

4.4.5 Lessons Learnt

a. Selection of Target Group

The above cited reflection of the result suggests that villagers with subsidiary income sources out of their home village found in TA-3 are not very much willing to be engaged in labor oriented works inside village like fattening for which they should pay feeding. Rather, they prefer hitherto extensive grazing to new feeding system. However, there are many lowland villages in TA-3 where fewer chances of working outside villages are available. Such villages are suitable for introducing new, labour intensified activities like fattening and higher demand for such activities are anticipated. Therefore, the selection of target group should carefully be made taking into consideration of the local situation. The interested people will be firstly selected as the target group and then the group will be expanded to the surrounding areas.

b Necessity of Training and Communication

It has been learnt that specific training on all aspects of planning, monitoring, participation and management of the project is vital for the community people to be able to carry out the management of the projects on their own. At the same time, the communication between the stakeholders will be considerably important for the proper management of the project. In this regard, fortified training and closer communication among members and extension staff through frequent meetings are desirable to rectify current managerial drawbacks to improve function of the implemented projects.

c. Required Leadership

It was also felt that leader's character had a close bearing to functional performance and positive attitude towards introduction of new attempts into the community concerned. It follows that competent persons should be posted to leading staff or cadres of the committee, and leadership training should frequently be prepared for village leaders. Likewise, complete involvement of village elders into newly planned activities seems essential precondition to make it fully sustainable and successful, judging from the performance of individual grazing projects with failure of involvement in TA-2 due to long absence of village chief.

4.5 Agro-forestry/Community Forestry Project

4.5.1 Objective

The main objective of the Pilot Projects is to practically test cost- effective methods of afforestation and to draw lessons, which will lead to successful afforestation in the Target Areas and the country as a whole. Specific objectives of developing sustainable afforestation methods will be learnt, through establishment of a tree nursery, field afforestation and Agro-forestry technology of improved fallow with the active participation of the communities.

4.5.2 Implementation

a. Selection of Activities

One of the main problems, which was articulated by the community in the course of brain storming workshops was lack of planting material in the fields and the grazing areas. To overcome this problem, an integrated tree nursery in TA2 was established. So far the constraints encountered in its construction, lessons learnt on community participation and a host of other problems in material procurements etc is fulfilment of an important objective of learning how tree nurseries should be developed. In addition to this learning process, the nursery aims at producing both fruit and tree seedlings for the community at large. The

nursery will also serve as a training area in some of technical issues such as grafting of seedlings and implementation of some of the Agro-forestry technologies, which are proposed.

The other problem being experienced by particularly the community in TA 2 is acute lack of fuel wood and building material. The objective of the afforestation pilot project in the area was to test if tree planting can be undertaken efficiently on difficult sites to provide wood material while at the same time addressing land degradation. The objective has been realized by woodlot planting on site one where practical lessons of community involvement, dry land planting, appropriate land preparation and tackling termite problems were all experienced.

The other major problem is that of soil fertility in fields where crop yield have continued to deteriorate. Improved fallow technology aims at addressing this problem. Seeds were germinated for improved fallow and the delicate interventions which were applied in seed preparation, germination management, and transplanting onto polythene tubes will at least prepare various stakeholders on a more efficient manner of implementing improved fallow technology in the three Target Areas.

b. Tree Nursery

The major activities undertaken in respect of tree nursery were initial survey and appraisal of the existing tree nurseries in the study area, actual construction of an integrated tree nursery in Zikhoteni Chiefdom, TA2 for the community and training of the community on nursery management. Major inputs included the many days the community spent in undertaking various activities, Government officials, especially the Forestry Section and the consultants' facilitation. Specifically, the following activities and inputs were undertaken.

b.1 Survey of Tree Nurseries:

The Forestry Section staff and the consultant visited all the existing tree nurseries and assessed them in terms of tree species grown, stocking rate, and quantity of planting material, location and the state of the tree nursery. One main observation was that the tree variety in the various tree nurseries (the country has only 6 tree nurseries which are Government owned) was quite limited and the number of seedlings were also very little compared with the country's demand for seedlings. Management level practices were also not adequate. Though located in the study Areas, the Target Area did not have any tree nursery.

b.2 Procurement of Tree Seeds from Tanzania and Kenya:

There are a number of tree species, which the country does not yet have for the various components of afforestation. To achieve initial stock, a total of 14 kg of seeds of important tree species were imported from Tanzania for afforestation, Agro-forestry programme and rehabilitation. The species imported were: Acacia xanthophloea (2kg), Calliandra culothyrsus (1kg), Dovyalis caffra (2 kg) Faidherbia albida (3 kg) Hakea saligna (1 kg) Khaya anthotheca (2 kg) Leucaena leucocephala (1kg), Lonchocarpus capassa (2 kg). The seeds are stored in Malkerns Research Station Forestry Seed Centre for future use in establishment of Seed Orchards and rehabilitation programme.

Following facilities were constructed under the tree nursery pilot projects.

- Water intake, water tank and its delivery pipe
- Fencing to cover 1 ha of nursery
- Nursery beds to germinate seeds
- Light house and nursery shed to facilitate growing of fruit and tree seedlings under various shading regimes

b.3. Training on Nursery Management

As a part of capacity training, 10 key community members from TA2 were trained in nursery management at the Malkerns Research Station. The key committee members received three

days residential training, which was conducted by the Government officials from the Forestry Section and Agriculture. The Agriculture officials in particular trained the community members on grafting and other horticulture issues. The topic was deemed important because the nursery will also be producing horticulture commodities.

The training was opened by the Principal Secretary, Ministry of Agriculture and Co-operatives. He urged the community to take the issue of tree planting seriously as a way of rehabilitating the degraded lands in the rural areas. See annex on training.

c. Afforestation

Afforestation was designed for the purposes of production of wood material, mainly poles, fuel wood and also as a rehabilitation strategy. In this respect, three sites were identified with consultation of the local community in TA 2. These were the badly degraded sites where no other land uses could be made. Briefly the major activities and inputs were:

During the early surveys of the community needs, among the issues that came up were the lack of building material and fuel wood. The community therefore suggested a need for afforestation. To this end the community identified and donated the land, which should be afforested.

The first major step was to fence off animals from the identified areas so that overgrazing, itself a major cause of soil erosion and development of gullies could be halted. An area of 3 ha each was therefore fenced and a lockable gate erected on each site.

On one site, land preparation in form of ripping and construction of cut off contours was undertaken. This was to encourage maximum moisture infiltration during and after rain for the planted trees and also to minimize runoff, which causes soil erosion.

During rain season of December 2002, about 58 member of community dug holes and planted approximately 6000 trees of eucalyptus and a few wattle trees. The eucalyptus trees planted were cross of grandis and camadulensis; grandis and erophylla, and Eucalyptus Dunni. To give the plants a boost in the initial stage, aquasoil was used. This is a chemical, which facilitates in retention of moisture as planting was done at the end of rain season.

The post planting maintenance has mainly been some spot hoeing around the trees and application of anti-termite spray on a few stems, which were attacked by termites.

Elaborate afforestation guidelines have been produced in consultation with the Forestry Section and given to the nursery committee. The NGO, which facilitated afforestation closely followed the guidelines and confirmed that in future the community can undertake afforestation using such guidelines.

d. Improved Fallow

The major activity to be undertaken in respect to this component was tabulated in Table below. Sensitization and training of interested farmers and provision of AF seedlings (Sesbania sesban) were already completed, but actual planting on seed bank and farmers' plots could not be completed because they have to wait for next rainy season for planting. It is envisaged that 90 farmers, or 30 from each TA will introduce this technique into 50% of their staple field (12 ha per TA). In brief, so far extended activities concerning technology transfer include:

A total of 5 kilograms of Sesbania seeds were imported from Kenya Forestry Research Institute by the Forestry Seed Centre, Malkerns Research Station.

Some of the seed was germinated at Malkerns Research station and germinates transplanted onto polythene bags ready for planting. Other germination was undertaken at Ludzeludze Rural development Area (RDA) nursery.

To ensure sustainable source of seeds, a small seed orchard of *Sesbania sesban* was planted next to the tree nursery in Malkerns Research Station. In addition, a small on-farm experimental plot was also established at Ludzeludze. This plot will be monitored for soil fertility.

The guidelines on how to establish improved fallow has been made. The Forestry extension officer participated in production of the guidelines. In addition, benefits and establishment procedure of *Sesbania sesban* has been produced and with assistance of Forestry Section, the same has been translated in *Siswati* and distributed to 90 farmers in all the Target Areas.(ie30 farmers per Target Areas.)

e. Summary of activities and outputs

All activities mentioned above could be summarized below with the outputs lead by those activities.

Table 4-18: Summary of activities and outputs

Component	Activities	Output
Integrated tree nursery	1. Survey and construction of water supply	Water on nursery site.
	2. Demarcation and fencing of nursery site	Prepared nursery site
	3. Construction of water supply	Water tank ($70m^3$) and laid pipes in place
	4. Construction of buildings and seedbeds	Light house 225m2 and seed beds.
	5. Material procurement	Nursery tools and equipment
	6. Training on nursery management	Trained and sensitized 10 nursery committee.
	7. Preparation of guidelines & constitution	Guidelines and working procedure rules.
Afforestation	Identification of afforestation sites	9 ha set aside by the community for forestry
	Protection of afforestation sites	Fenced area ready
	Land preparation	Area with ridges for moisture conservation at site
	Tree planting	3 ha planted with vigorous growing trees
	Afforestation guidelines	Reference material on planting ready.
	Community sensitization	Active community available.
Improved Fallow	Sensitization of farmers	Existence of well informed farmers.
	Seed procurement for the technology	5 kg of *Sesbania sesban* availed in the country.
	Seed germination	Approximately 36,000 tree seedlings ready for planting in nursery
	Establishment of seed source and experimental plot	Small seed orchard ready at Malkerns and a small plot of 80 m^2 ready at Ludzeludze nursery.
	Production of technical information.	Guidelines for 90 farmers ready. Also literature on benefits and establishment procedure available in field.

4.5.3 Achievements

a. Integrated Tree nursery

a.1 Major achievement

One of the achievements is establishment of the necessary nursery infrastructure in TA2. Most of the developmental activities on the integrated tree nursery in Zikhoteni have been completed. So far, a concrete water tank with a capacity of 70 cubic metres has been built. Water supply from the spring has also been completed and is flowing well with adequate gradient. During the dry spell flow is fairly limited. Construction of water from the main river has also been completed and is also now flowing well into the storage concrete tank. The water is currently being used for nursery construction and the community garden next to the integrated nursery. Hence the community is already benefiting from this component.

A bigger area than required for the actual nursery running has been fenced and reserved for demonstration purposes such as fruit trials, tree species selection and improved fallow. Necessary terrace for seedbed has also been completed. Also a lighthouse has been constructed on the prepared terrace. Shed house, which will also be used for training and other social communal functions, has already been constructed. Currently 18 seedbeds of 10 metres by 1.2 metres have been constructed. The road to the nursery has been opened and the area is accessible by vehicle using the earth road

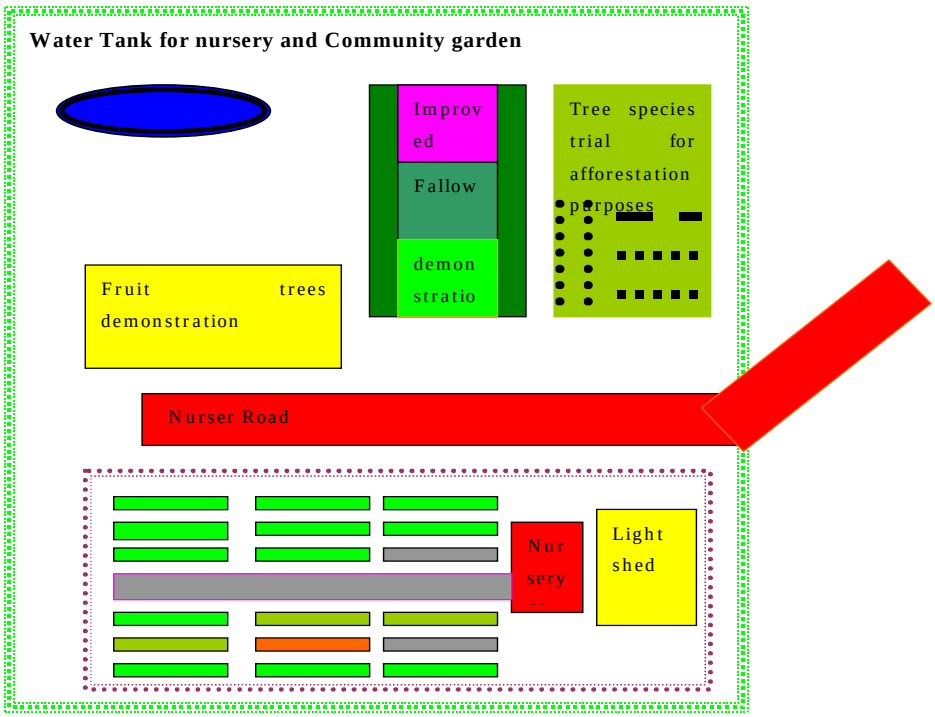


Figure 4-4: Sketch of the Nursery at Zikhoteni Chiefdom

A nursery committee of 15 sensitised members who have fully paid membership fee is now in place. Of the 15 members, ten of them have already been trained and further sensitised on nursery management. Certificates of participation were prepared and issued to the committee members.

The tree-planting programme will initially require some useful tree species whose seeds are currently not available in Swaziland. A stock of 14 Kg of assortment of seeds have been imported from Tanzania and are now stored at Malkerns Research Station for future use

Additionally necessary tools, equipment and consumable material have been bought and kept in the store at the Seed Research Centre in Malkerns to be handed over to the community as soon a as lockable store at the community nursery is completed.

a.2 Major tools used for the community nursery

The following tools were used for preparation of the community nursery.

Table 4-19: Tools procured for the community nursery in Zikhoteni

Main Categories	Component	Unit	Quantity
Shade Material m	80% shade 216 m; 50% shade 432 m; 30% shade 216 m		
Tools and equipment	Drums	no	5
	Watering cans	no	12
	Buckets	no	10
	Shovels	no	10
	Agri-knife	no	20
	Hand axe	no	10
	Measuring Tape	no	2
	Nails	kg	30
	Levelling rakes	no	10
	Wheel barrows	no	10
	Hoses	m	100
Consumables			
	Polythene pots	no	15,000
	Rope	m	100
	Fertilizer	kg	2,500
	Chemicals	kg	20
	Timber	m	100
	Seeds	kg	15

The nursery site will also be used for demonstration of afforestation, improved fallow and fruit trees as indicated in sketch above.

b. Afforestation

One site has been fully planted with eucalyptus and wattle trees. Other sites have been fenced and land preparation undertaken awaiting only rain. Regeneration of trees thus protected is also taking place and this will have favourable effect on halting advance of the gullies. Tree growth achieved on site one is commendable. The tree were planted in December when their heights were about 15 cm, but height measurements in February 2003, indicated that some fast growing stems had attained heights of 48, 58 and 69 cm respectfully. This is an average height of 58 cm in two months or an incremental growth of 43 cm, which averages to 21 cm per month of early growth.

Subsequent measurements of heights in June 2003, or six months after planting indicated that some tree had attained a height of 165 cm, an increment of 150 cm from the planting time. Again the average growth of the dominant trees per month was 25 cm, a normal growth pattern which accelerates in the beginning before tailing off. Overall, good growth has been obtained considering that this was a dry winter period when condition of growth were generally low.

Also some poplar trees have been planted inside the gullies with view to stabilizing advance of the active gullies. Land preparation which included, ripping, water check contours, redirecting water away from the advancing gully and digging of holes for plants has been undertaken. Adjacent grass and any remnant indigenous vegetation has successfully been conserved in the course of land preparation. There is now a land fully prepared for conservation and planted with trees.

The other achievement on afforestation is demonstration that it can be done and be sustained even on difficult sites, which would otherwise have very limited other land use and susceptible to accelerated land degradation. Inter-location tours were taken to the afforestation sites and discussion among the community tour participants indicated that there was a lot to learn. Judging from their discussions during the tours, many of them were motivated to start similar afforestation programmes in their respective areas. Local community members have now developed a sense of ownership, an important objective of the project. Pulling the community together to do the afforestation was an important achievement considering that people don't see personal immediate direct benefit on afforestation and generally most of land conservation activities.

Necessary afforestation guidelines have been produced and successfully tested in afforestation of site one. The guides will be handy in afforestation of not only the Target Area 1 but other parts of the country.

c. Improved Fallow

The main achievement in regard to this technology is actually sensitisation of farmers on the benefits and establishment procedure of improved fallow. Already the farmers are anxiously waiting for seedlings to plant and have requested for them during most of the participatory workshops. A total of 86 farmers have signed as the initial people who will implement the technology.

Guidelines on establishment and benefits of the technology have also been produced. Benefits and establishment procedures have also been translated and distributed to the farmers. The other major output is establishment of seed orchard for Sesbania sesban and planting of experimental plot. These will lead to sustainability of seed source if properly protected.

4.5.4 Evaluation

a. Community Self-evaluation

Self-evaluation results by the community people are summarised as focusing on a) advantage obtained by the activities which people feel, and b) Constraints encountered and their solutions discussed.

Table 4-20: Evaluation Results of Afforestation

Advantages obtained by the activities	
- Planted trees are growing lively, although the land was compacted due to cattle overgrazing (TA1, 2). - Feel that soil erosion and degradation is being reduced on the site where the trees were planted (TA1, 2).	
Difficulties encountered	**Countermeasures**
- Goats and other animals are coming into the conservation site and disturbing trees (TA2).	- Need to discuss with community people including traditional authority. - Talk with the owner of the cattle.
- Although the area was fenced, no maintenance has been done (TA2).	- Need to discuss with community people including the traditional authority.
- Need to slash grasses for preventing fire hazards (TA2).	- Slash grasses so as to reduce weeds.
- Some of the trees have been damaged by termites (TA2).	- Control the termites with using chemicals. - Need of training on termites control.

Table 4-21: Evaluation Results of Nursery

Advantages obtained by the activities	
- Feel that the community as a whole have been improved and developed since we have nursery - The water tank built beside nursery may also provide water to homesteads.	
Difficulties encountered	**Countermeasures**
- There is a fear of damage nursery trees by termites, since we have experienced in the trees on contour terracing.	- Need technical knowledge on how to control termites.
- Only 14 sub-committee members who offered field labour paid E10 of joining fee, and it was decided that the rest who didn't join in field labor should pay E250. Some of these non-participants complain of this large difference, yet to agree at a reasonable rate of member fee.	- Need to discuss with community.

b. Overall Evaluation

The evaluation will be developed as verifying the achievement of those outputs, with discussing the efficiency, validity, sustainability and indirect impact by the activity.

Evaluation criteria	Evaluation
1. Efficiency	• Sub-committees for Agro-forestry and nursery management were formed without delay and they are leading the other members of the community to participate in the various forestry activities. The committee members willingly attended the training on nursery management (June 2000), which has contributed to improvement of their management skills. • Without delay the community identified source of water and subsequently dug trenches to lay water pipes up to the water tank which is currently being used for the nursery and community garden. • The construction costs of the nursery in Zikhoteni and afforestation activities were greatly reduced due to the supplied labour force by the community. Though the construction of the nursery was delayed, it has achieved the expected output, as people will soon start using the facilities. • Local community committee members were able to explain various aspects of nursery and afforestation to the communities from other Target Areas. • Tree planting on site one was completed within one day and thus taking opportunity of the limited moisture.
2. Effectiveness	• The afforestation was done in 3 ha as scheduled, with the aim of producing firewood, poles, income generation and environmental protection. • At the moment, tree seedlings have been produced in the nurseries owned by government. The seedling production in the nursery in Zikhoteni will start after the second training course held in Aug-Sept in 2003. • On improved fallow, the seedlings are under production in Malkerns Research Station and at Ludzeludze RDA. Already vigorous growth of *Sesbania sesban* was achieved in the two nurseries. It is expected that the seedlings will be distributed to each farmer and will be planted in rainy season. • A few of the seedlings which were produced at Malkerns Research Station and also at Ludzeludze have been planted and thus producing future supplies as well as basis to monitor growth and benefits of *Sesbania sesban*. • Already, there are signs that farmers are more articulate on matters of land rehabilitation by use of afforestation. • Already the project has provided water, which is being used for nursery and community purposes. • Termite prevention measures undertaken were quite effective as no major damage on young trees has been noticed in spite of the fact that the trees were planted at the tail end of rain. Additionally the species planted are otherwise very prone to termite attack. • The distribution of seedlings from Zikhoteni nursery was not conducted due to

	the delay of the construction of the nursery facility.
3. Impact	• As a whole the community is well sensitised by the presence of the project. For the first time, concept of community nursery and general project ownership is evident from the way the community members discussed the project with their colleague and the Government officials. • The depth of discussion towards the end of training as well as self-evaluation undertaken at the end of the course indicated that the training achieved its desired result, namely capacity building among the grass root community. • The management techniques of nursery, seedling production and plantation are new to the community. However, it is accepted positively by the community people and their efforts are showing positive impact to environment improvement, which is one of the important policies of Swaziland Government. • It will take time until the afforestation project would have considerable impact on the improvement of the degraded land.
4. Relevancy	• The activity will lead to the improvement of income and contribute to protection of environment. In this sense, the activity is relevant to the national policy as well as the felt needs of the community people. • As a part of income generation, the project is likely to reduce poverty, itself one of the causes of land degradation and other harmful environmental activities. • There are some degraded sites for which other land uses are limited. The project has demonstrated that the areas can be put to useful purposes of tree planting for both fuel wood and ecological protection.
5. Sustainability	• The management of the nursery requires a lot of experience on technical matters as well as in management aspect, which are both new to the community people. To this end more efforts and backup will be expected from the government to maintain the community momentum. • Already the community has shown a sense of ownership and interest in project activities as evidenced by their attendance to project meetings and active participation on implementation activities. Community ownership will lead to the desired sustainability long after the project funding. • The major government support will be in provision of skilled people initially followed by occasional extension services. This will boost community involvement in project. • The community has indicated considerable interest on the project and this interest will greatly contribute to project sustainability.

4.5.5 Lessons learnt

a. Community Involvement in Planning Stage

One major lesson is that involvement of local community in planning and design of the project is very necessary for the successful implementation of the project. Opportunities should be given to as many community people as possible to join in the project workshops at the initial stage as conducted during the pilot project stage. In this regard, it should be considered that there might be a few people who may not appreciate the project due to some reasons. The community workshops at the planning stage will be helpful for the mutual understanding among the community people even if there are some people who may not appreciate the project.

b. Needs Assessment through Community Workshops

The local community people in the respective target areas are generally aware of their problems as clearly shown during the brain storming workshops held during the pilot project planning stage. As some of the community people have useful experiences on the implementation of the community-based projects, such experiences could be tapped for project implementation. Other than technical skills, the people are articulate on their needs and were able to identify a series of constraining problems which included lack of fuel wood

and planting material. These problems identified in the community workshops should be properly reflected on the planning and implementation of the projects.

c. Nature of the Projects

One often hears comments that community would not be interested in projects where they don't see personal immediate benefits. It has been demonstrated on site that the community appreciates the project activities. For example, local community provided very demanding labour in digging out trenches for water pipes for the tree nursery. The community also participated in tree planting in site one and are now regarding the trees thus planted as their own, judging from their discussion with members from other Target Areas. The fenced off areas for forestry are not grazed in order to protect the trees thus planted and where planting has not been undertaken, regeneration promotion of the indigenous forest is also an approach being appreciated. Two mutually opposite characters were observed in rural people's behaviour. As individuals, they prefer things that may bring profit to individuals, however, as members of a community, the same person is willing to cater for non-profitable public activities like social forestry, pursuing rather honour than profit. This behaviour could have been utilized by emphasizing public importance for selecting the committee member for non profitable projects such as soil conservation project, where the people normally would not intend to be involved.

d. Capacity Building to Community and Member Binding Rules

Private sector capacity to do afforestation activities is rather weak. It has taken quite long to do construction activities in the nursery and afforestation was done only at the end of rain season. Therefore, market mechanism could not be worked easily. This emphasizes a need to build local capacity of local people to undertake most of the project activities.

Discussion with community members indicates that they have developed their own working procedures. The rules and bylaws made by the community are meant to cause community compliance. Already, an elaborate constitution is under preparation on how to manage the tree nursery and other afforestation activities. It would appear that formulation of such member binding rules is essential for community projects.

e. Capacity Building to PPMU

Most of the project facilitation follow-up will come from the civil servants and in particular Forestry Section. Some of the new technologies developed by research organizations elsewhere in Europe and Africa are not easily available nor well known within the Department. It would be necessary to provide necessary capacity building to the government officers for the necessary confidence and motivation to enable them play a more active role on the Master Plan and on their other duties. Some of the capacity building could be in form of short courses and longer term training programmes.

f. Training to Communities

General land use pattern that majority of rural population used to imagine consists of the allocation of best land to arable purpose, better land to grazing and poorest, most degraded one to forestry. It follows that if this built-in idea of land use is literally applied to forestry activities, expected wood yield remains in low level and valuable species can hardly grow on poor land. However trees can grow on very demanding sites provided appropriate land preparation is undertaken. Training on afforestation on stony and degraded sites will therefore be an important feature of the Master Plan. This fact tends to support the improved fallow technology which will also generate fuel wood from farms.

4.6 Community Garden Project

4.6.1 Objective

The community garden project was started with the following purposes. These purposes are supposed to be achieved by attaining the outputs listed below.

***Project Purpose**:* *1. Proper land use is achieved.* *2. Income is born from un-used natural resources.*
***Expected Outputs**:* *1. Community garden is constructed.* *2. Garden committee is organized and being managed.* *3. Vegetable production is started in the garden.*

4.6.2 Implementation

a. Site selection

Three project sites were selected for the community garden pilot project. Soil survey and market survey were conducted after the first selection and the relevancy of the site was confirmed.

Selected Site 1 (TA2)	Zikhoteni A site near St. Anselem primary school (Approximately, 1.5 ha)
Reason to be chosen	- After examining the three proposed sites, discussions were held on site selection in the community workshop. - A site near St. Anselem primary school was selected because of the following reasons. ・ close to community centre, ・ good access, ・ proper soil for vegetable growing and ・ available water source for irrigation and land holding.
Selected Site 2 (TA3)	Mhlatane (Approximately, 2.0 ha)
Reason to be chosen	- People in Macdvulwini proposed five sites for community gardens in the workshop, which were Mhlatane, Lubovu, Shakala, Mbeka and Mhlangu. - Two sites were selected among the five carefully by reconnaissance survey, one at Mhlatane and another at Shakala. However, it was found later that Shakala site belonged to an individual and it might cause a land holding trouble in the future. - Then a new site was proposed at Mbeka, a communal land in the following workshop. - The site was examined carefully with a responsible person and an elder of the area. After all, Mhlatane and Mbeka sites were selected as sites of community gardens. Both of them have; ・ good access, ・ proper soil for vegetable growing, ・ enough water source for irrigation and ・ no land holding problem.
Selected Site 3 (TA3)	Mbeka (Approximately, 6.5 ha)
Reason to be chosen	- same as site 2-

In order to avoid disputes on land after starting the activity, a certificate of land use permission was signed by the headman of the Royal Kraal and kept by the committee.

b. Participants and Implementation Body

The breakdown of the number of participants is as follows. All of the people expressed their interest were accepted at initial stage. Individual interview was held later to confirm the will to join in, and finally only the people who paid the agreed membership fee were admitted as a member.

	Zikhoteni(TA2)	Mhlatane (TA3)	Mbeka (TA3)
Initial Stage	21 farmers (F 18, M3)	68 farmers (F16, M52)	80 farmers (F39, M41)
Acting numbers	17 farmers (F16, M1)	27 farmers (F15, M12)	68 (not fixed)

In order to run the community garden smoothly and maintain the facilities, the community garden committees were organized in each target area. The committee is consisted of the following structure.

- Chairperson,
- Vice chairperson,
- Secretary
- Treasurer
- Members (1 to 3)

c. Implementation process

The implementation process could be divided into three parts,

1) Construction of irrigation facilities,
2) Preparation of the garden, and
3) Operation and maintenance.

c.1 Construction of irrigation facilities

All the irrigation facilities constructed adopt gravity irrigation method only, aiming at easy and economical operation/maintenance by the members of the community gardens.

Zikhoteni

In Zikhoteni, irrigation water is taken about 800 m upstream from the garden, and delivered to the garden through furrows. The water flow of 3 l/sec measured at the water intake site in late February, 2002 is enough for irrigating the garden.

Mbeka

In Mbeka, the irrigation water is taken from the Shagala River, a tributary of Mbeka River, which is located 200 meter away from the garden. The intake site consists of the hard base rock with diorite intruded by highly folded dolerite and conglomerate. The water flow observed at the intake site seems sufficient to irrigate the garden.

Mhlatane

In Mhlatane, irrigation water is taken from the Mhlatane River. The intake site is located about 800m upstream from the garden and irrigation water is delivered to the garden through furrows. The water flow observed at the intake site seems sufficient to irrigate the garden.

c.2 Preparation of the garden

The structure and the land of the gardens were prepared as follows;

1. CG members cleared the site. A member cultivated approximately 150 m^2 of plot that is composed of 6 pieces of 25 m^2.

2. The land has been prepared by twice ploughing by a tractor, one time of harrowing, and be partitioned to each plot.
3. The land was enclosed by a fence to keep animals off.
4. Compost from cow dung will be scattered over the soil before the second ploughing with disc.
5. Divided into plots of $25m^2$ and allocate the plots to each members. It is possible in the future to increase the pieces of the plot if a member manages well all the pieces of plots allocated.
6. As partitions between plots, banana or sugar cane is recommended for the contour strips to protect soil from running off. The choice depends on the need of CG members.

c.3 Training

The series of trainings on vegetable growing were held by NGO and the crop production section of MOAC in/near the site before starting planting vegetables. After starting the cultivation, those staff had been visiting the site regularly giving technical advice.

c.4 Operation and Maintenance

All the operation and maintenance are in the hands of CG members.

Each member manages her/his plot by her/himself. Crops which have been planted in CG were decided by each member, referring to the recommendation and programme by NAMBOARD such as tomato, green bean, cabbage, pumpkin, green pepper, lettuce, butter nut, beetroot, carrot and spinach, which have better market.

At earlier stage of planning, the constitution was discussed and made by the members under advice by NGO staff and has been kept by each member.

CG members agreed to pay certain amount of membership fees, development fund, annual subscription fees, and plot fees and contribute labour force for maintenance.

The bank account was opened for management of the collected fees and the treasurer of Community Development Committee is responsible for it.

d. Arrangement of Cost and Work Sharing

All cost and work for the activity were agreed to be shared as follows; after completion of the pilot projects, the government will take over all the responsibility which JICA had covered in the pilot project.

Construction of irrigation facilities

Items	JICA/GOS	NGO	Members
Design	○	○	
Supervision of construction	○	○	
Materials			
Stones, Boulders	○		○
Ballast	○		
Sand	○		○
Cement	○		
Pipes, accessories	○		
Intake devices	○		
Iron (reinforcement)	○		
Fencing (water intake)	○		
Tools			

Shovel			○
Hoe			○
Pickaxe			○
Labour			○
Contribution Cash			○

Preparation of community garden

Items	JICA/GOS	NGO	Members
Supervision	○	○	
Clearing			○
Ploughing	○		
Harrowing	○		
Compost (cow dung)	○		
Fencing Pole	○		
Wire/Mesh	○		
Labour			○
Contour strips	○	○	○
Partition	○	○	○
Furrow	○	○	○

Operation & Maintenance

Items	JICA/GOS	NGO	Members
Operation			○
Maintenance			○

4.6.3 Achievement

a. Summary of the Achievement

Major achievement of each community garden project are summarised in the table below. Due to the delay of the training as well as disputes occurred in Mbeka, the activity has been conducted slowly in Mbeka. Remarkable points in each TA will be described after.

Table 4-22: Major Achievement of the Community Garden Project

	Zikhoteni(TA2)	Mhlatane (TA3)	Mbeka (TA3)
Number of participants	17 (M1, F16)	27 (M18, F9)	68
Training Period	Mar, April and May	Mar, April and May	June
Number of plots	Total 56 plots: 3 plots (10 participants) 4 plots (6 participants) 2 plots (1 participant)	Total 78 plots: 3 plots (23 participants) 4 plots (2 participants) 1 plot (1 participant)	-
Vegetables produced (= Number of plots)	Tomato (13), cabbage (11), mustard spinach (8), green pepper (7), carrot (5), spinach (5), beetroot (4), and lettuce (3)	Cabbage (24), beetroot (19), spinach (15), carrot (9) and mustard spinach (11)	-
Joining/membership	E60.00/participant	E20.00/participant	E20.00/participant

fee			
Development fund	-	E80.00/participant	E80.00/participant
Annual subscription fee	E30.00/participant	E30.00/participant	E30.00/participant
Plot fee	E30/plot, after harvest	E50/plot, after harvest	E50/plot, after harvest
Building fund (newly participants who didn't take part in construction phase)	E500.00 / person	E500.00 / person	E500.00 / person
Fees collected	E 890.00 (E800 is in a bank account and E90 is in hand)	E 2,162.00 (E 1,964 is in a bank account and E198 is in hand)	-

b. Physical Status of each CGPP

b.1 Mhlatane Community Garden

27 households participate in irrigating cultivation. 3 plots (25 x 3 sq.m) have so far been allocated to a household. The fourth plot has been allowed to irrigate and some households already transplanted seedlings from adjacent nursery. The following table shows vegetable production record as at May 21st, 2003. Earliest transplanting was done in March 2003 (Cabbage and spinach), and the harvest is already sold when merchant visited from Mankayane to purchase their products in early May.

Table 4-23: Vegetable Garden Production in Mhlatane

	Cabbage	Spinach (Beet)	Chinese Rape	Carrot	Total
Number of plot	27	38	16	9	90
Total square meter	675	950	400	225	2,250
Spacing of hills	12r x 7h	20r x 10h	20r x 8h	19r x 20h	-
Total hills in rows	2,268	7,600	2,560	3,420	15,848

Their plots are irrigated with watering tins once in two days. They carried farmyard manure for basal dressing and chemical compound fertilizer has been applied with periodical fumigation with insecticide Faftic once in two weeks. The group use common vegetable seedbeds, 3plots with 1m x 5m where beds are covered with straw shade, and lettuce seed was sown with four species as tabulated above.

Box hill method has been practiced for watering between rows, which was introduced by contracted-NGO. Four watchmen belonging to the group regularly monitor irrigation pipeline (PVC 4inch) and water source (sediment pond installed in river floor of Mhlatane River) everyday and other members undergo training for assisting those who give monitoring service currently.

Soil reaction was amended with lime applied thereto according to prior analysis in Malkerns. Visit of RDA extension officer has been limited in twice within these three months.

b.2 Mbeka Community Garden

In Mbeka, due to disputes on land issue, implementation of the project was delayed, however, the construction has been completed by the efforts of the members and NGO concerned. Also, training to the members was behind the original schedule, however it was completed. Accordingly, the members started vegetable production. 68 households finally took part in the project.

b.3 Zikhoteni Community Garden

At present 17 households so far affiliated the vegetable garden group, already cropping on 57 plots and now they are expanding their plots by reclaiming down side of garden terraces opening 3 x 12 = 36 plots with 25 m^2 /plot (1.5 x 10m).

The following table shows their crop species introduced. Since different kinds of vegetables have different transplanting dates, different selling timing will be expected. They have already started sowing vegetable seeds for next season on nurseries (1 x 3m, 1 x 15m) located at the third terraces of 5 terraced plots.

Transplanted vegetables receive watering with tins / hoses once in two days into box hills in between planted rows. Farmyard manure collected from kraal has been used for soil over nurseries and plots.

Table 4-24: Vegetable Garden Production in Zikhoteni

	Tomato	Cabbage	C.Rape	Spinach	Pepper	Carrot	Lettuce	others	Total
No. of plot	13	12	10	8	7	3	2	2	57
Total meter^2	325	300	250	200	175	75	50	50	1,425
No. of rows	10	13	20	20	18	18	18	-	-
No. of hills	5	7	8	11	6	20	8	-	-
Total hills	650	1,092	1,600	1,760	756	1,080	288	225	7,451

Note: Others comprise mustard pepper 1 (6hills with 20 rows, potato 1.(7hills with 15 rows)

c. Participation and confidence of the participants

The participant rate for the work is quite high in general. The average was around 87% in Zikhoteni (TA2), and 74% in Mhlatane (TA3). In fact, whenever visited the target areas, it was observed that there were always some people working in the garden.

According to the results of monitoring survey done in June 2003, 76% of the participants who have started vegetable production reply that they can continue the work by themselves, and around 20% stated that they need continuous technical assistance. Further, 100% of the interviewee replied that they have confident to continue the activity.

Judging from the results at least, it could be said that the participants are gaining the skills since they are able to manage by them, from growing seedlings, planting, and seedlings to production.

d. Advantages by the implementation of the community garden

According to the result of the monitoring survey, participants feel the following positive changes by this activity.

Table 4-25: Positive Changes by the Community Garden Members

Positive changes by the community garden	%
1. Learnt how to produce vegetables	95.2
2. Improvement of diet	85.7
3. Improvement of income	90.5
4. Work under community collaboration	76.2

Result of monitoring survey by JICA Study Team (June2003)

More than 70 % of the participants of Zikhoteni community garden already sold or home consumed their vegetables produced in the garden. Prevailing prices of major vegetables are given in Table 4-26. If 70% of the harvested vegetables can be sold to the middlemen at the

current farm-gate prices, then, net margin equivalent to E16,590[1] will be counted from farm-gate sale, and this amounts for E614 (E16,590/27 households) per member household. Given three seasons of cultivation a year, a member farmer can get gross income of E1,840 per annum and E1,220 as net income after subtracting the self-labour cost. Also, according to the farm economy analysis made for TA-3 (refer to the figures given in Table 3-65 in sub-section 3.4.1 of the report), mean annual farm income is estimated at E8,700 and the input cost for producing this value comes to E5,100, leaving only E3,600 as annual net margin. Comparison of these figures with each other suggests that the envisaged vegetable income accounts for about 17% of the net farm income per household. Thus, it may be said that the community garden projects can greatly contribute to the income generation of the households in the communities.

Table 4-26: Price of Major Vegetables

Vegetables	Price
Cabbage	E 3.50 (per kg)
Lettuce	E 2.00 (per kg)
Green pepper	E 0.50 (per kg)
Spinach	E 1.50 (bundle)

Result of monitoring survey by JICA Study Team (June2003)

It is expected that increase in income will contribute not only to betterment of livelihood, but also it will contribute to strengthen the motivation of the people towards the environment conservation in the communities.

It is shown in the comment made by the development committee members in Zikhoteni (TA2), for example, saying that, "They can feel real improvement and development of the community with seeing the community garden. It encourages the people to work for the improvement of their lives!"

Moreover, the community garden committee members in TA2 are planning to plant fruit trees around the garden by themselves, and further, planning to make proposal for extending their activity to poultry farming beside the garden.

As a whole, the management of the committee itself is also functioning appropriately, including the collection and its management of fees, both in Zikhoteni (TA2) and Mhlatane (TA3).

e Constraints and their countermeasures

There are no serious constraints observed in the community garden activities. It could be said that it is because the needs of the participants and the results are exactly matching. In the community garden in Zikhoteni (TA2), there is a minor issue of lacking of extension of pipe system for extension of the cultivated land. The committee members are planning to propose to Inkhundla Centre for assistance for obtaining the materials.

4.6.4 Evaluation

a. Community Self-evaluation

Self evaluation workshop was held to allow management committees to report back on progress of the pilot projects and for communities to make their comments.

[1] 4 plots with 2.5m x 5m were allocated to 27 participants. The spacing of planted vegetable hills was on average 25cm x 25cm, harvested hill rate: 80% mean price per hill: estimated at E 1.8 and rate of sales was estimated at 76%. 4 x 2.5m x 5m = 50 m^2 1 / (0.25 x 0.25) = 16 hill 800 hills x 0.76 x 0.8 x 1.8 = E 876, of which 30% (this figure is usually used for rough estimation of the production cost of the vegetables) should be paid for the input of production costs without considering home labour, and costs for water and land, etc., thus, net margin is calculated at E613 (E876- E263). Also, total net margin from the garden is estimated as follows. Total garden area: 1,354 m^2 , production per m^2; 16 hills / m^2 x 80% x 76% x E1.8 x 70% (net margin rate) = E12.257, thus, we obtain 1,354 m^2 x E12.257 / m^2 = E16,590

Self- evaluation results have been summarised, with focusing on a) advantages obtained by the activities as felt by the people, and b) constraints encountered and their possible solutions. The specific issues or comments raised in a particular TA are indicated with brackets and others are common issues.

Advantages obtained by the activities	
- The water is available for irrigation and could start the garden. - The members have paid the membership fees agreed and they are managed well. - The garden has already started to produce vegetables and the diet could be balanced well. - Moreover, people can sell the surplus. - School children and teachers could also get water now from the water tank (TA2).	
Difficulties encountered	**Countermeasures**
- Need to extend water pipes for more convenience (TA2).	- Ask to Inkhundla centre to assist the water pipe for extension.
- Planned to plant trees around the garden, but has not yet started (TA2).	- Will plant trees very soon.

b. Overall Evaluation

The evaluation will be developed as verifying the achievement of outputs, with discussing the efficiency, effectiveness, impact, relevance and sustainability of the projects.

Evaluation Item	Evaluation
1. Efficiency	- The community garden committees were formed and performing well in terms of cooperative work for land preparation, allocation of plots, and the management of the garden. - The trainings were held for the participants by NGO and government and each member attended the series of training actively, which contribute to continue their activities (Mar–Jun 2003). - The size of the garden, plots and number of plots for each member are adequate which could be management by each participant.
2. Effectiveness	- After the construction of the facility as well as preparation of the land, vegetable production has been started. Since the land is used properly as planned and the participants have already got benefits from the garden with gaining vegetables for domestic consumption as well as sale of the surplus, it could be said that the project purpose was achieved.
3. Impact	- The majority of the participants of the community garden are women (70%). According to the interview to the female participants, they have control of using the income from the garden without getting permission by their husbands, apart from one respondent. Having control to use income will lead significant change in the status of women. - Since the education cost is the highest in the expenditure of household, which holds around 30 to 45% of the total expenditure, those women were commenting that they would use the benefits for educating children. In this way, education opportunity is widened.
4. Relevancy	- MOAC is promoting vegetable production in replaced to maize production and put it as one of the pillar of agriculture policy. In this sense, it is relevant to the national policy. - The community garden projects were most appreciated projects in the pilot projects due to the clear individual benefit. Accordingly, it is also relevant to the needs of the community people. - As for the contribution to soil conservation, it could contribute in the

	way of creation of awareness of utilisation of land as well as generating income for bearing expenses for soil conservation activities.
5. Sustainability	- Participants have been gaining the technique of growing vegetables in a sense that 76% of the participants who have started vegetable production reply that they can continue the work by themselves without external assistance. - In Zikhoteni, the participants have already started to expand their garden with extending irrigation pipes by themselves. They are going to grow maize in the extended land this year for gaining money to buy pipes for extension since they do not have enough capital at the moment. This shows the strong intention of people to continue the activity. - Although community garden project was not implemented in the pilot project in TA1, they have great intention to start it and have already found the agency to support them for installing irrigation facility by themselves.

c. Comprehensive Evaluation

As it could be seen, the purposes of the projects have been achieved, and are expected to contribute to improve degraded land for the sake of appropriate land use.

Looking at the attainment of the achievement, it could be said that the inputs provided by stakeholders from materials to labour force could contribute to lead the expected result.

The technology applied was also appropriate, as proved by the fact that around 76% of participants reply that they have confidence to continue by themselves. Moreover, about the important issue for sustainability of the activity, which is management of the garden, it functions also properly and expected to be continued in this way. Thus, it could be said that the sustainability in terms of technique as well as management aspect is quite positive.

Although the activity has been delayed in Mbeka, it could be also expected to be continued under support by the government as well as Mhlatane community garden members who are neighbours.

4.6.5 Lessons Learnt

a. Motivation Originated by Clear Individual Profits

The community garden project is most appreciated by development by the community people in pilot projects. The most obvious reason is that the fact that the individual profit is clear. Though it says “community garden”, the operation system is quite independent. The size of the land to cultivate was equally allocated to each member, and each member grows vegetables under their own responsibility. Accordingly, they can consume and sell the product as they want and do not need to feel any uncomfortable ness by communal work.

It was confirmed through the pilot project that the “motivation” to work is very much related to the individual profitability. If this point is clear, people are willing to contribute to cost share.

b. Importance on Equality and Transparency

From the beginning, the equality among participants and transparency of the committee were cared in this pilot project since it is put great importance in Swazi culture.

Firstly, the selection of member was clear, since only the people who contributed the membership fee could join as the member of the community garden. Secondly, the each plot

was allocated by lottery for keeping equality and every member is fulfilled. The collected money has been kept in the common bank account under the name of committee, and managed by the treasurer and the record is kept.

It was proved by the pilot project that the community people do not like inequality and if the project clarifies the individual benefits with equality, the activity goes.

c. Land Issue

In order to avoid disputes on land, land issue has been keenly taken care of by the study team from the early stage of the implementation, however in Mbeka, the problem with respect to the land acquired for the purpose of the project occurred. And the issue was discussed with traditional authorities, and it was solved already. However, the issue caused the delay in various activities. This problem suggests that in planning the community garden project, it is important to fully discuss the land acquisition and the scale of memberships among the members prior to implementation of the project.

d. Way forward for Diffusion

About the diffusion of community garden to other areas, the role of development committee as well as traditional authority and Inkhundla will be important. Participants express that they are willing to teach others in technique, but followers require some financial support for land preparation as well as construction of facility at initial stage.

Summary of the lessons learnt through implementation of the projects are briefed in the Table 4-27.

Table 4-27: Summary of the Lessons Learnt through Implementation of the Community Garden Pilot Projects

Scheme	Briefings of the Scheme	Main Lessons Learnt	Necessary Inputs for Formulation of the Income Generation Plan Identified from the Lessons Learnt
Zikhoteni Community Garden (TA2)	Area: 1.2 ha Member: 17 Irrigation Method: Gravity Cultivated Crops: Vegetables	Very successful. • Size of area was suitable. • Size of membership was suitable. • Participation by community people was high. • Need more understanding on the constitution for O/M of their facilities.	• Necessity of guidance to the community people that the community garden project was implemented to promote and assist the soil conservation activities by community people. • To start activities to expand this kind of projects in the neighbouring communities utilizing the experiences obtained through the pilot projects.
Mhlatane Community Garden (TA3)	Area: 2.0 ha Member: 24 Irrigation Method: Gravity Cultivated Crops: Vegetables	Very successful. • Size of area was suitable • Size of membership was suitable. • Participation by community people was high. • Need more understanding on the constitution for O/M of their facilities.	
Mbeka Community Garden (TA3)	Area: 6.5 ha Member: 68 Irrigation Method: Gravity Cultivated Crops: Vegetables	Successful at acceptable level. • Size of area was too big. • Size of membership was too big. • Need more understanding on the constitution for O/M of their facilities.	

4.7 Improved Cooking Stove Project

4.7.1 Objective

Due to the scarcity of wood resources in the area, people, especially women are forced to spend long time for fetching firewood or money to purchase those. Result of the Baseline Survey showed almost all homestead/household are using firewood, 91.5% of them depend on own harvest and they spend 5.5 hours for fetching firewood per week on the average.

Under such circumstances, improved cooking stove, which was initially installed in Kenya where women used to use three-stone cooking place, was presented. It consumes less firewood thus conserve tree resources and creating women's spare time by not spending long time for fetching firewood. At the same time, cooking time would be reduced since it has three cooking places. As a result, introduction of the stove was selected by the community people as one of the pilot project components at all three pilot areas.

The purpose of promotion of improved cooking stove was set as follows. This purpose is supposed to be achieved by attaining the outputs listed below.

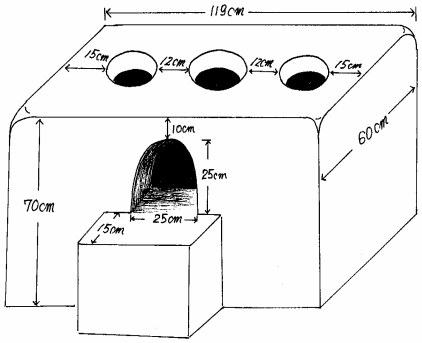
Project Purpose: *Consumption of firewood will be reduced.*
Expected Outputs: *1. Participants learn about the function of Improved Cooking Stove* *2. Stove committee is organized for construction and extension of stoves* *3. Stoves are constructed in the community*

4.7.2 Implementation

a. Demonstration

Demonstration together with seminar at each pilot area was done in August 2001 to provide enough time for women to know what improved cooking stove is as well as to confirm whether it suits in the target areas.

Demonstration sites in each target area were selected by the community people during the workshops. Materials of stove are mud, stones and water, which are all locally available, and they were prepared before the demonstration day. About 20 people were gathered at each site and participants were eager to learn how to construct it.



Improved Cooking Stove
Source: A Case Study of Population Education Promotion Project in Kenya

According to the Baseline Survey conducted five (5) months after the demonstration, 54.3% of Eni & Ngcayini, 71.9% of Zikhoteni and 70.0% of Macdvulwini people interviewed know about the stove, and 77.4%, 83.9% and 84.2% of households are interested to construct the stove at their place. These figures indicate that the effect of the demonstration was quite high and this will be the right methods to extend the stoves to the surroundings.

b. Extension Strategy at each Target Area

Extension strategy at each TA is summarized as follows;

Table 4-28: Extension Strategy by each target area

	Eni & Ngcayini (TA1)	Zikhoteni (TA2)	Macdvulwini(TA3)
Target number by June 2003	20 homesteads (16% of the total HH)	Half of the homesteads under Zikhoteni (50% of the total HH)	Over 100 of homesteads (20% of the total HH)
Activities	1. Organize women's meeting and confirm the number of interested women 2. Form a small informal groups with interested women 3. Each group decide rotation system 4. Start working within each group in merry-go-round system*	1. Demonstration at 2 far areas 2. Form informal group with interested 10 women 3. Collect stones and mud and fetch water with those 10 women 4. Invite the expert and learn how to construct or interested group come to the expert place to learn how to construct 5. Construction in merry-go-round system* 6. Expand to other informal groups in the same way	1. Demonstration at one site 2. Form a first informal group 3. Construction in merry-go-round system* 4. Formation of other informal groups 5. Members of the first group will be invited to other groups to teach techniques.
Contribution arrangement	Transportation fee and lunch are prepared by the inviting group and provided to the invited stove expert	-ditto-	-ditto-
Beneficiaries	Whole homesteads, but especially women	All community since trees are conserved	Everyone in the community since all family members will benefit
Management, Operation & Maintenance	- Development committee will be in charge of monitoring - Owner of the stove will maintain	- Development Committee members will keep records - Owner of the stove will maintain	The area was divided into four sections and three committee members, who will be in charge of extension and monitoring, were selected for each section.

Note: * The construction starts from the first household in the informal group and each one of the members participate material collection and construction. All members gather at the following woman's place to help her. It goes in such way up to the last woman's place.

c. Operation and Maintenance

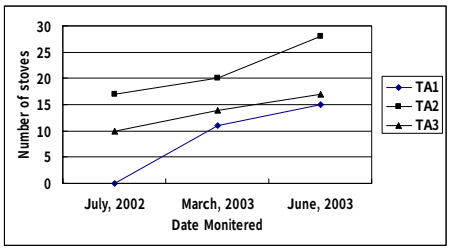
Improved Cooking Stove requires regular maintenance, especially rim of the fireplaces, otherwise it starts cracking and falling down. Maintenance is done by smearing the Stove with soil mixed with cow dung. Once-a-week maintenance is good enough for keeping the stove in sound condition, however depending on the climatic condition, once a two weeks or once a month will be sufficient.

The regular maintenance requires, besides soil and cow dung, about five litters of water. This could be a critical impediment to carry out the regular maintenance in the areas where there is less access to water sources.

4.7.3 Achievement

a. Attainment of the Achievement

The number of cooking stoves installed so far is as follows. Since the target number of the stoves is 20 (TA1), a half of the whole number of homestead, which is 303 (TA2), more than 100 homestead (TA3) respectively, it has not been achieved in every TAs. According to the committee members, major reasons for the slow progress is, 1) People feel busy for other pilot project component as well as agriculture work, 2) problem of distance to diffuse other community members. Although these issues have been continuously discussed during the pilot project period and several countermeasures have been taken such as dividing the committee into small groups regarding the area of residence, those constrains have been still remained.



However, according to the interview to the committee members as well as the result of the self-evaluation workshop, they are satisfied with their achievement, and are not feeling the slowness is their problems, since at least there is a demand and the activity is continued somehow.

Especially in TA1, they upgraded the design of the stove more modern one since they liked to make their kitchen more modern, not only for the purpose of reducing firewood and saving time.

b. Advantages by Installation of Stoves found by Participants

The advantages of improved cooking stove which people feel are shown below.

Table 4-29: Advantage of Improved Cooking Stove by Participants

Advantages of improved cooking stove	%
1. Conserve a fuel wood	75.0
2. Can cook various foods at the same time	68.8
3. Cooking fast	56.3
4. Kitchen became tidy and clean (became modern)	50.0
5. Community development has been achieved.	37.5

b.1 Saving Fuelwood

Several advantages by installation of stoves have been reported by the owners. The monitoring survey in June 2002 shows that the most important impact by installation of the stove is “saving fuelwood” supported by 75% of users. According to the responders, the quantity of firewood was reduced by half, as they use only 1.6 bundles of firewood for cooking lunch with the improved cooking stove, instead of 2.8 bundles, which had been used before.

b.2 Creation of Time

Secondly, other advantages raised above, including the 1 to 3 is showing that the improved cooking stove contributes to save time for cooking. According to the same survey above, the time for cooking lunch became 0.9 hours instead of 2.2 hours, which was the result of the baseline survey conducted in March 2001. Above all, since the time for fetching firewood

have been also saved, the creation of time is quite obvious. Actually, from looking at the level of pilot project, the saved time could be utilized for the work in community garden.

b.3 Improvement of Living Environment

Thirdly, it was found that users are feeling it much importance on the modernization of their kitchen. This tendency is also observed in the change of design in TA1, not only by the result of the monitoring survey. It also mentioned in TA2 to say, "We feel that we are like people in town since we have stove!" In TA2, the technique to make stove with local materials was applied to make cupboard to improve their kitchen.

c. Constraints and Possible Solutions

Constraints observed in cooking stove activity are more in extension aspect, rather in technical aspect. Due to the two reasons namely individualism and distance between homesteads, group activities have not been easily achieved. At the same time, it may be showing the necessity of improved cooking stove is less than the one of assumed, since they have access to fuel wood somehow, especially in TA1 and 3.

The problem of distance between homesteads has been worried from the beginning especially in TA3, and the stove committee was divided into four (4) sub-committees for efficient diffusion however, it did not work without repeated encouragement. In TA2, the committee tried to conduct stove construction competition with prize which would be prepared by the Study Team, it could not been started since the community members did not show their interest.

Considering the situation, *three solutions* are proposed. *One solution* is to find the way of individual work. Rather than constructing the improved stove in "a group", people could install it separately with their family members. It has been already practiced in TA3, though it is not strategic way. If there is an ultimate necessity for reduction of fuel, for example, it should be diffused with their own speed.

The second idea is diffusion based on construction of stoves as professional work with certain fee. It was observed especially in TA2 that those who have skills of construction of stoves feel that they are now professional of construction of stoves. They prefer to construct stoves individually with asking the fee for construction as professionals, rather teaching it to the community people voluntary. Thus, they have more interest to diffuse to neighboring communities as professional according to the result of interviews and analysis. This method has been already practiced in lowveld by NGO and it is functioning according to their experience.

Thirdly, it might be recommended for RDA to provide transport, rather than depending on the voluntarism of the committee members. It might be more applicable in the case that the government treats with the extension of improved cooking stove as an effective countermeasure for tackling with the deforestation.

4.7.4 Evaluation

a. Community Self-evaluation

The activity on promotion of cooking stove was evaluated as follows by the participants.

<u>Advantages obtained by the activities</u>:

- 15, 28, 17 stoves were constructed in TA1, TA2 and TA3 respectively.
- The amount of firewood used for cooking reduced by half.
- The improved stove has helped a lot and its useful to the community as it saves time. Women can do other things at home, such as handcraft, sewing, making

mats, etc., because, 1) Reduction of time of fetching firewood, and 2) can cook various dishes at the same time.

- The sub committee has developed knowledge about construction of stoves and they share the knowledge with other people by constructing stoves in the community.
- Upgrading the knowledge and skill of construction of stoves, e.g. adding chimney, make storage for firewood, make cupboard for putting dishes and pots, etc. (TA1, 2)
- People are eager to construct more stoves and there are lots of demands (TA1, 2).
- Could utilize the saved money of buying firewood for educating their children (TA2).
- Obtained knowledge how to utilize cheap or free local materials such as mud and stones (TA2).
- Feel like we are modern now just like the people in town since we have cooking stove at home! (TA2)

Difficulties encountered and Countermeasures

The following difficulties were pointed by the participants and the countermeasures were discussed among the members.

Difficulties encountered	Countermeasures
- No time for construction of stoves, since only a few people have skills to construct stoves (only three!) (TA1)	- Train more people so as to improve the work. - Community has to give them time by leaving some part of the community work.
- Collecting stones for construction of stove are time consuming (TA1).	- Decided to use bricks made of mud instead of stones.
- It was smoky in the room (TA1).	- Decided to add chimney and problem was solved.
- At the beginning, the design of the stove was not favoured by the community people (TA1).	- Had changed the design to modern style and people like it.
- Problem of transport since there is long distance from area to area is a problem on diffusion (TA1 and TA3).	- Ask transportation to RDA.
- Although the sub-committee was formed for construction of cooking stove, the members are only engaged in construction, not for diffusion of them (TA2).	- Considering the distribution of work from development committee, reform of the sub committee will be necessary.

The evaluation will be developed as verifying the achievement of those outputs, with discussing the efficiency, validity, sustainability and indirect impact by the activity.

b. Overall Evaluation

Evaluation Item	Evaluation
1. Efficiency	- After the demonstration of construction of cooking stove, diffusion of cooking stove was started by the committee members. Since it uses only materials which could be obtained around homestead, it is promoted only by the effort of the community women, though the extension speed is not the same as the one of expected.
2. Effectiveness	- According to the interview to the users, the quantity of firewood was reduced by half, as they use only 1.6 bundles of firewood for cooking lunch with the improved cooking stove, instead of 2.8 bundles which had been used before and now 60 households have installed stoves. In this way, project purpose is achieved as scheduled.

3. Impact	- According to the monitoring survey, the time for cooking lunch reduced to 0.9hours instead of 2.2hours without using the stove. - The utilisation of saved time could contribute to increase women's possibility to participate in other activities in the society or in other income generating activities. For instance in TA2, many women are mentioning that they can work longer time in the community garden since they could save time because of improved cooking stove. In TA1, the users were appreciating that they can spend more time in making mats for sale. Both cases also lead income generation. - Another expected impact, around 37% of the users feel that improvement of stove is part of development of their lives. Especially in TA1, it could be observed that women have been motivated to work for community development through the activity of construction of stoves. For example, the committee members including some female development committee members have organised themselves for planning rural tourism in the community. The plan has not been taking shape yet, however, this could be evaluated as one of the positive impact through the stove activity. - 50% of the users stress that they are content to modernise their kitchen by installation of the cooking stove.
4. Relevance	- Promotion of cooking stove has lead reduction of fuel wood, creation of time, and contributing to improve their living environment. These effects are relevant to national policy as well as needs of the community people.
5. Sustainability	- Since 1) there are lots of demand by non-users within/ and outside of the chiefdom (around 80% within the target areas and all participants of intra-monitoring tour), 2) the effectiveness has been confirmed and appreciated, 3) it does not require cost for construction, and 4) people acquired the skills are eager to teach how to construct the stove to other community members as well as to outside of their chiefdoms, it is expected to be diffused continuously.

c. Comprehensive Evaluation

As it could be seen, the purpose of the projects has been achieved, and is expected to contribute to reserve more trees in the forest for improvement of degraded land.

Looking at the attainment of the achievement, the achievement is not very big in number, however still have been continued somehow, and the users are satisfied and well maintained them. Since it does not require high input, if there is an ultimate needs, it will be continued with their comfortable speed.

Moreover, what could be highly evaluated through the cooking stove activities is 1) creation of time, and 2) Enhancement of motivation of female members for community development. These impacts are hidden, but crucial for continuous development including soil conservation activities.

4.7.5 Lesson Learnt

a. Difference of the "sense" of time

Promotion of cooking stove seems going slower than which was expected at the beginning by the Study Team. However, in the process of self-evaluation, as far as interviewing and analyzing the results of the series of survey result, it is observed that the participants are feeling that they are working hard enough and are satisfying the achievement in general.

The time flows in rural areas passes slower than the one of urban area, where the planners/ experts are sitting in the office.

For example, when the workshop at community level is given, for example, “starting from 10 o’clock” means “starting before noon”, under their perception and nobody blames the delay of the start. It might be important for the planner to understand this culture in order not to be too much ambitious and demanding in planning.

Additionally, promotion of cooking stove is not the activity, which is indispensable for soil conservation. At the same time, if people feel definite needs to reduce fuel wood as well as the information of effect of cooking stove, it may be diffused since it does not require construction cost as well as heavy labour force.

b. Motivation of installation of stove

It was assumed at the beginning that the most attractive advantages by installing cooking stove would be reduction of firewood without any investment, since it is the benefit, which is directly related to their livelihood. The effect of reduction of firewood has been recognized and appreciated for sure, which could be seen in the workshop. (75% of the user’s replies that the advantage of improved cooking stove is reduction of fuel wood).

However, it was also found that other impacts such as reduction of cooking time, and modernization of kitchen are also great motivation of community people to install stoves. Especially in the latter case, it was found that women invest to cooking stove to make it beautiful, such as applying colour, change the design to make it bigger and modern, place iron sheet on top, use blocks instead of stones, and so on.

In this sense, it could be said that promotion of cooking stove has a meaning of complementary activity with creating time for work as well as motivate people to contribute to communal work.

4.8 Water Source Protection Project

4.8.1 Objective

Following an investigation of the situation in the study area, it was noted that a large amount of time was spent collecting and using water and that often the water was fouled by animals also using the same water resources as humans. Further, it was noted that some old water resource sites had become so badly eroded they were no longer useful. Thus it was decided to see what could be done to develop these sites as a means of improving the livelihoods of communities whilst at the same time protecting these resources. The aim of the pilot projects then was to determine whether there was anything that could be done to conserve these sites along with maintaining their utility value. The specific objective of the water source protection intervention was to have secure protected clean water sources established in rangelands near homesteads.

4.8.2 Implementation

The community meetings were organized by the PPMU among the interested people for the selection of the project sites. A total of 6 sites, 2 sites per each pilot area, were finally selected. Then the sub-committee members were selected for the drafting of the constitutions.

Project facilities consist of a water intake, a water tank with a capacity of 1,200 liters, washing basins, and a shower room. Concept designs were developed by the PPMU and detailed design and supervision of the work were mainly entrusted with NGOs. The sub-committee members and the people who would use the facilities contributed their labour forces for the construction works. It took around one month for one water source protection facility.

a. Physical Appraisal of Pilot Projects

a.1 Eni/Ngcayini (TA1)

Two sites were proposed for this Pilot area, one each in each of the two Chiefdoms. At Eni the site selected is at the north east side of the grazing scheme on one of the tributaries of the Labandza River. The site in Ngcayini is also on a small tributary to the Labandza River, just to the east of the *Umpakatsi* (Chief's homestead).

There is a water collection sump in the stream in the Eni site that leads to a concrete storage tank, washbasins and washroom. At Ngcayini, a protective sump is built around the spring and water lead by pipe from there to a concrete storage tank, and by pipe to taps in the washbasins and washroom. There are soak-ways from the washbasins and washroom in each case to prevent pollution of the streams. These have all been designed to last with minimum maintenance and have been built sturdily. Both have a fence to keep livestock away from the main water source so that it does not become contaminated nor is the water source paddled and rendered unusable.

a.2 Zikhoteni (TA2)

Two sites have been selected for Zikhoteni. The one is by the main road at Galilee Water Pump and the other is at Leten Spring. At the former one, only washbasins and a washroom are provided along with a protective goat-proof fence surrounding about 1600 m^2 of grass around the pump. At Leten a concrete collection sump is provided from which water is piped to a concrete tank; washbasins and a washroom are also provided. Sturdy structures are being used.

a.3 Macdvulwini (TA3)

Two sites have been selected for Macdvulwini. The first is in the east on a small tributary to the Mhlatane River a short distance downstream from the Mankayane-Macdvulwini Road at the Mtfunjwa Spring. A concrete sump is built to collect water from the spring; water is piped to a concrete tank and from there to a washroom and washbasins. A fence has been erected around the water collection point (covering about 1600 m^2 and which includes a small degraded sponge) and around the washing facilities (about 200 m^2). There is a water soak-way.

The second site is at Eboteni Spring to the far west of the Chiefdom on the Mbulungeni Hills. As at the Mtfunjwa Spring, there is a concrete collection sump, a pipe to a concrete tank and then a pipe to the washbasins and washroom. There is also a soak-way. The area is fenced (about 5000 m^2) around a large grass and sedge sponge, to protect it from wandering livestock as they are beginning to cause erosion in the area.

The structures at both sites are well built and sturdy and should require minimum maintenance.

b. Project Design Matrix Used For the Final Evaluation

The final Project Design Matrix (PDM) Table for the spring water source protection pilot project is shown in Annex C.11 for activities in TA1, TA2 and TA3 presented together. This shows a summary of the projects' purposes, results and outputs as well as listing activities. This Table is an amendment of the original design matrix table and has been changed to reflect the project design. The project purpose was changed from "improvement of water quality of tap water" to "securing of the protected clean water sources established in rangelands near homestead". The project purpose of the original PDM indicated only the water improvement of tap water, while the revised purpose includes not only the improvement of water quality of tap water, but also the improvement of water use environment through the provision of such facilities as fencing, water basins and shower rooms. The provision of fencing aims to protect the water sources from animal puddling. Provision of water basins and shower rooms is intended mainly for women's easier domestic works.

c. Implementing Agencies

Planning was undertaken by the project with active participation of communities. Communities, in consultation and with the agreement of their elders and traditional leaders, selected sites from the communal land where project activities could take place. With facilitation of the project, communities elected leaders amongst themselves and formed management committees to undertake the various activities, including an overall development committee, and committees to manage the developed water resources. The services of a NGO, active and experienced in development work in Swaziland, was used to assist the community in construction the water resource facilities. Government also facilitated the holding of community workshops, and inter- and intra-site visits. Communities provided the manpower needed for development activities.

4.8.3 Achievement

Achievement is described briefly below and summaries of accomplishment have been prepared in PDM and are presented in Annex C.12. From these it can be seen that there has been successful development of protection of spring water sources, using well-built structures and further that other useful and beneficial infrastructure can be added to make life easier for the rural people.

Simultaneously it has been shown to be possible to provide protection and prevent erosion and degradation of these valuable water resources. Further, these are simple interventions that

can have a marked impact on improvement of livelihoods and well-being of communities and go a long way to fostering a sense of community spirit which will help in coordinating more difficult projects such as soil conservation on rangelands.

It can be seen that there has been successful development of infrastructures using a participatory approach in both planning and implementation:

- 6 fenced and protected water sources, 2 in each target area, consisting of concrete collection sumps and piped water at five sites (the sixth has no land gradient to allow collection in a tank), brick wash rooms (at four sites with running water for showers – at the other sites as there is insufficient head, they have to use buckets), concrete wash basins (four with running water)
- All 6 are functioning satisfactorily.

In addition, a level of management of these facilities and resources has already been imposed:

- 6 water source management committees – there are men and women on these committees, assigned with various duties, and they are learning their tasks;
- Although plans of operation have not been prepared as such, there are some agreed rules governing the use of the resources to which people are apparently adhering
- Although not systematically done so far due in part to the hardships imposed by the recent poor rainy seasons, some funds have been collected from surrounding homesteads toward the maintenance of the facilities that have been erected and constructed. As far as could be determined, this had not yet been placed in a savings bank account.

In terms of impact achievement, despite slower than expected rate of implementation of the projects, there has been an immediate impact:

- Water is freely available all the time at all sites
- water is clear, clean, lacks past turbidity, tastes pleasant, appears uncontaminated and pure
- women have more time as they are spending less time carrying water
- In terms of other benefits, as one resident put it with reference to the running clean water and shower: “I did not know what it was like to live in town before”!

The participatory approach used has been useful and should contribute to the sustainability of these projects. There is no restriction on who can and who cannot use the facilities but it is generally just the homesteads living close by that use the facilities on a regular basis.

No potentially negative aspect to progress has been noted to this simple intervention except if there are large numbers of people gathering at one place for any length of time there is likely to be a build up of a health hazard at these sites unless there are some forms of toilets and sanitation also included in the infrastructure.

4.8.4 Evaluation

a. Community Self-evaluation

Following implementation of self-evaluation workshop was held to allow management committees to report back on progress of the pilot projects and for communities to make their comments.

Self-evaluation results have been summarized (Table 4-30), focusing on a) advantages obtained by the activities as felt by the people, and b) constraints encountered and their possible solutions. The specific issues or comments raised in a particular TA are indicated with brackets and others are common issues.

Table 4-30: Evaluation Result of Grazing, Feedlot and Fodder Plot Projects

Advantages Obtained By Activities	
• the facilities were constructed and people can now get clean water without fear of water-borne diseases • it is felt a community feeling/spirit has been developed in this way	
Difficulties Encountered	**Countermeasures Proposed**
• a maintenance fee has been decided, but has not yet been collected • constitutions (rules of use) have been agreed upon, but have neither been written down nor presented to traditional authorities for their endorsement yet	• the fees should be collected as soon as possible • the rules should be written down first and then presented to the traditional authorities

From this it is apparent the community are satisfied with the facilities but are a little complacent about the need and urgency to start to collect maintenance fees early – but it has been recognised as an issue nonetheless. Some leadership training and timely advice and extension on the need for this would be beneficial.

b. Overall Evaluation

A summary of overall evaluation is presented in Table 4-31 Comprehensive evaluation summaries on different factors of evaluation using PDM are presented in Annex C.13. From these it can be seen that there has been successful implementation of the project. And those communities can probably manage them on their own from now on with only limited extension required.

Table 4-31: Evaluation of Water Source Protection

Evaluation Item	Evaluation
1. Efficiency	- Project output was mostly achieved as: i) six water source protection sites were developed and protected (five springs and one pump); ii) six washing facilities were erected; and iii) on the job training was provided. -
2. Effectiveness	- The project objective was mostly achieved as: i) there is enthusiastic and appreciative use of the facilities as they ease the burden of carrying water to the homesteads for their domestic use; ii) water quality is pure, sweet tasting, crystal clean and clean; iii) there is prevention of puddling and little likelihood of erosion due to the fences erected in the surrounding areas.
3. Impact	- The impact of the development of the facilities has all been positive and water sources have come under protection. - Strong impact was observed during the inter location study tour that the people from the other areas showed keen interest in the project. There is possibility that the similar projects would be implemented in other areas in the future.
4. Relevance	- The projects are considered to be fully consistent with the country's development objectives as the projects would lead to the improved living conditions of rural households that is one of the top priority in the National Development Strategy.
5. Sustainability	- Although the project facilities were successfully constructed through the participation of the community people, the community people still need the knowledge and skills for the maintenance works of the project. In this regard, the training programme should be prepared for the community people particularly on the maintenance of the project facilities. - The maintenance works especially of the surrounding fences need to be reinforced periodically with extension training on maintenance to protect sponges and spring.

4.8.5 Lessons Learnt

a. Taking Enough Time for Site Selection

As a whole, it may be said that six (6) water source protection projects at pilot stage were implemented successfully. However, there were disputes among the community people in TA3 with respect to the final decision on the location of the facility to be constructed under the water source protection project. Due to this, implementation of the project was delayed. This fact suggests that early involvement of community people and full discussions among the community people concerned on the project prior to its implementation is essential.

b. Need of Further Training for Maintenance of the Facilities Constructed

Since the training for the completed facilities under the water source protection projects were not conducted this time due to shortage of time, it is necessary to prepare training programs, which provide knowledge and skills necessary for operation and maintenance of the completed facilities under the water source protection project as early as possible. Timely implementation of the said programs will make the life of the facilities longer.

c. Hygiene Improvement

One of the project purposes is to prevent the animals from puddling the water sources by erecting the fencing around the sites. In this regard, the construction of healthy toilet in the project sites should be promoted for the improvement of hygiene conditions. The disposal of rubbish in the vicinity of water collection and washing points should also be conducted by the participants.

4.9 Pilot Project Management Unit (PPMU)

4.9.1 Objective

The objective of the Pilot Project Management Unit (PPMU) is to implement the pilot projects smoothly through the capacity building activities. It is expected that the project management skills of PPMU staff, community leaders and community people who participate in the projects will be improved through the capacity building activities to be conducted by the PPMU staff at central, regional and community level.

4.9.2 Implementation

a. Input by Swaziland Side

MOAC agreed to set up a Pilot Project Management Unit (PPMU) in February 2002, and the PPMU was officially established in the same month. PPMU management staff comprises a project manager, an alternate manager and a coordinator, who were selected from the officials in the Land Use Planning Section. PPMU management staff appointed three project coordinators, who are either an extension officer or a rural development officer. Project coordinators were assigned to supervise the pilot projects to be conducted at each pilot project area. They were supposed to be responsible for providing technical and management support to the community people for the efficient implementation of the pilot projects to be conducted in each pilot project area.

b. Input by Japanese Side

Out of eleven JICA Study Team members, an organization development expert and a GIS expert were appointed for assisting PPMU activities. Other Study Team members were also expected to provide technical assistance for the activities.

In order to improve the project management skills of PPMU staff, GIS system was introduced. Two units of computers run by DOS/Windows with GIS software were provided by JICA.

In addition, on the job trainings were occasionally conducted by the Study Team members to each counterpart staff during the implementation of the pilot projects.

c. Activities

c.1 Monitoring and Evaluation

Prior to the commencement of the implementation of the pilot projects, a baseline survey was conducted in February and March 2002. A Study Team member and three RDA staff conducted the survey covering about 130 homesteads to grasp present conditions of the pilot project areas.

In the middle of August 2002, an inter-location monitoring tour was organized by PPMU and the Study Team at the mid-point of the pilot projects implementation. The tour was conducted for 2 days with total participants of 50 persons including 12 participants from each pilot project area. PPMU management staff, the Study team members and project coordinators also participated in the tour.

Following the monitoring tour, workshops were organized in each pilot project area for the evaluation of pilot projects based on the observations made by the community members during the monitoring tour.

In the middle of June 2003, another inter-location monitoring tour was organized by PPMU and the Study Team at the final stage of the pilot projects implementation. The tour was conducted for 2 days with total participants of 58 persons including 49 participants from three pilot project areas. PPMU management staff, PPMU local staff, and the Study team members also participated in the tour.

Following the monitoring tour, workshops were organized in each pilot project area for the evaluation of pilot projects based on the observations made during the monitoring tour.

c.2 Group Development

For the implementation of pilot projects, a development committee was organized in each P/P area, i.e. Eni & Ngcayini Development Committee, Zikhoteni Development Committee and Macdvulwini Development Committee. The committee members comprise a chairperson, a vice chairperson, a secretary, a treasurer, and two or three members. Under the development committee, sub-committees were organized to carry out sub-component projects in each PP area.

Advice on the formation of these groups was occasionally made by PPMU staff and relevant NGOs during the implementation of the pilot projects. Advice was made on the preparation of the group constitution, book keeping, and opening of bank account and so on.

c.3 Community Development

Community development activities included the trainings for traditional leaders, community leaders, development committee members and community people in general.

(1) A seminar for community elders and leaders was held on 6 March 2002 at Mpophoma conference centre with total participants of 58 persons. Another seminar was organized on 17 March 2003 with total participants of 21 persons. Participants in these seminars included community elders and traditional leaders such as members of inner councils (*bandlancane*), messengers (*mgijimi*), a governor *(indvuna*) and elders (*imisumphe*).

Explanation on the pilot projects was made by PPMU staff in order to have mutual understanding on the implementation of the pilot projects. Importance of formation of the development committee was emphasized.

(2) In addition to the above, leadership training for development committee members was organized by PPMU during 17 and 20 March 2003 at Mpophoma conference centre. A total of twenty six (26) representatives attended. Participants were expected to learn more about working as a team in development projects; to learn how to solve problems; and how to take good decisions. (Refer to ANNEX H.10)

c.4 Technical Support

Design review and technical advice on pilot projects were made by PPMU staff during the course of the implementation of the pilot projects. Technical advice was made in the fields of soil conservation, irrigated community gardens, community forestry including tree nursery, and grazing schemes. Provision of heavy equipment such as tractors and bulldozers was also made through RDA offices.

Technical supports are included: i) technical advice at the construction stage of the project facilities; and ii) technical training programme after the completion of the project facilities. The training items included: i) leadership; ii) range management; iii) soil conservation; iv) vegetable cultivation; and v) nursery management. Training for improved cooking oven was conducted occasionally during the implementation of the pilot projects.

4.9.3 Achievement

a. Improvement of Project Management Skills of PPMU Staff

a.1 Accumulated Experiences on Monitoring and Evaluation

The monitoring and evaluation activities included; i) the baseline survey in February 2002; ii) the inter-location monitoring in August 2002; iii) the mid-term evaluation workshops in August 2002; iv) the terminal evaluation workshops in June 2003; and v) monthly monitoring works during the implementation of pilot projects.

Through these activities, PPMU staff could accumulate the knowledge and experiences on monitoring and evaluation works. These knowledge and experiences could be applied to the implementation of the subsequent Master Plan projects.

a.2 Improved Project Management Skills through GIS Operation

The GIS expert (JICA Study Team) and GIS trainees (PPMU) conducted the creation of GIS database for the analysis of data in the target areas. Through the activities, PPMU staff could accumulate the knowledge and experiences on project management skills by way of GIS operation. These knowledge and experiences could be applied to the subsequent stages during the implementation of the projects proposed in the master plan.

b. Improvement of Project Management Skills of Community Leaders and Community People

b.1 Leadership Trainings for Community Traditional Leaders

In the leadership seminar held on 6 March 2002 explanation of the pilot projects were made by PPMU staff and JICA study team members. Discussion was made on the implementation of pilot projects among 58 participants.

In addition, a leadership training workshop was held on 17 March 2003 at Mpophoma conference centre. The workshop was attended by twenty one (21) traditional authorities from Eni, Ngcayini, Zikhoteni and Macdvulwini chiefdoms. During the workshop, the

traditional authorities were given an opportunity to say their understanding of the project. The leaders seemed to understand what the projects are all about.

During the workshop, the main topic was on the role of traditional leadership in community development. The presenter touched on the importance of leaders uniting the whole community in support of development projects.

b.2 Workshops for Development Committees

In the leadership training workshop held on 17 March 2003 for the development committees of Eni, Ngcayini, Zikhoteni and Macdvulwini, a total of twenty six (26) representatives attended.

Participants of the workshop was expected to: i) learn more about working as a team in development projects; ii) to learn how to solve problems; and iii) to learn how to take good decisions.

b.3 Workshops for Community People

A series of workshops have been organized by PPMU and the Study Team for the community people for planning, project management, and operation and maintenance of the projects. Workshops for project planning were held at the initial stage of the study. Monitoring and mid-term evaluation workshops were held in August 2002. Monitoring and terminal evaluation workshops were organized in June 2003 at each pilot project area. Through these workshops, the community people in three pilot project areas could obtain knowledge on project planning and management. The knowledge and experiences obtained by the people could be applied to the implementation of any other development projects in the subsequent stages. Achievement of each output is summarized in the following table.

Table 4-32: Achievement of Pilot Projects Implementation

Output	Achievement
1. Improvement of Project Management Skills of PPMU Staff	● PPMU staff could accumulate the practical knowledge and experiences on the project management through a baseline survey, inter-location monitoring tours, mid-tem evaluation workshops and final evaluation workshops. ● Two PPMU staff could have practical knowledge on the project management method through GIS operation. ● Performance of TA2 project coordinator and his staff was not much satisfactory due partly to insufficient transport and partly to poor communication. ● Outputs are considered to be mostly achieved.
2. Improvement of Project Management Skills of Community Leaders and Community People	● Community participation in the pilot projects was enhanced through a series of consultation with community leaders and seminars for the same. ● Committee members and project participants could obtain practical knowledge on the project management skills through the training programmes organized by PPMU. ● Operation of the pilot projects started under the leadership of the Development Committee and Sub-committee members. ● Outputs are considered to be mostly achieved.

4.9.4 Evaluation

a. Community Self-evaluation

The evaluation results have been summarised as focusing on a) advantages obtained by the activities, which people feel, and b) Constrains encountered and their solutions discussed.

Self-evaluation workshop was held for the community people, therefore, evaluation results are summarised only for Development Committee and not for the Government Staff.

Table 4-33: Evaluation Results of Development Committee

Advantages obtained by the activities	
- Development Committee as well as sub-committee has been formed and the work is being continued with their efforts. - Development Committee members leant how to work with community people and communicate with them, including the knowledge and skills how to keep leadership (TA1, 2). - The work has been developed and made achievement with success in general (TA1). - There are some people volunteered a lot (almost daily) by their labour force (TA1). - We feel that the work has been successful in general (TA2). - Feel improvement and development of the community! (Especially the achievement of community garden, and obtaining water for the nursery, the garden and for the school.) (TA2)	
Difficulties encountered	**Countermeasures**
- Members who are attending meetings are always same and majority of the community people have not been attending them (TA1).	- Leadership training should be continued to promote the participation of the committee members and the interested people.
- Community people are not sure how to use some of the structures constructed since training has not been done enough (TA1).	- Technical trainings on the maintenance of the project facilities should be conducted for the sustainable use of the same.
- Though sub committees were formed, most of the works have been done by the development committee (TA2).	- Demarcate the activities to sub-committees.
- Leadership is not still strong enough to lead the community (TA2).	- Ask assistance to the government.

b. Overall Evaluation

b.1. Efficiency

Output of PPMU project component are expected to be: i) improvement of project management skills of PPMU staff; and ii) improvement of project management skills of community people.

Table 4-34: Efficiency of the Project

Evaluation Indicators	Assessment	Significance
Whether or not the project management skills of PPMU management staff were improved?	- PPMU management staff accumulated the project management skills through a series of seminars and workshops during the implementation of the pilot projects. - Two of PPMU staff obtained GIS operation skills during the implementation of the study works.	- High

	- PPMU management staff accumulated experiences on the monitoring and evaluation of the projects through a series of monitoring and evaluation workshops.	
Whether or not the PPMU staff at RDA level could improve the project management skills?	- Involvement of RDA staff in the implementation of pilot projects was not much satisfactory, particularly in TA2. - Some RDA staff could accumulate the experiences of monitoring and evaluation activities through a series of monitoring and evaluation workshops.	- Medium
Whether or not the project management skills of community people were improved?	- Community elders and traditional leaders could have project management skills through the leadership trainings. - Community people in general also could accumulate the experiences of planning, implementation, monitoring and evaluation works during the implementation of pilot projects.	- High

From the table above, it is concluded that the outputs of the project are mostly achieved indicating medium to high significance. However, it was also found that the activities of PPMU staff at RDA level, particularly in TA2 was not much satisfactory as planned.

b.2. Effectiveness

Project purpose of PPMU project component is expected to be smooth implementation of pilot project.

Evaluation question inquiry items for effectiveness were set as follows:

i) Whether or not at least 75% of PPs are operated by June 2003?

Some facilities related to the pilot projects were constructed by August 2002 and some other facilities were constructed and prepared by the end of March 2003 as shown in the following table. Operations of some pilot projects were, however, delayed due to several reasons. For instance, operation of the feedlot fattening facility at Macdvulwini was delayed due to unavailability of fodder crops.

Table 4-35: Status of Project Implementation (As of June 2003)

Pilot Project Area	Project Component	Facility Construction	Operation	Operation Status
Eni & Ngcayini	Soil Conservation	Contour terracing and gully training works completed in July 2002	- Monitoring surveys continued - Training conducted	○
	Fenced Rotation	Fencing works completed in August 2002	- Grazing activities continued	○
	Feedlot	Feedlot construction at Ngcayini completed in August 2002	- Feedlot operation started in June 2003	○
	Spring protection (Eni & Ngcayini)	Spring protection works completed in	- Water use started and continued	○

		March 2003		
	Improved cooking stoves	15 stoves prepared by March 2003	- Extension activities continued	○
Zikhoteni	Soil Conservation	Contour terracing and gully training works completed in July 2002	- Monitoring surveys continued - Training conducted	○
	Community garden	Micro irrigation system completed in February 2003	- Vegetable cultivation started from March 2003	○
	Spring protection (Leten & Galile)	Spring protection works completed in March 2003	- Water use started and continued	○
	Tree Nursery	Tree nursery facilities completed in March 2003	- Nursery training conducted in June 2003	X
	Afforestation	Afforestation conducted by March 2003	- Monitoring surveys continued	○
	Improved fallow	Seedlings are under preparation in government nurseries	- Training activities continued by Forestry officers and RDA staff	X
	Improved cooking stoves	28 stoves prepared by March 2003	- Extension activities continued	○
Macdvulwini	Soil Conservation	Contour terracing and gully training works completed in August 2002	- Monitoring surveys continued	○
	Community Garden at Mhlatane	Micro irrigation system completed in February 2003	- Vegetable cultivation started from March 2003	○
	Community Garden at Mbeka	Micro irrigation system completed in March 2003	- Vegetable cultivation training conducted in June 2003	X
	Fenced Rotation	Fencing works completed in March 2003	- Grazing training conducted in June 2003.	○
	Feedlot	Feedlot construction completed in March 2003	- Feedlot training conducted in April 2003	X
	Spring protection (Mtfunjiwa & Eboteni)	Spring protection works completed in March 2003	- Water use started and continued	○
	Improved cooking stoves	17 stoves prepared by March 2003	- Extension activities continued	○

As presented in the above table, more than 75% of pilot projects are presently at its operation stage. The construction works of most projects were conducted as planned, except the tree nursery at Zikhoteni and the improved fallow component in TA2. The delay in nursery construction was attributed mainly to the delay in decision making on the size of the mesh of the cover, which is needed to protect the young trees in the nursery from the sunlight. On the other hand, the delay in the said improved fallow projects was attributed to the non-availability of the equipment. Although the construction works of some projects was delayed, it is considered that the project purpose was mostly achieved.

b.3. Impact

Overall goal of the project was set as "smooth implementation of the Master Plan".

The Master Plan is planned to be implemented in 30 communities in three target areas. The impact is assessed from the view point of project management capability of the government agencies, community authorities and community people in general.

Table 4-36: Impact of the Project

Evaluation Indicators	Assessment	Significance
Whether or not the project management capabilities of PPMU staff were improved so that they can conduct the Master Plan in the future?	- PPMU management staff accumulated the project management capability through a series of seminars and workshops conducted during the implementation of the pilot projects. - Two of PPMU staff obtained GIS operation skills during the implementation of the study works. - PPMU management staff accumulated experiences on the monitoring and evaluation of the projects through a series of monitoring and evaluation workshops. - Involvement of RDA staff in project activities was not fully conducted. There arise the needs for RDA staff to involve in the project activities more frequently.	- High
Whether or not the project management capability of the community leaders and community people was improved so that they can conduct the Master Plan in the future?	- The development committee members accumulated the project management capability through a series of workshops conducted during the implementation of the pilot project. - Involvement of RDA staff in training programme for the community people was not fully conducted. Needs would arise for RDA staff to involve the training programme more frequently.	- Medium

Strong impact was found in the project management activities of PPMU management staff. However, the project management capability of the community leaders and people in general would need to be improved through more active involvement of RDA staff in the project activities.

b.4. Relevance

Evaluation question inquiry items for relevance are set as follows.

i) Whether or not the Overall Goal and Project Purpose of the project are consistent with country's development objectives?

ii) Whether or not the Overall Goal and Project Purpose are consistent with the needs of the target groups?

It is considered that most pilot projects are fully consistent with the county's development objectives in that environmental improvement is the top priority in the national development plan as indicated in the National Development Strategy.

The pilot projects were selected through a series of workshops held in each community among the community stakeholders including constituency headman (*indvuna yenkhundla*), traditional community leaders, and community people in general. After the completion of the project facilities, the community people living in the vicinity of the sites immediately started to utilize the facilities and expressed their satisfaction with the improved facilities. Therefore it is judged that the overall goal and project purpose are still now consistent with the needs of target groups.

b.5. Sustainability

Following are the result of evaluation in terms of sustainability of the projects.

Table 4-37: Sustainability of the Project

Evaluation Indicators	Assessment	Significance
Whether or not the community people in the target areas have the capability of operation and maintenance of the project facilities?	- Training for operation and maintenance (O&M) was conducted for soil conservation, tree nursery, community garden, improved cooking stoves, and range management components. - Involvement of RDA staffs of TA2 in training activities was not much satisfactory. - There arise the needs for RDA staffs to involve in the training programme more frequently.	- Medium
Whether or not the government agencies, particularly MOAC, have the capability of implementing the projects as proposed in the Master Plan?	- The PPMU management staff accumulated the project management capability through a series of workshops conducted during the implementation of the pilot project. - Involvement of RDA staff in training programme for the community people was not fully conducted. Needs would arise for RDA staff to involve the training programme more frequently.	- Medium

Although the technical trainings were extensively organized by PPMU, the training opportunities for operation and maintenance of the project facilities were not so frequently conducted. It will be necessary, therefore, to give more frequent training opportunities for the project participants in the subsequent stages.

Although involvement of some RDA staffs in the project implementation was not much satisfactory, the performance of PPMU staffs in the project implementation as a whole was considerably satisfactory, indicating that PPMU staffs are considered to have greater capability for implementing other projects in the subsequent stages.

4.9.5 Lessons Learnt

a. Technical Support for RDA Activities

During the implementation of the pilot projects, various kinds of training activities were organized by PPMU, including leadership, soil conservation, forestry, horticulture, and feedlot management. It has been recognized that such training activities are very important for the community people who participated in the pilot project implementation as they could have practical knowledge and technologies for the operation and management of the projects.

However, most of training activities were organized and conducted by PPMU management staff and extension officers at regional offices. Involvement of RDA staff in the training activities was not sufficient except those of Central RDA office.

In this regard, reconsideration would be necessary for the strengthening of the RDA activities through the more frequent involvement of regional extension officers relevant to the concerned RDA offices. It is recommended that the extension officer in the agriculture office at Nhlangano should give continuous technical support to the project coordinator for TA2 in Hluti RDA. It is also recommended that the project coordinator for TA3 (Ngwempisi RDA office) should be technically supported by the regional agriculture offices at Mankayane and Manzini.

b. Establishment of Monitoring and Evaluation System

During the implementation of the pilot projects, the monitoring and evaluation activities were mainly conducted by PPMU management staff with supporting staff recruited from other departments. For the implementation of the Master Plan, however, such monitoring and evaluation activities should be conducted mainly by the frontline staff at RDA offices. It will be necessary, therefore, to organize a monitoring and evaluation team at RDA level. The team members for monitoring and evaluation activities will be trained by PPMU management staff prior to the implementation of the projects.

4.10 Changes in awareness of the community

4.10.1 Changes in the community

a. Changes in the community and their awareness

The achievement and evaluation of the details of each component of the pilot project are described in the former sections. Judging from the result of the activities, it seems that the community people are learning a lot through each activity and have had certain confidence that they can do something to improve their lives. To grasp this situation, firstly, it is necessary to examine to which extent the community people feel that they have been benefited from the pilot projects, especially from the main components for improvement of land degradation. According to the results of the monitoring survey, around 65% of the participants of soil conservation activity feel that one of the most important benefits are from gully training and more than half of the participants find the effect by observing the sediment deposited inside the gully or on the contour terraces after treatment. Since around 50% of participants found that they have obtained the technique how to work for soil conservation, it is expected that they can be the resource persons who can encourage other community people.

Table 4-38: Benefits by the Soil Conservation

Benefits	%
Slowed gully expansion speed	65.6
Obtained Technique & Knowledge	50.0
Motivated to work for Community devt.	25.0
Feel less danger	21.9
Don't know	0.0
Nothing	0.0

As for the grazing scheme, around 50% of participants are feeling that the soil can be conserved by promotion of grazing scheme. It shows that at least half of the participants understand the real purpose of this activity in this pilot project, whereas 55% of them are putting more value on selling cows. There are some people who have not known what they will be benefited or there is no especial benefit from grazing scheme. It might be because they have not yet confirmed the effects since the activities have just started.

Table 4-39: Benefits by the Range Management

Benefits	%
Learnt about grazing management	55.3
Expecting to sell cows	55.3
Prevent soil conservation	51.1
Motivated to work for community devt	38.3
Don't know	6.4
Nothing	2.1

However, the need of more training is still observed. Whereas around 55% of participants think that they have been benefited by gaining knowledge and technique, around 38% participant answer that they want to continue grazing management since they can keep more cattle, which is completely opposite to the project purpose.

Thirdly, it is observed that the participants of agro/community forestry have more understanding on the purpose of their activities. It has been assumed that the community people have jointed the activity with expecting gaining forestry products in the future,

however, the results show that around 83% of the participants think that they get benefit for soil conservation through the activity.

Table 4-40: Reasons to continue the Range Management

Reason to Continue the Activity	%
Easier herding	57.8
Can keep more cows	37.8
Fields protected	51.1
Catte grow well	48.9
Soil is conserved	51.1
More grass will grow	40

Finally, in each activity, 24 to 38% of the participants feel it as benefit that they have been motivated to work for community development through each activity. It is one of the great achievement and change since this is the element for sustainable activity.

Table 4-41: Benefits by the Agro/community Forestry

Benefits	%
Gained knowledge&technique	96.6
Soil is conserved	82.8
Expecting fuelwood and fruits	41.4
Expecting to sell nursery plants	37.9
Motivated to work for community devt.	24.1
Just tring agroforestry	20.7
Don't know	0.0

b. Difficulty Encountered and Capacity of the Community

As to the difficulty of implementation of the pilot project, 36% of the respondents indicate that there was a problem in communication within the community. It is due to the physical distance among homesteads as well as the disputes among community people. Another, 29% of the participant express that the time was not enough for implementing all activities.

On the other hand, 33% of the respondents reply that there is no difficulty in implementation of this pilot project. As the applied technology in these pilot projects is small-scale and simple in general, there was no respondent who feels difficulty in technique applied.

Further, nobody mentioned about the difficulty in inputs, apart from some elder participants who find it physically difficult to provide enough labour force. Hence, as for the capacity in acquisition of material resources, it was found that the community people can manage them.

As for the capacity in knowledge, according to the result of the monitoring survey, 74% of the respondents reply that they got knowledge and technique to continue the work. As a whole, it could be said that the capacity of the community people and the scale of the pilot project have been matched in general, apart from the issue of the time period.

c. Evaluation on Participation of the Community

Discussing on evaluation on participation of the community, remarkable differences are observed in the evaluation by the community people and by the development committee. The differences are observed especially in TA1 and TA3. Especially in the case of TA1, around 80% of the community people evaluate themselves that community people were cooperative in the work during the pilot projects, whereas 50% of the development committee members evaluate that the cooperation by the community were “weak”.

The gap shows that the development committee see it was not enough for all activities considering the participation of whole community, while those who participated in the activities think that they have been cooperative to the activities.

The relatively low evaluation by the development committee of TA3 could be also explained in the following example. According to the report of NGO commissioned for the construction of fences for the grazing scheme, the participant rate in construction of grazing scheme in Macdvulwini (TA3) was quite poor. Even when the whole community was called by the development committee, the maximum attendance was only 15%. It is also reported that around 44% of the households never attended the work.

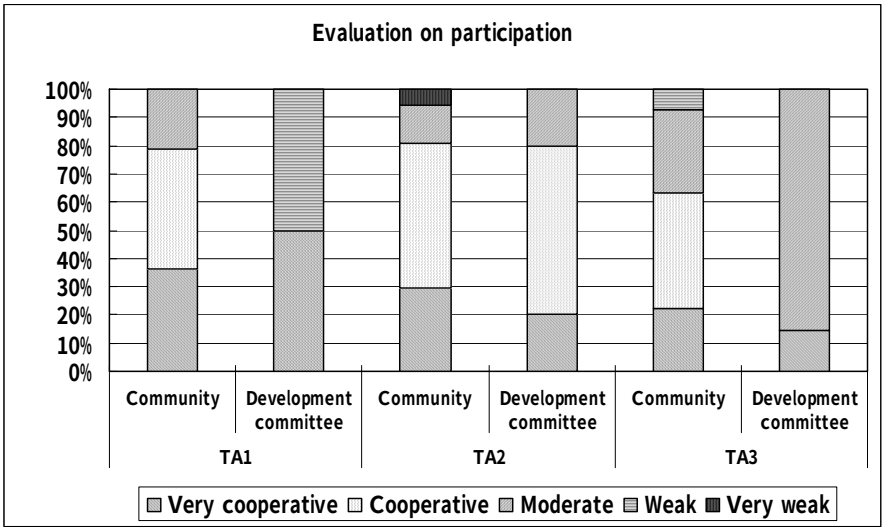


Figure 4-5: Evaluation on Participation

Though it is one of the prominent cases in Macdvulwini where the community covers too huge area, it might be showing the degree of interest toward the activity, compared to the high participant rate in community garden activity which of the average is around 80%.

Summing up, it could be said that the community people who are involved in the activities are quite actively participating, however, those who have not been involved from the earlier stage, still do not have interest to join the activities or are hesitating to join. Expanding the inclusion of other community members is the next step which should be challenged.

d. Group Work

Considering the feature of Swazi society, it was planned and organised group for pilot projects with making clear individual profit and equality, and these features were remarkably confirmed through the pilot projects.

Observing the process of implementation in general, people tend to organise themselves in the activity which has got obvious individual benefit in short term, such as community garden and water spring protection. In other activities, such as soil conservation and afforestation, which takes time to find the benefits in longer term to get invisible benefits, most of the work have been done under the leadership and responsibility of development committee as kind of duty and even if there are members appointed.

Moreover, these tendencies will be changed by other elements of the community, such as leadership of the group as positive force and social problems such as disputes as negative force. This tendency could be explained in the figure below.

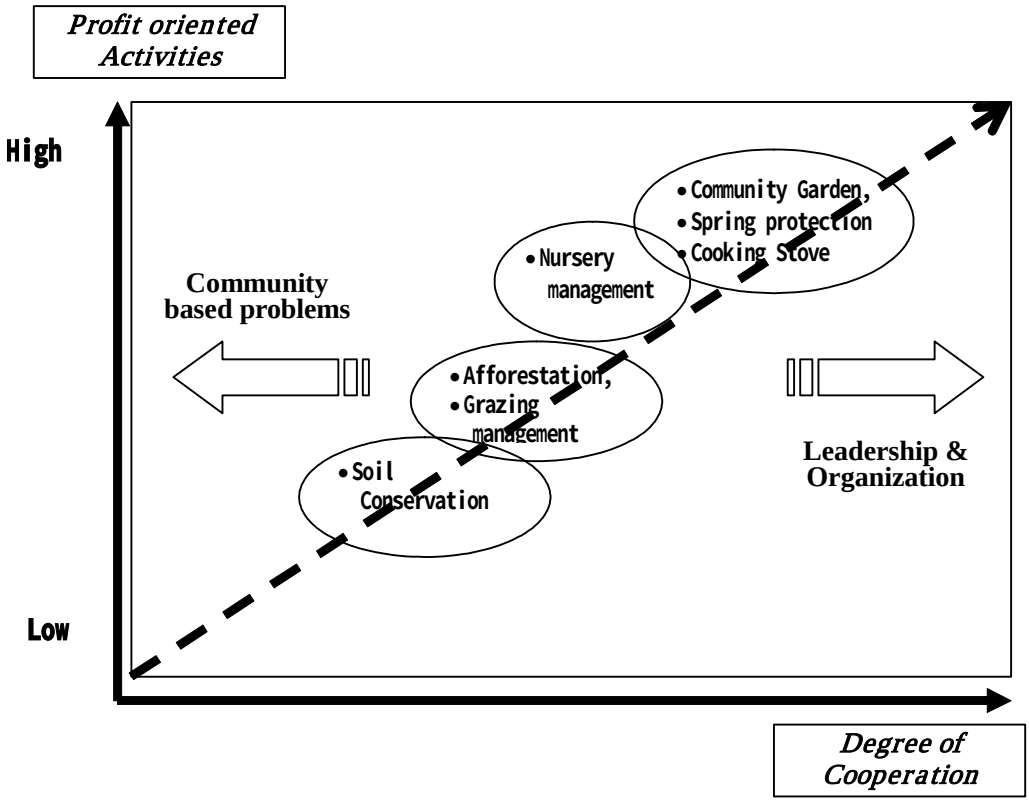


Figure 4-6: Elements to strengthen and weaken the group work

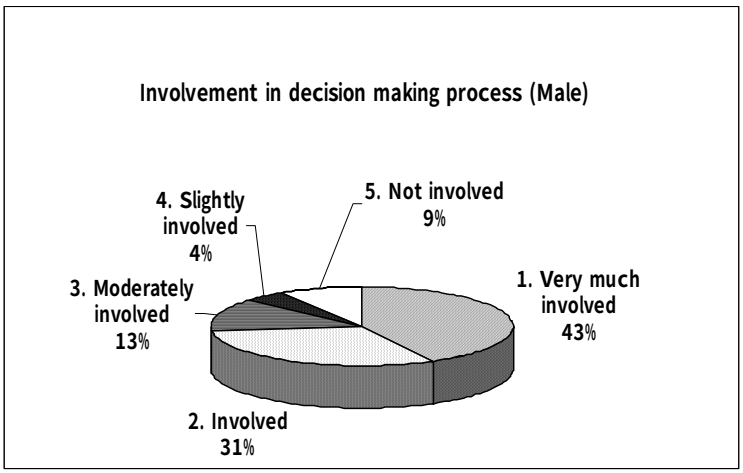
Where there is more individual profit, the cooperation becomes higher. The leadership of the committee pull the degree of cooperation up, but if some community-based problems such as jealousy, disputes on land, issue of traditions and so forth occur, the cooperation will be discouraged. The leading ability of the development committee will be the key to make the cooperation stronger or weaker since those kinds of problems may frequently happen in the Swazi rural society.

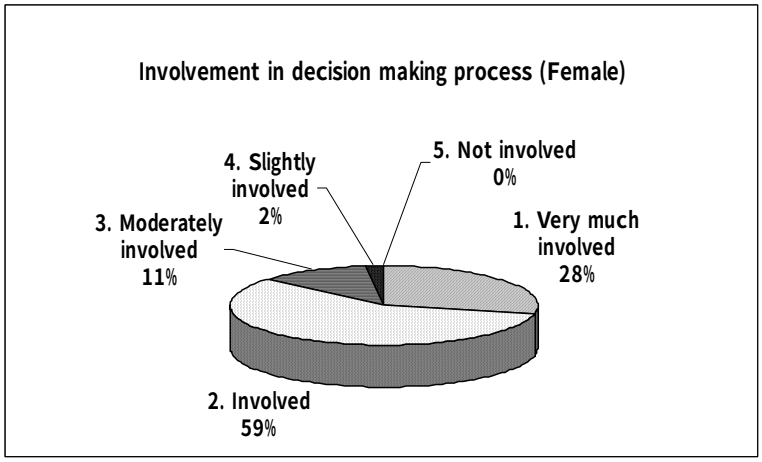
At the same time, it will be the cause to hinder the cooperation if the activity does not create individual profit. Since soil conservation activity is the project which will not bring direct individual profits in short term, for example, it is necessary to think of the mechanism to encourage the activity by way of compensation with other supporting components.

e. Changes in Gender

The pilot project was started with the understanding that Swazi culture tend to be male dominated culture as described in chapter 3.

The result of the monitoring survey(June, 2003) shows that 86.8 % of female participants feel that they have been involved in decision making process of pilot projects, whereas 73.8% of male have felt the same.





The result of Monitoring Survey in June 2003

Figure 4-7: Involvement in decision making by sex

As a fact, compared with the first workshop held in 2001, women were more actively participating to discussion. For example, in the self-evaluation workshop held in TA1, most of the presenters except one grazing committee were women. This shows that women were more participative for the activity and were regarded as appropriate person to present as a representative of the group, and they were quite confident to do this. They are contributing in the discussion with their opinions even for the issue of grazing which is considered as men's matter. It could be said that women have obtained confidence on their capability by fully participating development activities either as a committee or community member.

Especially through the stove activity, women took initiatives to take actions and it would help them to be encouraged to continue and extend their works.

Moreover, according to the result of interviews to the garden committee members, who are mostly women, they answered that they have controlled how to use the benefit from the garden. Since most of them did not have control of cash so far, it brings great changes in their lives as well as in social status.

As for the perception of men, they are ready to listen to women's opinion. Some women became more busy participating in development projects and they might go home late. According to the interviews with women, they have not heard any complaint from their husband. Many of their husbands are working and staying outside. Even for those who stay at home, at least some projects are both for men and women, and men easily comply with their wife participating in works outside.

4.10.2 Changes in Development Committee

a. Development Committee and Capacity Building

In the planning stage of the pilot project, the development committee as well as sub committees on each activity were formed as the implementation body at community level. Each development committee has eight (8) to nine (9) members depending on the target areas, of which the 30% are female members.

Since management skill of the development committee is crucial for sustainability of the activities started in the pilot projects, the committee members have been trained through several trainings as well as OJT under support by the government and the study team, in order to be self-reliable organisation from vulnerable development committee as described in the figure below.

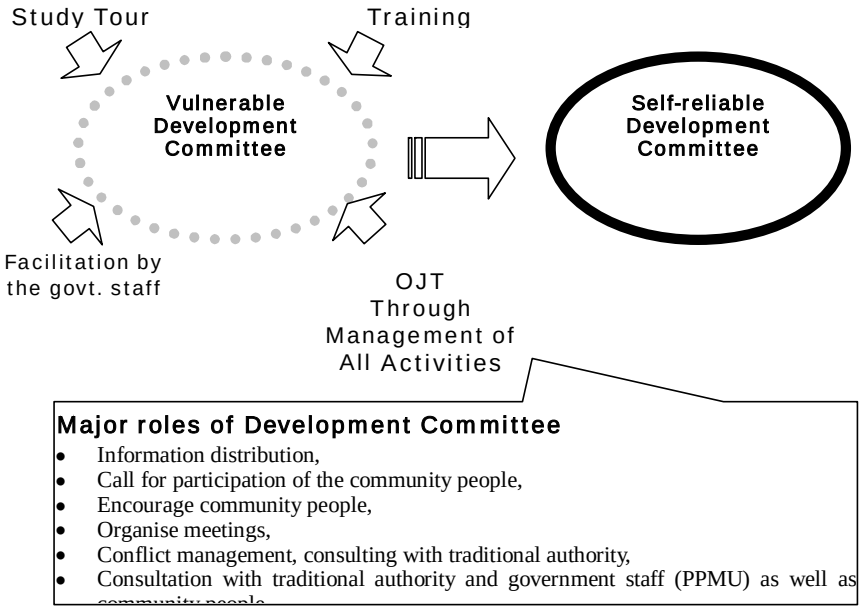


Figure 4-8: Toward self-reliable Development Committee

The following training and study tours were conducted on the OJT basis. As for the series of capacity building, through these trainings and tours, the members were encouraged and further, the network among three TAs has been also enlarged, such as observed in promotion of modern cooking stove from TA1 to TA3 (see details in chapter 4.7).

Table 4-42: Major Method of Capacity Building of Development Committee

Major CB components	Expected outcome	Time to implement
Study Tour to Lesotho	Motivate the members through visiting the advanced areas for soil conservation.	Sept. 2001 (5 days)
Inter-location Monitoring Tours	- Exchange of experiences among three communities, - Provision of occasion to compare the activities	Aug.2002 (2 days) Jun. 2003 (2 days)
Leadership Training	Train the committee members and traditional leaders on leading and management skills.	Mar. 2003 (3 days)
On the Job Training	Practice the management of the all activities and learn through the action.	Sept 2001- Jun 2003 (22 months)

b. Feature of each Development Committee

Eni and Ngcayini (TA1):

The development committee seems more organised compared to others and the members are motivated for the series of works under strong leadership of the chairperson. The committee is balanced in gender in terms of the number, division of roles, and activeness of participation. Whenever having meetings, the committee members are punctual and responsible, and moreover, seemed enjoying the work. However due to the disputes occurred in the community, they are struggling to cope with the problem, consulting with traditional authorities.

Zikhoteni (TA2):

Insufficient leadership is observed, as the leader tends to be absent from the activity. It seems that disputes in the community and local political issues lying in the community affects the unity for proceeding communal work. However, there are some committee members who are motivated for the work, especially female members. It is expected that they could continue and expand their activity in the community.

In Macdvulwini (TA3):

Half of the development committee members have gone to find work outside from earlier stage of implementation, and they were not replaced till now. It is affecting the efficiency of implementation and due to this situation, the community people evaluate their development committee lower than others. Existing development committee members are participative for the work in general, however it was mentioned that they are too old to lead the community people. The re-election of committee members was proposed in the self-evaluation workshop.

c. Changes observed in development committees

Firstly, changes of development committee will be discussed with analysing the result of self-evaluation by the development committee.

When the development committees were formed at the beginning of the pilot projects, the members seemed quite motivated to start the activities, and they had evaluated their ability subjectively as development committee quite high as 4.5[2] in average.

Figure 4-9: Comparison of Self Evaluation Results

Contrarily, after implementation of the pilot projects, it was evaluated lower to 3.9 unexpectedly in average. It does not necessarily mean that their leadership and confidence as

[2] The criteria is categorised in 5. 5 indicates "very good", 4: "good", 3: "moderate", 2 "slightly weak", and 1 "Very weak".

a development committee have been deteriorated, considering the interview survey results. Rather, this result could be analysed that 1) They have evaluated their capacity more realistically and objectively and, 2) Some members have encountered the difficulty of managing reality as leaders through their experiences.

Especially in TA1, the differences are remarkable. Since they have encountered the disputes occurred in the community and, they have been straggling how they cope with those issues. It could be said that now they feel that they could not involve community people enough to avoid those disputes.

This awareness change is important in two ways, namely; 1) for the committee members to grow by themselves and, 2) for external agency to know how to support them depending on the feature of the community.

Contrarily, community people evaluate the development committee as follows; Comparing the survey result in September 2001 and June 2003, 83.1% of the respondents evaluated that the leadership of the development committee is "very good" or "good" with the average of three TAs, which used to be 63.8% before. It could be said that objectively, the community people are satisfied with the leaders in general.

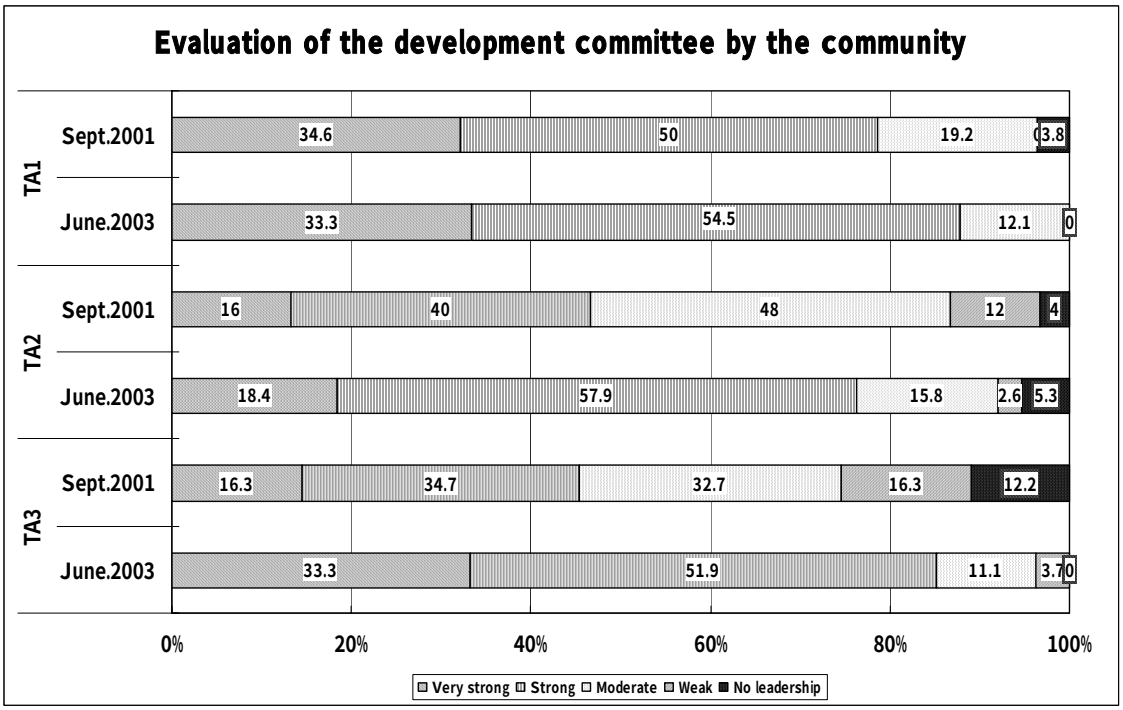


Figure 4-10: Evaluation of the Development Committee by the Community

On the other hand, evaluate the development committee from the aspect of involvement of community people to decision-making process. The results vary in each TA, and especially positive change is observed remarkably in TA1 and TA2, which is shown as 84.9% and 78.9% of people (TA1 and TA2, respectively) feel that they are "very much involved", or "involved" in the decision making process. Moreover, the number of respondents who answered as "slightly involved" and "not involved" has been decreased from 28.8% to 7.6%. There is no one who feels that they were not involved or only slightly involved in TA1. These are positive change which shows the function of the development committee.

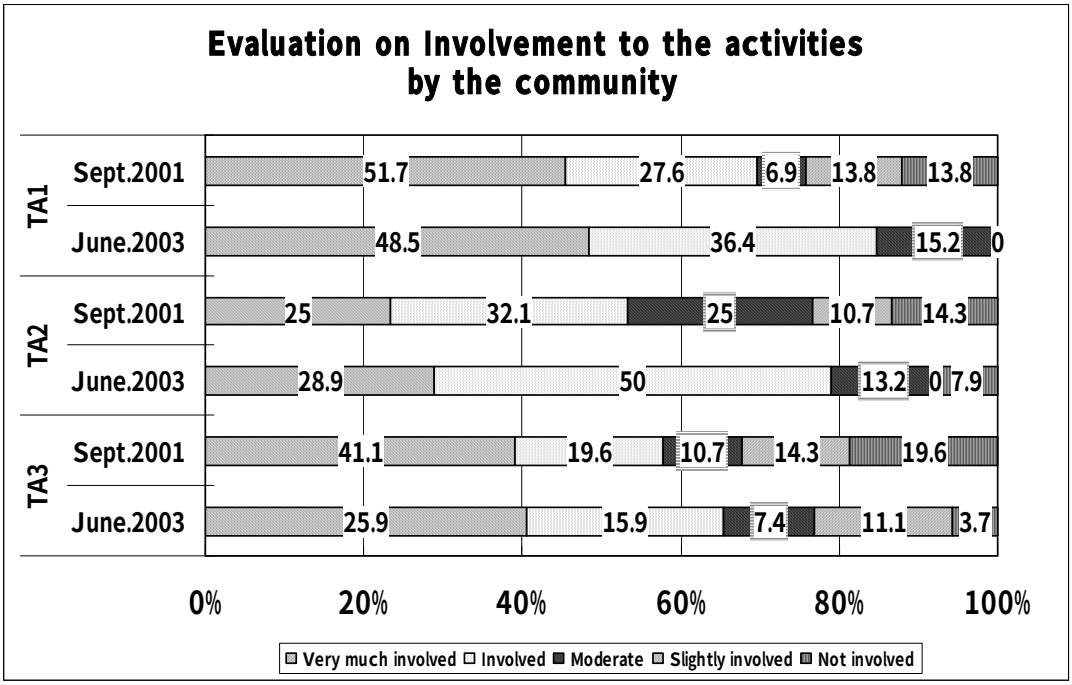


Figure 4-11: Evaluation on Involvement to the activities by the Community

It could be said that the development committee could lead and involve community people in general.

4.10.3 Constraints and Challenges

Though some positive changes have been observed through the pilot projects as explained in former sections in each TA, the following will be the challenges which the external agency should take into consideration so as to obtain more effective results.

a. Jealousy and Development Committee

It has been stated that people said there are many cases of spoiled group or community activities recognized in the study area because of "jealousy". Considering these situations, the pilot project has tried to keep transparency and fairness in order to avoid jealousy and disputes. However, it could not been avoided in TA1.

In TA1, the leader has clear idea how they want to develop their community and was a quite hard worker. Core members including development committee members have been very much cooperative for the work, and the great progress was made at the beginning. However, gradually a few community members started to find fault with the work that has been done and it brought more confusion in the community. It could be assumed that the success of him as a leader of development committee leads the jealous of those people.

Tackling with this kind of issue may take time, however it might be indispensable process to overcome with changing traditions, which might be one of the causes for putting on the brake for development and development committee should keep continuous discussion with community people with keeping transparency and fairness.

b. Relationship with Traditional Leaders

Disputes within the community might become the "killer assumption" of any development. Traditionally, disputes and problems that occurred in the community should be solved by the traditional authority. Hence, the pilot project has tried to involve those traditional leaders whenever necessary.

However, sometimes it was observed that the disputes were laid within or around the traditional authority or it took time for the disputes to be delivered to the traditional authority, and affected progress of the activities, like the case of TA2.

The importance of keeping good relationship with traditional leaders has been repeatedly stressed during the process of pilot project by the government staff. Besides, the leadership training was held in March 2003 for the elders to ensure their roles in development projects. It seemed contributing to provide constructive perception for the traditional authority, and more training were requested by development committee in order to cope with them well.

Thus, intervention of external agency such as Study team and the government who are not involved in the community directly could facilitate the meetings if necessary.

c. Diversity of the "community"

"Community" is diverse. One of the differences of the successful and unsuccessful cases seem to be observed in the differences of the dimension of the community.

The pilot project has been started with regarding the chiefdom as "one community". However, the perception toward "community" seems not necessarily common for every community members. These differences of the perception toward "community" might be one of the difficulties in communal work.

It could be seen remarkably in the case of construction of grazing fence inTA3. The selected area locates in the eastern side of the chiefdom, where it takes 2 hours to reach there for the people living in the western side. The physical distance might also disturb to participate in the work. Accordingly, the average attendance toward the work was minimum as 7 to 25% of the expected numbers. It might be also showing that the people are not regarding the area as the range of their lives.

Contrarily, the activities on water source protection, which the target number is limited, the active cooperation was achieved. The clearness of the visible benefit from the activity may have induced their motivation for sure, and at the same time, it could be said that the size of the "community" was appropriate for communal work.

To sum up, depending on the contents of the activity, the size of the target area should be flexible, with considering the "community" as the perception in the area.

d. "Motivation" to Work

The pilot project consisted of various schemes in order to combine several approaches, which the people could profit in short term as well as long term.

It was confirmed through the various pilot projects that the "motivation" to work is very much related to the individual profitability which is explained in 4.10.1.d.

Observing the successful activities such as community garden and water source protection, it is easy for the participants to imagine the profit even before starting the activities. Moreover, in the case of community garden, the garden was divided into plots to allocate each member in order that the benefit will be clearly allocated as a result of individual effort. The work has been managed well with managing collected fees under constitution agreed with the members.

Contrarily, in the case of soil conservation work, which is totally communal work, it has not been easy to organize themselves and the participant rate was also not high in general. Other schemes such as range management and feedlot, they might be in-between, since they understand the profit in their head, but gaining income from cow is not really their expectation culturally.

However, those latter schemes might be indispensable for improvement of soil. Considering this fact, it might be important to examine the mechanism to link the "individually profitable scheme" and "communally profitable scheme". For example, as a condition to start community garden project, the certain amount of profit from the garden should revolve to the fund for soil conservation as a community development.

This kind of mechanism may keep the fairness between the people who could get the opportunity to start garden and the ones who cannot start, in terms of public benefit.

e. Continuous External Support

During the pilot projects, it was observed that the community people have been making efforts to work for all activities in general, and it is expected that they will continue the work by themselves. However, it was observed sometimes that the activity was stopped during absence of the study team, or the community people have just waited for the training planned to be given by the government.

In the case of promotion of cooking stove in TA1, for example, the activity did not start for long time, however, after one visit of the study team with the government staff, they started constructing stoves immediately.

The support is not necessarily intensive visits or support with material or financial inputs. Providing information and opportunity to discuss through regular visits will assist and encourage the community people to continue work.

4.11 Summary of Lessons Learnt

The major lessons learnt are summarised as follows in three stages, namely planning, implementation, and follow-up.

4.11.1 Planning Stage

a. Mobilisation of Community

How to enhance the commitment of the community to participate in the project is an essential point to lead success of the project. When the ownership of the community people toward the activity is build, the sustainability of the project will be achieved. In order to achieve that, firstly, the project itself needs to be attractive to the communities with matching to the needs of the community people. Secondly, it needs to have short-term benefits that the local people can foresee, and thirdly, it is important to create better conditions for the communities to participate. Understanding these needs, sufficient explanation on the purpose of the project and discussion on the content of the activities is the process, which is inevitable to establish the ownership of the community people. Hence, having sufficient time for discussions at the planning stage will be significantly effective to achieve the expected results.

b. Cost Sharing

In this pilot project, it was planned and started that all initial cost was burdened by the project and the maintenance cost will be shouldered by the community people basically. The cost sharing issue needs to be discussed and cleared at the planning stage rather than at the implementation stages.

Furthermore, cost sharing among community is important since the dimension of "Community" is various, from lower class to high class and so forth. Consideration on the lower class is important for keeping equality among the community, which is indispensable to discuss at planning stage.

c. Scale of the Project

Basically, all of the work, except such works as requiring special skills, was carried out by the residents without any allowance. Considering the daily routine work of the community people, it is important to consider the availability of workers when designing the scale and schedule of each pilot project. In particular, the number of beneficiaries should directly affect the scale of the project.

From the experience of the pilot project, it was found that the smaller the number of beneficiaries is, the easier it is to manage and control the project. This is because when fewer people were involved, they had a stronger sense of ownership towards the project and recognized that it would be their property in future. However, when the beneficiaries included the whole community, the project was difficult to manage and people's motivation was also very low. The scale of the project should be examined and determined, considering these features.

d. Combination of Various Projects

There are several types of projects, some requiring heavy physical work and others requiring easy and light work. The Team found that residents were very keen to participate in projects of which the short-term benefits could be foreseen and the number of beneficiaries was limited. On the other hand, they were reluctant to participate in projects of which the benefits could not be foreseen and the beneficiaries included whole communities.

Since the both activities mentioned are necessary for achieving the livelihood, including the effect of soil conservation, flexible combination of various projects is effective to keep the motivation of the community people for the implementation of the Master Plan.

4.11.2 Implementation Stage

a. Utilization of NGOs

Although, there are various NGOs exist in Swaziland, the NGOs which might be able to work for soil conservation, grazing management, afforestation and agriculture are quite few. Simultaneously, MOAC have only a few experience to work with NGOs, which means the relationship between MOAC and NGO is quite weak.

In this pilot project, the series of construction as well as trainings, which could not be covered by the government, have been conducted by NGOs, and it was confirmed that they have ability in regards to design, supervision, and logistic support. On the other hand, there is a fear to rely on NGO in terms of ; 1) Utilisation of NGO is costly for the government, and 2) Too meticulous care of the community people may increase dependency of the community people.

Thus, utilisation of NGOs is subsidiary measures for implementation of the project, and it is recommended to utilise them depending on the availability of human resources or necessity of specific technique alternatively.

b. Inter Location Monitoring Tour

The same kind of project was implemented in three target areas and an inter location monitoring tour was carried out to observe the activities in the different locations. There was an active exchange of opinions regarding the increased need for tree planting in soil conservation sites and methods for managing community gardens and nurseries, which further developed the residents' willingness to participate in such activities.

Observing the success example of the farmers who live in similar circumstances encourages other farmers and the credibility of the activities may also become high. Hence, it could be proposed to include this activity as one of important item for the master plan.

c. Measures Concerning Village Leaders

When implementing the projects, the traditional village leaders (i.e. the elders, etc) often hindered the activities of the Development Committee and the various subcommittees. The reason is believed to be that the traditional leaders are not accustomed to sharing power and wanted to show their authority over the Development Committee, which is mainly composed of young members.

At the request of the Development Committee, the study team and the C/P facilitated a meeting in order to explain to the village leaders the project activities and the specific roles of the Development Committee and other concerned persons (i.e. JICA, etc). The study team also made it a point to include them in the inter location monitoring tour.

The authority of the traditional leaders is significantly high still in the target areas, and it is necessary to include them with asking cooperation at each certain point from planning stage to implementation.

d. Transparency and Fairness

The importance on avoiding jealousy is crucial for promoting any community development project in the target areas.

It has been stated by people there are many cases of spoiled group or community activities recognised in the study area because of "jealousy", and several devices as involving whole chiefdoms in the selection process have been carried out in the pilot project. However, some problems had occurred by the problems related to these issues. As it was tried in the pilot projects, keeping transparency and fairness of organisation and activities are inevitable for successful implementation. Frequent regular meetings, discussion for reaching consensus and, keeping records of participants and meetings may assist to keep transparency to support the fairness.

e. Continuous Training

The series of trainings have been carried out during project implementation and covered a variety of fields including soil conservation, agriculture, livestock production, and forestry, as well as training on management aspect such as strengthening of leadership. The effectiveness of the training is evaluated highly by the community people in the self-evaluation workshop, and at the same time, it was found that "the fact that they have received training" could be important encouraging element for the community people. Thus, continuous training can be an effective means for implementation of the projects.

4.11.3 Follow up Stage

a. Periodic Follow Ups

It is essential to conduct periodic follow-ups after completion of the project in order to 1) establish a relationship of mutual trust between the government and the community, and 2) Encourage the motivation of the community people to continue the work. For instance, it was observed that the stagnated activity during absence of the study team was re-started with this opportunity of re-visit of the Study Team in the pilot project. Although there are problem of lack of human resources and transportation, the RDA extension staffs have sufficient skills to conduct these kinds of follow up. It is, therefore, important for the government to implement the follow-ups, preferably through the MOAC, which has local offices and staff stationed throughout the country.

Chapter 5

Degraded Land Improvement Plan (Proposed M/P)

5 Degraded Land Improvement Master Plan

5.1 Basic Concept

5.1.1 Objective of the Master Plan

The objective of the M/P can be summarized as follows:

1) To improve the environmental condition of rural areas included in 30 chiefdoms of 3target areas through improvement of the degraded lands with the combined efforts of all the stakeholders, including the governmental agencies concerned, community people, and NGOs. With this achievement,

2) To further expand and realize sustainable land use in the study area in the same manners with the help of the Guideline for Soil Conservation in the Study Area, which will be prepared together with the M/P.

5.1.2 The Basic Concept

This Master Plan (M/P) has been formulated under the following concept, which could be summarised in the Figure 5-1 .

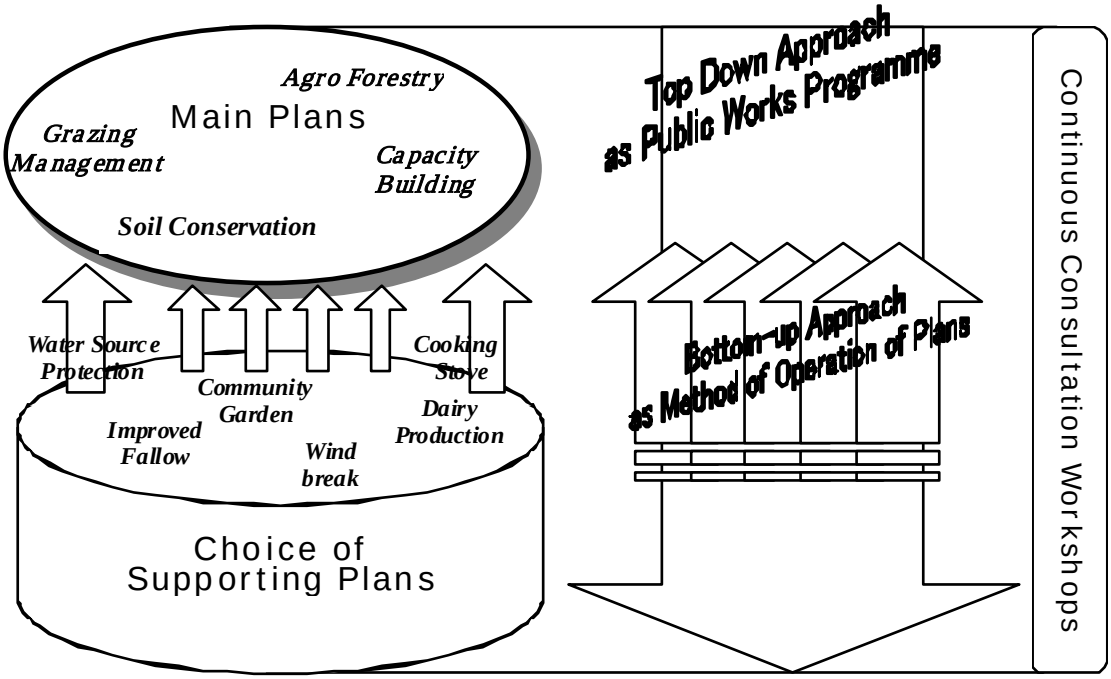


Figure 5-1 : The Concept of the Master Plan

a. Soil Conservation as Public Works

Judging from the seriousness of soil degradation in 3 target areas and the urgent need of tackling them, also in due consideration of obtaining the public environmental benefits by implementing the soil conservation plans, the soil conservation plans should principally be planned and implemented as indispensable public works by the Government of Swaziland. In this regard, it is expected that MOAC will play an important role as the leading government agency in implementation of the soil conservation plans. In addition to the above, the

community people may contribute not only to the soil conservation works as labour force but also contribute to the maintenance of the facilities that will be constructed under the proposed soil conservation works etc. Apart from the above, the community people can also contribute to the soil conservation works through participation in the supporting plans, which are described below.

b. Combination of Main Plans and Supporting Plans

The degraded land improvement M/P proposed in this report consists of several sub components. It is because that the motivation of the community to participate in soil conservation activity is generally low and there is a necessary to seek the way to motivate the community people in order to continue the activities in long term period.

Hence, this M/P is categorised into two, namely, **"Main Plans" as inevitable component for improvement of land degradation, and "Supporting Plans" as necessary supplementary component to enhance smooth implementation of the "Main Plans"**. Parallel implementation of the "Main Plans" and "Supporting Plans" may produce the effect toward soil conservation.

Main Plans consist of 1) Soil Conservation Plan, 2) Grazing Range Management Plan, 3) Agro/Community Forestry Development Plan and 4) Capacity Building Development Plan.

Supporting Plans consist of various options of components related to each scheme of main plans, which are compiled as; 1) Grazing management Supporting Plan, 2) Agro/Community Forestry Supporting Plan, and 3) Livelihood Improvement Plan. The Supporting Plans are various and it will be selected depending on the situation of the target community and their needs.

Since most of the Main Plans include such works that will greatly contribute to the environmental conservation in the communities of 3 target areas, also in due consideration of the difficulty in implementing the main plans by the community people alone, it is strongly advised that these main plans should be implemented as the public works with strong support by the Government of Swaziland. On the other hand, since some Supporting Plans may provide individual benefits, it is expected to acquire the advantage of rotational use of those benefits through implementation of the supporting plans. This mechanism of rotational use of the benefits obtained through implementation of the supporting plan is examined in section 5.1.3 of the report as an approach to achieve the target.

c. Combination of Top-down Approach and Bottom-up Approach

As mentioned above, the degraded land improvement plan will be basically implemented as public works. However, in order to sustainably implement and manage the proposed soil conservation plans, active participation by the community people is inevitable. Simultaneously, people's motivation to work depends on the situation and needs of the community. Accordingly, there must be a gap between the demand of the community and the emergency needs of soil conservation.

Hence, to bridge the said gap as well as to materialize the proposed soil conservation plans, the proposed M/P should be implemented with the combination of Top-down Approach and Bottom-up Approach, thereby, the both parties, i.e., the related government agencies and community people can find the way for suitable as well as sustainable implementation of the proposed M/P

d. Gradual Reduction of the Heads of Cattle

It has been identified that about 48,600 heads of cattle are presently grazed in 3 target areas whose grazing area amounts to about 39,000 ha. This means that present cattle population density is 1.2 heads/ha. This population density is already too high to naturally graze the cattle on the grazing area of SNL of 3 target areas.

On the other hand, it has been confirmed through the pilot projects that direct promotion of reduction of the number of cattle will only hamper the implementation of the Master Plan. This Master Plan proposes that controlling the number of cattle will be gradually made through 1) introduction of rotational grazing, 2) introduction of habit of tethering cattle with provision of fodder, and 3) encouraging commercial use of the cattle etc.

e. Capacity Building through Implementation

For implementation of this M/P, it is necessary for all the stakeholders to fully understand the purpose and the necessity of implementation of the plans. Especially understanding of the community people who are living in the core of the problems exist is crucial.

In this target area, the community people have certain capacity to carry out the activities, which was confirmed through the pilot projects. Hence, this M/P proposes mainly OJT combined with the series of trainings during the implementation of the plans, and do not consider social preparation period in advance to start implementation.

The whole process of plans from the planning stage, implementation, monitoring to evaluation of the activities, is a great learning process for the community people to have ownership of the activities as well as being capable to manage their activities with having clear idea of the activities. It may be more practical to learn through the process with seeing the result of action done by themselves under instruction and training of the government support.

f. Explanation on the Selection of the Components of the Main Plans

As stated earlier, the proposed main plans consist of soil conservation plan, grazing management plan, agro forestry development plan, and capacity building plan. Out of which, such components as soil conservation plan, grazing management plan, and agro forestry development plan directly affect the soil conservation, on the other hand, since the proposed M/P has been formulated putting greater emphasis on the participation of the community people, capacity building plan focusing on the community people is also a must. With this background, the said 4 components have been selected as the main plans of the proposed M/P.

5.1.3 Proposed Mechanism to be established among Each Activity

As stated earlier, the soil conservation is the work, which should be done as public work basically. However considering the capacity of the government, it is inevitable to be taken care of by the majority of the community people continuously after completion of the physical work.

At the same time, the effectiveness of supporting projects has been confirmed through the pilot projects and it has been found especially that the "motivation" to work is very much related to the individual profitability. On the other hand, it has also been found that those supporting projects could assist only specific people who could have access, and most probably, it may be attributed to the fact that the effect of supporting project toward soil conservation may have been limited.

Considering the public benefit as public works, those supporting projects should not be implemented as an independent project, which provides benefit only to specific target; instead, it should be implemented as a part of contribution to improve soil condition in the target areas.

In this sense, it is proposed that the following mechanism should be established among each activity (in other words it may be replaced with "each components") proposed in this M/P. This mechanism aims to;

1) keep equivalency within the community with linking the "individually profitable activity" and "communally profitable activity",
2) attain sustainable soil conservation activities, and
3) fill up the gap between the peoples' demand and necessity to conserve soil.

The illustrative images given in Figure 5-2 will explain the above stated mechanism.

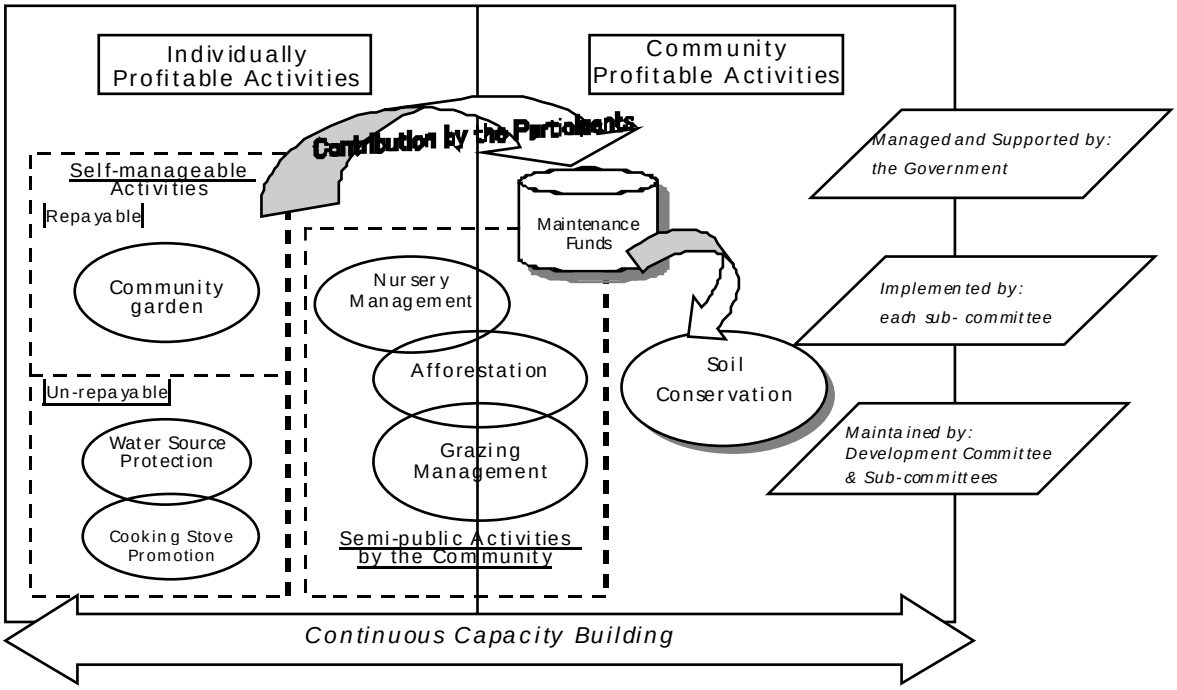


Figure 5-2: The Mechanism of implementation of the Master Plan

Each activity included in this mechanism is chosen based on the results of Pilot Projects. They are categorised as individually profitable activity and community profitable activity. Here, one would use the term of "community profitable activity" for "public profitable activity", since the mechanism covers the public as a community base, not as a target area as a whole.

Soil conservation project is placed as community profitable activity. Grazing scheme and afforestation will be placed in middle since they have both features of individual and communal benefits. As for the promotion of nursery, considering the both aspects of selling seedlings which brings individual benefit and contribution to increase the number of trees, it has also both features of individual and communal benefits. Accordingly, those are regarded as semi-public activities.

The community garden, water management activity and promotions of cooking stove are categorised as individually profitable activities, and especially, the community garden could be expected to create the higher benefit than others. The promotion of cooking stove may have the role to alleviate the pressure to existing forest as well as encourage participation, especially women.

All activities will be implemented by the community under the management and supports by the government in cost, and the community people do not have obligation to return the initial cost. The maintenance will be done by the community lead by the development committee and each sub committee basically. Implementation of all the activities will be supported by the government in cost, and the community people do not have obligation to return the initial cost, but the maintenance will be done by the community apart from soil conservation project.

Under this mechanism, it is requested that the people who have benefited by certain activities which produces individual benefits, such as community garden should return their part of profits to the society as maintenance funds as obligation.

The contribution collected will be managed by the development committee at community level in order to utilise for maintenance of the soil conservation within the community. In this way, the equitability of the comprehensive plan will be kept, which contributes to alleviate jealousy among the community people.

Since grazing management and afforestation activities have both features of individual and communal benefits, their contribution to the community will be automatically made with gaining the individual profit. In this sense, the participants for those activities are not necessary to return the initial cost, instead, it is requested that the activities started should be self-managed by the community by utilising their benefit gained from the activity.

5.2 Phased Planning

The proposed M/P has been prepared for the years of 2004 through 2020 and it also has been prepared phase-wisely based mainly on the following reasons and considerations.

1) Various national and strategic papers including action plans for environment protection, which have been prepared by the Government of Swaziland, aim to accomplish the targets given in the said papers by and around the year of 2020.

2) The land degradation in 3 target areas has been accelerated since 1980 and it is still going on. To improve this situation and to recover the situation of the land degradation level at 1980, it is assumed that at least time span of 20 years will be required.

3) It is considered that the proposed soil conservation plans for 3 target areas should be carried out putting the first priority on the areas under initial stage of land degradation, the second priority on the areas under moderately-eroded condition, and the third priority on the areas under seriously-eroded condition in due consideration of effectiveness of the soil conservation works, required period for implementation of the soil conservation works depending on the different stages of land degradation, and cost-benefit performance of the soil conservation works.

4) Consideration on the work volume as well as the implementation capacity of MOAC and community people that was observed through implementation of the pilot projects during the study.

With above-stated reasons and considerations, the target year has been set at 2020 and the period of Y2004 to Y2020 has been divided into 3 phases, namely, Phase-1 (Y2004-Y2009), Phase-2 (Y2010-Y2015), and Phase-3 (Y2016-Y2020).

Based on the above discussions, the phase-wise degraded land improvement plan targeting at 30 chiefdoms (including the 4 chiefdoms, where the pilot projects were implemented) in 3 target areas under the M/P for the period of year 2004 through 2020 has been proposed as shown in Table 5-2, considering the degraded land condition in 30 chiefdoms.

5.2.1 Selection of Chiefdoms in each Phase

a. Selection Criteria

1) The same or similar numbers of Chiefdoms are grouped in each Phase for a target area.

2) In view of ample opportunities for inhabitants to observe and monitor the implemented demonstration of pilot components, top priority was placed on the Chiefdoms located in the vicinity of those already implemented, i.e., adjacent Chiefdoms were chosen for the

group to be implemented in Phase-1. Then, those adjacent to the Chiefdoms selected in Phase-1 group were given second priority to be implemented in Phase-2.

3) Notwithstanding the preceding criterion, Chiefdoms with relatively large portion of the areas that have severely been degraded where restoration can be envisaged through the proposed measures were chosen for phase-1 group on account of immediate necessity for taking timely countermeasures.

4) Chiefdoms with least degraded land were grouped in Phase-3 since there's little need of early implementation, though degradation would proceed as time elapses. By the similar reason, those with most seriously degraded to such an extent that measures in a scale of participatory conservation works are not enough to rehabilitate the devastated state in an acceptable period were also set aside as phase-3 groups.

b. Selection Process

Judging from the above criteria, the following process was taken to allocate the target chiefdoms in each phase. The basic principle of selection resides with both gradual diffusion originated from the Pilot project to surroundings, and taking timely measures to moderately eroded areas, because too seriously eroded ones require prohibitive costs, period and efforts and too mildly eroded ones may allow sometime to leave them as it is. The grouping procedure of chiefdom in three TAs is tabulated below.

Table 5-1: Grouping of Chiefdoms in TA's

TA	Factor considered	Phase-1	Phase-2	Phase-3
1	Pilot Area (ha)	Eni(396), Ngcayini(1381)	-	
	Nearest to P.A.	Nkiliji (2042), Nsenga(1173)	-	
	Area adjustment	Butfongweni(829)*	Below 5 occupy 1/3 of TA-1	The rest Kingdoms:
	Nearer to P.A.	These 5 occupy 1/3 of TA-1	Mdayane(588), Bhekinkoshi (1938), Ngwazini(898)	Sankolweni (too eroded), Ntunja (too eroded), Nyakeni, Swaceni
	Phase 2 Area adjustment		Mkhulamini(1350), Maliyaduma(1197)	
2	Pilot Area (ha)	Zikhoteni(4822)	-	
	Nearest to P.A.	This larger than 1/3 of TA-2		Mchinsweni (228), Manyandzeni (978)
	Area adjustment		Mabona(4753), Dumenkhungwini (919)	These two are nearest to PA but least eroded
	Nearer to P.A.		These two are moderately	
	Area adjustment		Eroded	
3	Pilot Area (ha)	Macdvulwini(5491)		
	Nearest to P.A.	Velezizweni(6,358), Bhazeni II (2701)	Bhadzeni I (2840), Mahhashini(844), Khabonina(921)	
	Area adjustment	These 3 occupy 1/3 of TA-3	These three have comparable degree of erosion	
	Nearer to P.A.			Mgazini(3644), Dladleni(826),
	Area adjustment			Ngcoseni(2000), Lishikishini(4975)

Finally, the following groups by phase were proposed for this component, shown in Table 5-2 and the proposed phase wise works are presented from Figure 5-6 to Figure 5-17.

Table 5-2: Proposed Phased Degraded Lands Improvement Plan for Each Chiefdom of 3 Target Areas

Stage/Phase	**Pilot Stage (Y2001-Y2003)**	**Phase-1 (Y2004-Y2009)**	**Phase-2 (Y2010-Y2015)**	**Phase-3 (Y2016-Y2020)**	**Total**
Implementing Body	**MOAC/JICA**	**MOAC**	**MOAC**	**MOAC**	
Numbers of Target Chiefdoms	(4)	9	11	10	30 chiefdoms
TA1	Eni, Ngcayini	**Eni, Ngcayini,** Nkiliji, Nsenga, Butfongweni,	Mdayane, Maliyaduma, Bhekinkoshi, Ngwazini, Mkhulamini	Sankolweni, Ntunja, Nyakeni, Swaceni, Mbeka	
TA2	Zikhoteni	**Zikhoteni,**	Mabona, Manyandzeni, Dumenkhungweni	Mchinsweni,	
TA3	Macdvulwini	**Macdvulwini,** Bhadzeni II, Velezizweni	Bhadzeni I, Mhhashini, Khabonina	Lishikisini, Mgazini, Dladleni, Ngcoseni	

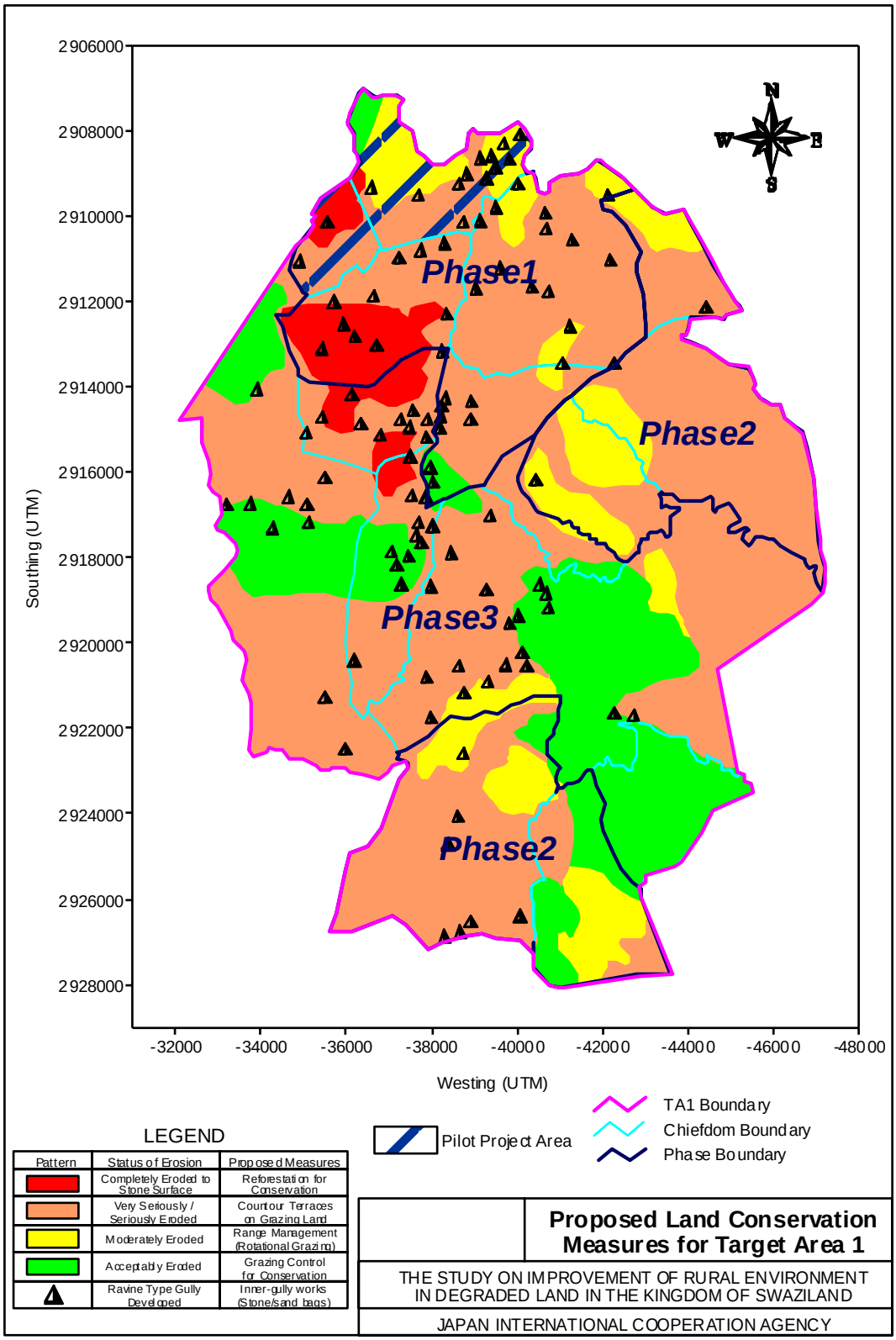


Figure 5-3 Phased degraded Land Improvement Plan in TA1

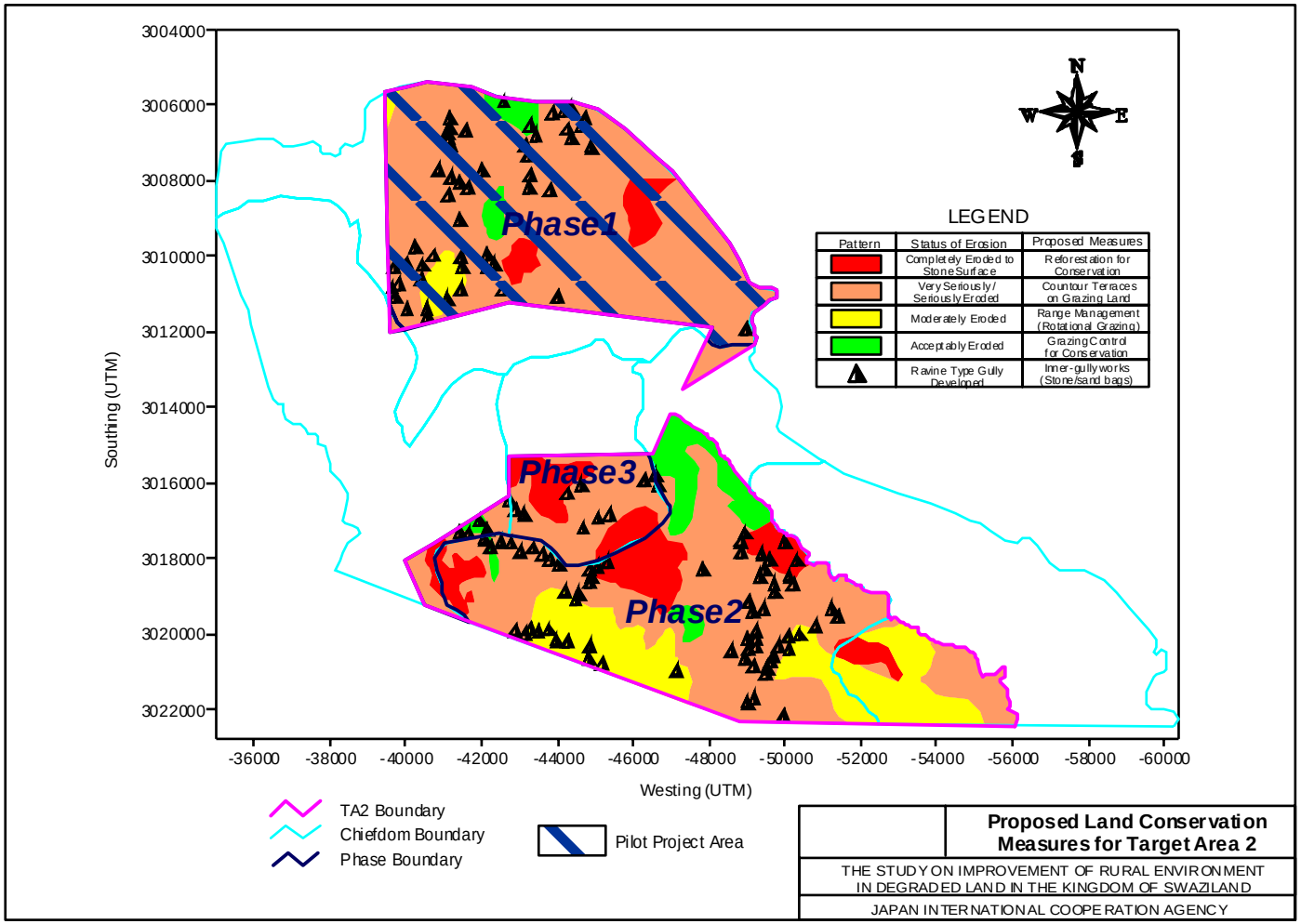


Figure 5-4: Phased Degraded Land Improvement Plan in TA2

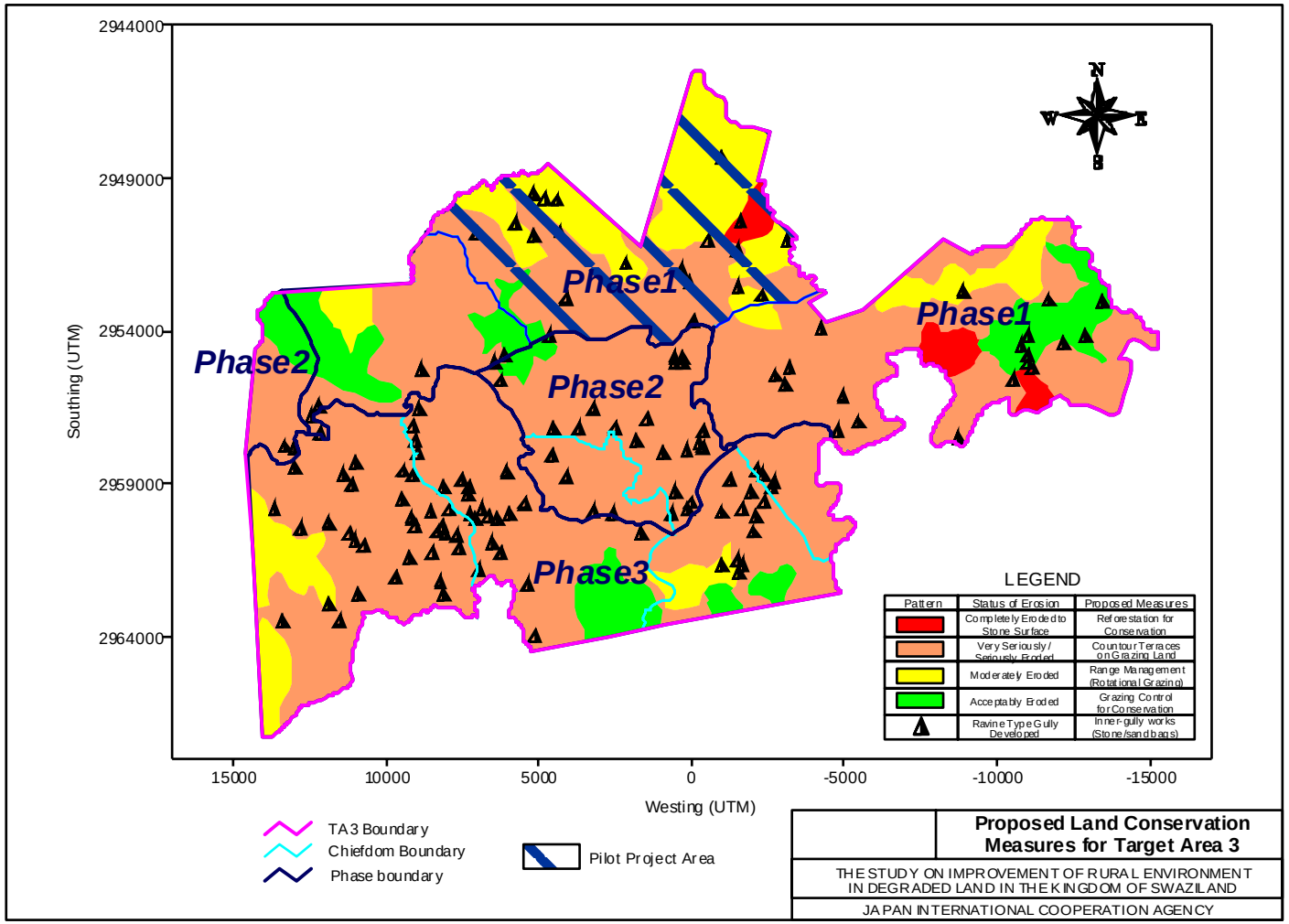


Figure 5-5: Phased Degraded Land Improvement Plan in TA3

5.2.2 Phased Target

The target to be achieved by implementation of the proposed M/P is to realize sustainable land use through improvement of the degraded lands in 3 target areas in due consideration of 1) income generation for community people, 2) improvement of living environment of community people, 3) environment conservation in 30 chiefdoms located in 3 target areas. Another important target is to formulate a consistent basis for land degradation, which enables sustainable implementation of the degraded land improvement plans proposed in the M/P in collaboration with MOAC, related governmental agencies, NGOs, and people living in the traditional communities in 3 target areas.

Table 5-3: Phased Target of the M/P

Main Plan	unit	Phase 1	Phase 2	Phase 3	Total
Soil Conservation Plan					
Contour Terrace	ha	1,869	2,800	4,671	9,340
Gully Training	site	85	75	90	250
Rill Stabilizing	site	31	43	72	146
Grazing Range Management Plan					
Rotation Grazing	ha	1,375	3,120	2,185	6,680
Feedlot	site	4	6	4	14
Grazing Control(Tethering)	ha	490	730	1,240	2,460
Agro/Community Forestry Development Plan					
Integrated Tree Nursery	site	2	0	0	2
Stony Surface Reforestation	ha	220	320	530	1,070
Woodlot Development	ha	95	115	170	380
Wattle Management	ha	110	291	229	630

5.3 Expected Roles of MOAC, Inkhundla and RDA, NGOs and Community People

5.3.1 Expected Roles of MOAC

MOAC is expected to play a leading role in implementation of the proposed soil conservation projects in 3 target areas. Judging from the nature of the soil conservation projects as well as the experiences obtained from the implementation of the pilot projects, it will be very difficult to ask community people to continuously take part in soil conservation projects for a long time without any support by the government. With this understanding, JICA study team considers that the soil conservation plans/projects proposed in this M/P should be implemented as the important public works to be carried out by the Government of Swaziland with wide-range as well as long-term support by the community people (the majority of the stakeholders), inviting NGOs where necessary.

In addition to the above, MOAC should take accountability for the community people that the prevailing land degradation in 3 target areas has been caused as a result of long-term as well as combined human activities by the community, availing every possible means and opportunities such as media and workshops etc., through which, it is expected that community people will gradually realize that it is not only the government but also the

community who people are also responsible for the prevailing land degradation in 3 target areas.

With provision of the said accountability, it is expected that the proposed soil conservation projects to be carried out in 3 target areas in the future will work and function, thereby the achievements obtained through the implementation of the soil conservation projects will be sustainably managed by the community people as well as the by the government.

Also it may be mentioned here that, as identified through implementation of the pilot projects, MOAC should pay attention to the combination of the soil conservation works; it means that the soil conservation works should be implemented in combination with profitable supporting projects which directly bring the benefit to the community people, thereby encourage the community people during implementation of the soil conservation projects. Without this consideration, sustainable implementation of the soil conservation projects in 3 target areas will be very difficult and any soil conservation projects without supporting projects that encourage community people will not bring any remarkable results in the future.

5.3.2 Expected Roles of Inkhundla and RDA

Each Inkhundla in 3 target areas consists of several chiefdoms. Accordingly, each Inkhundla concerned is expected to play an important role, especially in execution of proposed grazing management projects in 3 target areas, which include rotation grazing, feedlot (cattle fattening) and grazing control. Because, the proposed grazing management projects will be implemented in the wide areas, which cover 2 to 3 chiefdoms. Accordingly, to implement these projects it needs adjustments among the chiefdoms concerned.

Thus, it is expected that each Inkhundla to take action to settle the matter prior to implementation of the projects. Also, it is expected that each Inkhundla to take necessary action so that the community people can access to the development committee established in each Inkhundla to obtain further fund for continuous implementation of the soil conservation projects by community people. It is also expected that each Inkhundla should look after the implemented pilot projects and should try to expand them by providing more information and funds to manage the implemented pilot projects. Because the implemented pilot projects have great possibilities as a starting point of soil conservation activities in 3 target areas.

Utilization of RDAs in executing the soil conservation projects is considered very useful, because RDAs are considered as locally-stationed branch offices of MOAC, although its present functions of RDAs are limited to extension services, forestry, cooperatives etc. There exist 2 RDAs in TA1, i.e., Central and Mliba/Bhekinkosi RDA, Hluti RDA in TA2, and Ngwempisi RDA in TA3. And there are 17 RDAs in Swaziland in total. At present due to shortage of the budgets, activities by the RDA staff are limited, however, considering effective use of RDAs in implementation of the future soil conservation projects, MOAC should increase budgets and strengthen the man power assignment of RDAs to facilitate their ability to guide the community people for continuous implementation of the soil conservation projects.

5.3.3 Expected Roles of NGOs

Considering the present activities of NGOs in Swaziland, also considering the achievements of NGOs that took part in implementation of the pilot projects, the expected roles of NGOs in implementation of the proposed M/P are summarized as below.

JICA study team considers that all the components included in the proposed M/P should basically implemented by the stakeholders, i.e., all the related government agencies inclusive of the community people concerned. Accordingly, although JICA study team highly evaluates the ability of NGOs in Swaziland that was proved through implementation of the pilot projects, also it is necessary as well as effective to use the NGOs in implementation of

the proposed project components in the M/P, the expected roles of NGOs in implementation of the proposed M/P are that they should act as supplemental staff and they should always keep neutral positions and act as a organization which bridges the gap between the communities and the government. Because over presence of NGOs will bring the problems of increase in the costs for implementation of the proposed components of the M/P as well as it may hamper creation of self-depending mind of the community people concerned.

5.3.4 Expected Roles of the Community People

In implementation of the pilot projects, community people have proved that they have capability of 1) carrying out planning and implementation of the projects together with the governmental officials and NGOs, 2) decision making for establishment of rules to be observed for management of the implemented projects. During implementation of the pilot projects, community people were well guided by the governmental staff, NOGs, and JICA study team, thereby they achieved good performance in implementation of the pilot projects, self-evaluation of the pilot projects, discussions with each other regarding the pilot projects, also in the performance of inter-location monitoring of the pilot projects etc. These experiences are not only highly evaluated but also they will make it possible that community people can continue this kind of soil conservation projects by themselves provided that the government extends necessary supports and accountability for the community people of the necessity of the soil conservation in their communities. Accordingly, it is expected that the community people take part in the soil conservation projects from it initial stage i.e., from planning stage of the projects to the management and operation and maintenance stage of the projects in collaboration with the governmental staff and NGOs, where necessary.

5.3.5 Cost Sharing and Necessary Support by the Government of Swaziland

MOAC has been implementing soil conservation projects as well as range management projects in different places of the country. However, it seems that the results obtained by this time through implementation of these projects are not always satisfactory. Because these projects were implemented by the government or NGOs, and community people did not play much important role in execution of the soil conservation projects.

However, since it has been identified that the human activities, mainly free grazing in Swazi Nation Lands has caused land degradation, which is now commonly observed almost in every places of the country, it is the time for the community people to take responsibility for those activities. This means that community people, the majority of the stakeholders, must take action to prevent SNL from further land degradation.

As a contribution by community people, for example, 20% of the costs for construction materials necessary for a soil conservation project should be borne by the community people, and the ratio of the cost sharing among the community people may be decided depending on the heads of cattle that the community people own, and the community people who do not own cattle should also bear the responsibility by contribution either in kind, money or by offering labour may be considered.

In conclusion, judging from the lessons learnt obtained from implementation and evaluation of the pilot projects, as well as judging from the present economic status of the majority of the community people, it is proposed that contribution by community people in implementation of the proposed M/P should be limited to contribution by participation in planning of the projects in collaboration with the government officers and NGOs, offering labour, paying operation and maintenance cost for the completed project, taking part in training programs, collecting materials such as sands, stone, woods etc. which can be obtained free of charge etc.

5.4 Basic Parameters for Formulation of M/P

A series of below-listed Tables summarize the basic parameters for formulation of M/P. Table 5-4 summarizes the present land use in the chiefdoms included in 3 target areas.

Table 5-4: Present Land Use in 3 Target Areas

Unit: ha, 1997

Target Area	Chiefdom	Grazing Area	Arable Land	Forestry	Amenities	Total
TA1 (Kukhanyeni)	Eni	224	163	9	0	396
	Mdayane	359	205	24	0	588
	Butfongweni	484	316	29	0	829
	Maliyaduma	755	418	24	0	1,197
	Ngwazini	587	307	0	4	898
	Mbeka	658	229	0	0	887
	Swaceni	143	184	14	16	357
	Mkhulamini	788	431	123	8	1,350
	Sankolweni	563	169	24	0	756
	Ngcayini	713	668	0	0	1,381
	Ntunja	809	130	30	0	969
	Nkiliji	1,107	875	30	0	2,012
	Nyakeni	3,346	1,400	18	5	4,769
	Bhekinkoshi	1,164	765	4	5	1,938
	Nsenga	789	367	7	10	1,173
	(15 Chiefdoms)					
	Sub-total	12,489	6,627	336	48	19,500
	Percentage (%)	(64.0)	(34.0)	(1.7)	(0.3)	(100.0)
TA2 (Shiselweni)	Manyandzeni	634	339	1	4	978
	Mchinsweni	82	146	0	0	228
	Mabona	3,217	1,423	112	1	4,753
	Dumenkhungwini	735	179	2	3	919
	Zikhoteni	2,673	2,139	10	0	4,822
	(5 Chiefdoms)					
	Sub-total	7,341	4,226	125	8	11,700
	Percentage (%)	(62.7)	(36.1)	(1.1)	(0.1)	(100.0)
TA3 (Ngwempisi)	Bhadzeni II	1,371	675	635	20	2,701
	Dladleni	601	225	0	0	826
	Lishikishini	3,201	1,672	76	26	4,975
	Macdvulwini	3,977	826	683	5	5,491
	Mahhashini	534	308	2	0	844
	Bhadzeni I	1,382	701	756	1	2,840
	Mgazini	2,015	1,534	86	9	3,644
	Khabonina	646	255	20	0	921
	Ngcoseni	1,167	803	8	22	2,000
	Velezizweni	4,352	1,753	238	15	6,358
	(10 Chiefdoms)					
	Sub-total	19,246	8,752	2,504	98	30,600
	Percentage (%)	(62.9)	(28.6)	(8.2)	(0.3)	(100.0)
	Total (30 Chiefdoms)	**39,076**	**19,605**	**2,965**	**154**	**61,800 (618.0 km^2)**
	Average Percentage (%) (Total 30 Chiefdoms)	**(63.2)**	**(31.7)**	**(4.8)**	**(0.3)**	**(100.0)**

Table 5-5 summarizes the numbers of homestead, household, and population in the chiefdoms included in 3 target areas.

Table 5-5: Homestead, Household, and Population in 3 Target Areas

Target Area	Chiefdom	Number of Homesteads	Number of Households	Population (1997)
TA1 (Kukhanyeni)	Eni	50	59	375
	Mdayane	81	96	607
	Butfongweni	63	75	472
	Maliyaduma	160	190	1,199
	Ngwazini	192	228	1,439
	Mbeka	65	77	487
	Swaceni	51	61	382
	Mkhulamini	320	381	2,398
	Sankolweni	47	56	352
	Ngcayini	68	81	510
	Ntunja	58	69	435
	Nkiliji	210	250	1,573
	Nyakeni	740	880	5,545
	Bhekinkoshi	280	333	2,098
	Nsenga	83	99	622
	(15 Chiefdoms)			
	Sub-total	**2,468**	**2,935**	**18,494**
TA2 (Shiselweni)	Manyandzeni	300	357	2,248
	Mchinsweni	300	357	2,248
	Mabona	635	755	4,758
	Dumenkhungwini	125	149	937
	Zikhoteni	606	721	4,541
	(5 Chiefdoms)			
	Sub-total	**1,966**	**2,339**	**14,732**
TA3 (Ngwempisi)	Bhadzeni II	230	274	1,867
	Dladleni	68	81	552
	Lishikishini	758	902	6,152
	Macdvulwini	500	595	4,058
	Mahhashini	44	52	357
	Bhadzeni I	250	297	2,029
	Mgazini	500	595	4,058
	Khabonina	200	238	1,623
	Ngcoseni	246	293	1,997
	Velezizweni	900	1,070	7,305
	(10 Chiefdoms)			
	Sub-total	**3,696**	**4,397**	**29,998**
	Total (30 Chiefdoms)	**8,130**	**9,671**	**63,224**

Table 5-6 summarizes the heads of main livestock in the chiefdoms within 3 target areas.

Table 5-6: Heads of Livestock in 3 Target Areas

Dip Tanks- Based, 2000

Target Area	Chiefdom	Cattle	Goat	Sheep	Horse	Donkey
TA1 (Kukhanyeni)	Eni	350	225	0	1	46
	Mdayane	596	593	0	0	0
	Butfongweni	84	101	0	0	31
	Maliyaduma	419	1,013	30	0	9
	Ngwazini	699	1,351	0	0	0
	Mbeka	294	191	0	0	18
	Swaceni	91	68	0	0	0
	Mkhulamini	105	43	8	3	18
	Sankolweni	378	146	0	0	0
	Ngcayini	1,049	225	13	0	0
	Ntunja	776	450	0	0	18
	Nkiliji	1,748	945	0	0	0
	Nyakeni	7,760	2,251	495	6	46
	Bhekinkoshi	489	563	50	0	15
	Nsenga	870	113	10	0	15
	(15 Chiefdoms)					
	Sub-total	**15,708**	**8,278**	**606**	**10**	**216**
TA2 (Shiselweni)	Manyandzeni	87	98	10	3	6
	Mchinsweni	760	3,056	612	0	8
	Mabona	1,216	978	47	0	32
	Dumenkhungwini	342	183	41	0	42
	Zikhoteni	9,497	917	102	0	106
	(5 Chiefdoms)					
	Sub-total	**11,902**	**5,232**	**812**	**3**	**194**
TA3 (Ngwempisi)	Bhadzeni II	1,306	374	72	27	35
	Dladleni	78	829	14	0	3
	Lishikishini	2,395	935	98	0	12
	Macdvulwini	1,305	62	33	0	7
	Mahhashini	122	106	6	0	7
	Bhadzeni I	1,044	249	65	4	9
	Mgazini	1,100	170	0	16	12
	Khabonina	133	374	65	6	11
	Ngcoseni	5,721	939	405	0	50
	Velezizweni	7,837	8,411	0	11	124
	(10 Chiefdoms)					
	Sub-total	**21,041**	**12,449**	**758**	**64**	**270**
	Total (30 Chiefdoms)	**48,651**	**25,959**	**2,176**	**77**	**680**

5.5 Main Component of Master Plan

5.5.1 Soil Conservation Plan

a. Objective

This plan aims at conserving soils in the Target Areas as the main component of this Project and following objectives will be achieved.

1) Minimizing soil loss from surface.

2) Improvement of vegetation in grazing land

3) Stabilization of Gullies from bottom

b. Justification

Soil conservation works in Chiefdom level has fully been justified by the results obtained through the soil conservation pilot projects of different kinds implemented in 3 target areas during the study, including the self-evaluation results by the participants and all stakeholders. Because, effectiveness of the soil conservation works has been confirmed by the study team and community people have also recognized the effectiveness of the soil conservation works as well as the need of soil conservation in their communities as the measures for protection of the environment. Also, the methodology of soil conservation applied to the pilot projects has been accepted by beneficiaries, bringing about change in concept and consciousness of environmental conservation among the stakeholders. Since prevailing soil erosion constitutes major part of land degradation and local population have long suffered from serious state of soil erosion, in particular that in the rangeland, thus, it is justified that the soil conservation should be placed at the core of the M/P. The relevance of the plan proposed here has also been justified in the performance at three pilot areas, and the contents of the proposed plan have already been endorsed in the workshops held in the communities, where community people appealed the needs for soil conservation measures at the beginning.

c. Target Group

Since the Target Areas affected by erosion covers the whole space of living activities, those who live therein should be involved in the target group of this component. Usually, they are organized into members of certain sub-committee in Chiefdom Development Committees. The direct target group of this plan is the sub-committee members under Chiefdom Development Committees, who are expected to participate in the implementation of the Plan. As a matter of course, many villagers will be mobilized to take part in the implementation of conservation plan to be carried out as a public work by the sub-committee members.

d. Activity

The proposed soil conservation works include contour terrace, gully training and rill stabilization. The reasons why these have been chosen constitute; contour terraces (strips) covered with grass have protected arable land and less erosion has been observed on grazing field converted from arable tracts protected by grass strips. Gully training has brought sedimentation inside treated gullies that can make them shallower and can facilitate vegetative establishment inside them that fosters earlier stabilization of gullies. Further, early efforts for rill stabilization can prevent land from subsequent formation of huge gullies.

The **strategy** of the proposed activity includes phase wise selection of Chiefdoms concerned, procedure of implementing the proposed works, input procurement and constraints as well as coping measures. Phasing of the target areas is as explained in 5.2., and the activities have been chosen with a view to timely and most readily implementable works. The basic principle of selection resides with both gradual diffusion originated from the Pilot project to

surroundings, and taking timely measures to moderately eroded areas, because too seriously eroded ones require prohibitive costs, period and efforts and mildly eroded ones may allow sometimes to leave them as it is. Besides, along with the phasing of soil conservation works during the period of M/P, the following consideration has been taken to group chiefdoms into three to be implemented in each phase.

1) Chiefdoms adjacent to the pilot areas are selected as the first group constituents because the inhabitants therein are more aware of what have been tried in the pilot areas.
2) Within a TA, chiefdoms are divided into three groups so that divergence in surface area of each phased group can be minimized, or into three group those with comparable area.
3) In separating groups, effort has been made in such a way that chiefdoms having similar degree of erosion can be grouped into the same group.

Total area of each target areas in each phase is proposed as follows.

Table 5-7: Groups of Chiefdom in TA's

T A	Phase I (2004~2009)	Phase II (2010~2015)	Phase III (2016~2020)
TA1	Eni, Ngcayini, Nkiliji, Nsenga, Butfongweni (Total Area 5491ha)	Mdayane, Maliyaduma, Bhekinkoshi, Ngwazini, Mkwalamini (T.A. 5971ha)	Sankolweni, Ntunja, Nyakeni, Swaceni, Mbeka (Total Area 7738ha)
TA2	Zikhoteni (T.A. 4,822ha)	Mabona, Dumenkhungwini (Total Area 5672ha)	Manyandzeni, Mchinsweni (Total Area 1,206ha)
TA3	Macdvulwini, Bhadzeni II, Velezizweni (T.A. 14550ha)	Bhadzeni I, Mahhashini, Khabonina (T.A. 4,605ha)	Lishikishini, Mgazini, Dladleni, Ngcoseni (T.A. 11445ha)

Breakdown of erosion in each of above listed chiefdoms is shown in the following table.

Table 5-8: Breakdown of Erosion in Chiefdoms of 3 Target Areas

Unit: ha reassessed in 2003, gully & rill; sites

T A	Chiefdom	Stony Surface	Serious Sheet E.	Terra cette E	Mild Sheet E.	Almost No erosion	Gully Sites	Rill Sites
1	Eni	75	120	35	0	0	8(4)	5(1)
1	Ngcayini	25	650	150	160	85	15(7)	13(3)
1	Nkiliji	0	550	245	285	50	3(2)	3(1)
1	Nsenga	400	230	175	0	0	12(6)	16(3)
1	Butfongweni	10	250	75	60	120	1(1)	7(2)
2	Zikhoteni	280	1,470	285	330	310	29(15)	23(6)
3	Macdvulwini	180	2,540	755	360	160	13(7)	22(8)
3	Bhadzeni II	0	0	0	1,000	370	19(10)	24(9)
3	Velezizweni	385	2,170	890	425	490	45(23)	11(3)
	Phase I Total	1355	7,980	2610	2,620	1585	145(75)	124(36)
1	Mdayane	0	160	90	110	0	0	0
1	Maliyaduma	0	330	80	310	55	0	5(1)
1	Bhekinkoshi	0	510	0	170	390	5(3)	11(3)
1	Ngwazini	0	0	0	450	140	0	13(4)
1	Mkwalamini	15	180	45	430	95	55(27)	33(7)
2	Mabona	1,050	850	480	555	280	49(24)	29(9)
2	Dumenkhungwini	175	320	110	310	0	3(1)	5(1)
3	Bhadzeni I	25	540	470	180	170	85(42)	97(22)
3	Mahhashini	0	100	45	120	175	7(4)	9(2)

T A	Chiefdom	Stony Surface	Serious Sheet E.	Terra cette E	Mild Sheet E.	Almost No erosion	Gully Sites	Rill Sites
3	Khabonina	0	370	275	0	0	7(14)	23(6)
	Phase II Total	3,975	19,320	6815	7,875	4475	211(115)	225(55)
1	Sankolweni	230	290	40	0	0	31(15)	40(8)
1	Ntunja	170	155	65	110	310	35(18)	43(9)
1	Nyakeni	0	1,115	775	260	1,195	7(4)	19(4)
1	Swaceni	0	40	0	70	25	5(3)	9(2)
1	Mbeka	0	0	0	305	340	0	11(2)
2	Manyandzeni	265	295	75	0	0	32(8)	55(10)
2	Mchinsweni	35	25	0	0	20	58(22)	32(6)
3	Lishikishini	15	1,290	385	1,275	240	112(56)	130(28)
3	Mgazini	40	855	285	350	445	25(12)	40(6)
3	Dladleni	20	235	195	150	0	10(5)	15(3)
3	Ngcoseni	0	455	75	320	315	54(27)	57(13)
	Phase III Total	8,725	43,395	15,525	18,590	11,840	369(170)	452(91)

Note: Density of gullies are estimated at a gully per 40ha. Half of them, ( ), are to be treated with in the MP.

In the above table, area under stony surface has almost completely lost soil cover either by climatic hazard or by overgrazing. No acute or immediate need of taking measures is felt on this area, but in view of limited territory area of Swaziland, this futile grazing area should be converted into more useful land by planting trees, and it is only tree that can be self-established over rocky surface.

Then there is the most extended grazing area under serious sheet erosion, to which impressing soil conservation measures with contour terracing should be applied. Grazing area affected with terracette erosion has fairly steep slope, commonly as steep as 10% or more, where narrower terracing is recommended with the interval of 30m, with the width of a terrace 1m.

The area under mild erosion is preferably used as fenced rotation grazing to realize sustainable grazing, because grass regeneration within shorter period can be expected, as compared to that under serious erosion where bare patches are widely seen. No impressive measures seems to be required on the area where there is almost no erosion, but it will sooner or later be degraded by heavy grazing unless due care is taken. Therefore, sustainable conservation with tethering of cattle herds is proposed to keep such less eroded land in desirable condition. Most of such less degraded land belonged to private estates until recently where owners intentionally avoided over-stocking of cattle or goats. It's a global tendency that land in common undergoes fast and severe erosion. The reason why tethering is recommended here lies in frequent occurrence of huge gullies along cattle tracks, which the effects have been already proved in other countries such as China. Tethered feeding is equivalent to or easier than confined feedlot feeding with intensive fodder cultivation.

Procedures of formulating soil conservation projects are advised in the following:

1) Existing community development committee (CVC) of individual chiefdom concerned takes initiative for launching Chiefdom Soil Conservation Project. Firstly, chairman of CVC calls for organizing and convening regular meeting for its preparation. Mapped long list of area erosion inventory on grazing fields is to be drawn where acreage and intensity of current erosion status are recorded according to the field observation survey with RDA extension staff, referring to land degradation maps attached to this report. Based on this list, the committee decides priorities and kind of measures to be taken for the grazing fields. Then the committee submits project plan to the Inkhundla development committee to be endorsed and further submitted to MOAC. The format of above mentioned list

should be printed in MOAC to be distributed free of charge to chiefdoms in 3 TAs.

2) CVC members should visit villages that implemented Pilot Projects to observe the works and ask the village committee members about the techniques of project implementation

3) MOAC that received the above cited plan from Tinkhundla concerned is to evaluate and assess the content, and send the result of evaluation with a list of available technical and financial assistance from MOAC back to the Tinkhundla that has submitted the plan. Upon the assessment of all the plans submitted within a fiscal year, MOAC is to take account of budget availability and foreign aid availability on soil conservation as a public work so that realistic advice can be replied to the Tinkhundla that has requested the approval.

4) Upon receiving the result of the assessment on the requested project plan, the Inkhundla development committee decides budget allocation for implementing public work, identifying whether the chiefdom is eligible and has intention to implement the submitted plan. Finally, the chiefdom convenes the committee and community meeting to determine the actual implementation of the submitted soil conservation plan.

PMU established in MOAC is to take charge of this assessment and evaluation, while it also is responsible for organizing an assisting system within RDA concerned for Tinkhundla / Chiefdoms. RDAs have bulldozers, tractors and their attachments that can be used for soil conservation purpose. They also have staff to guide and train villagers to enable them to make plans and implement them.

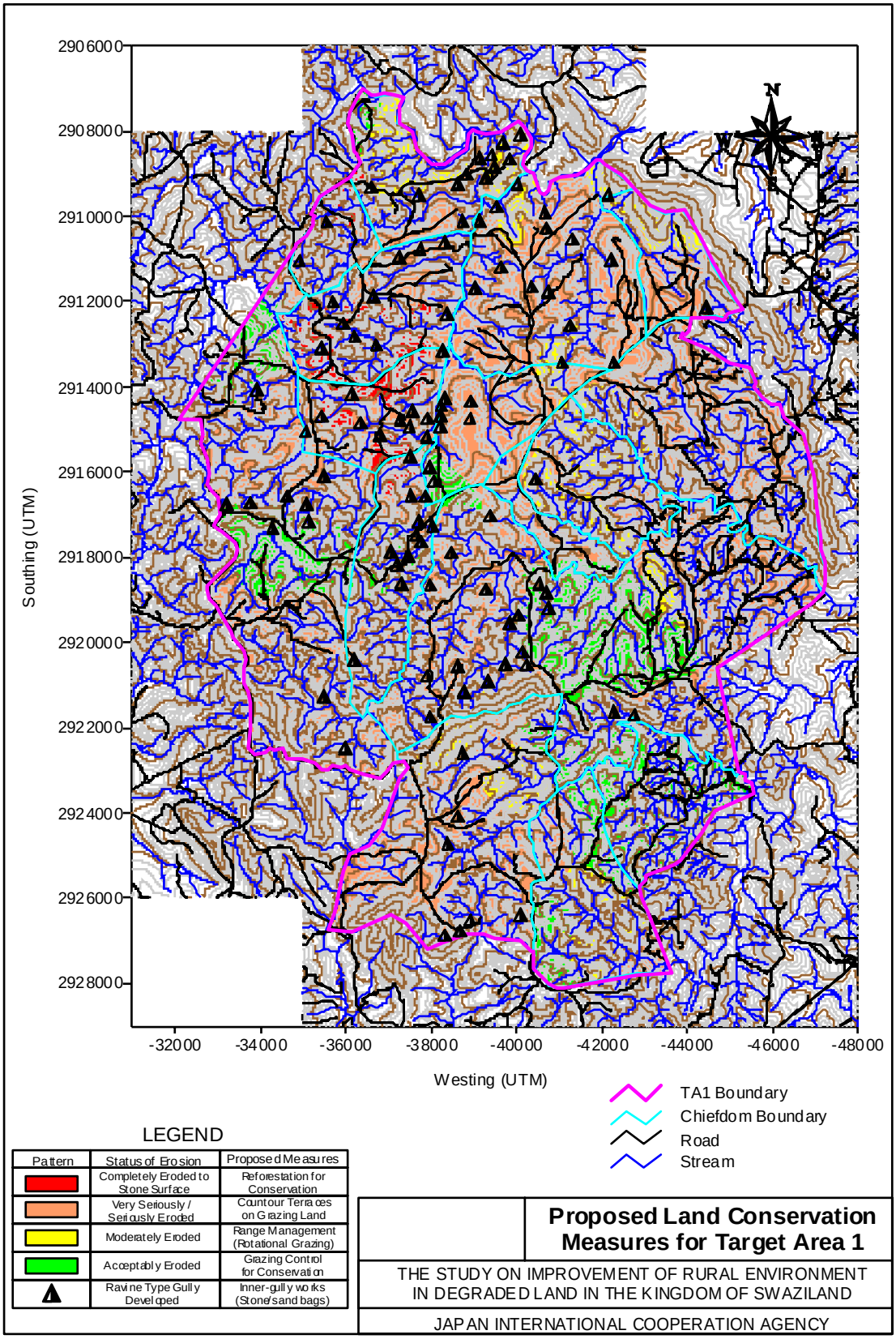


Figure 5-6: Proposed Soil Conservation Measures in TA1

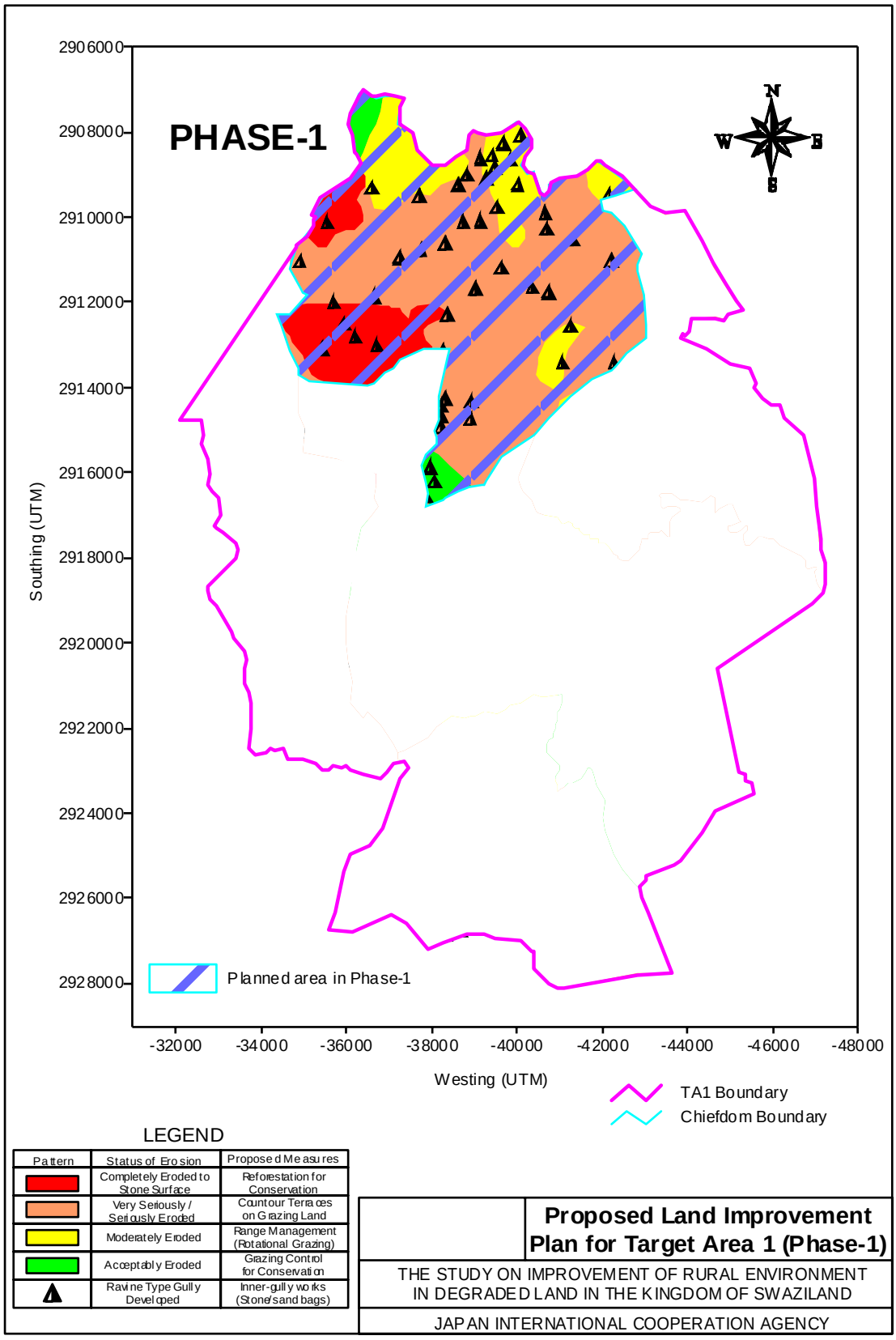


Figure 5-7: Phase1 Soil Conservation Plan in TA1

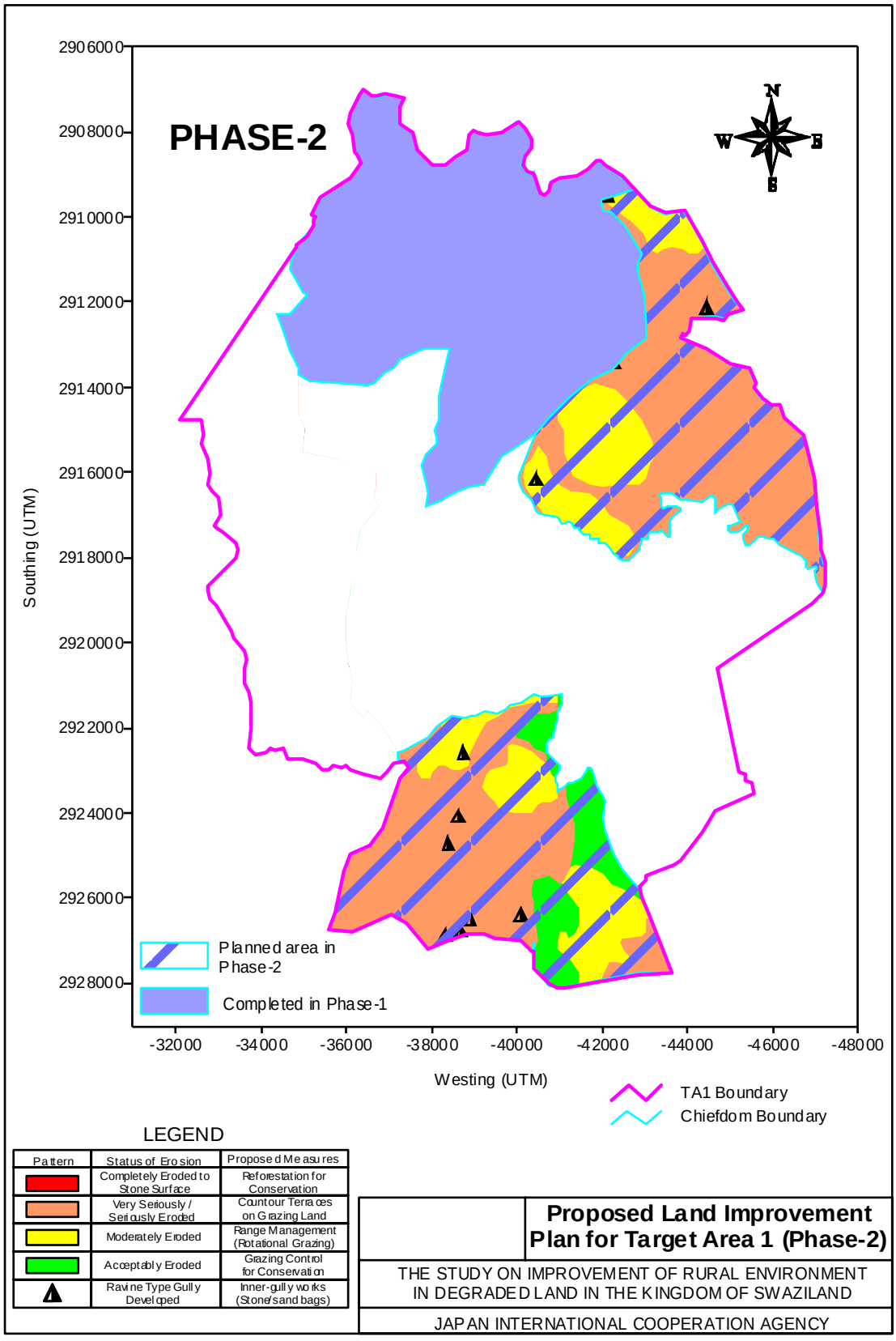


Figure 5-8: Phase2 Soil Conservation Plan in TA1

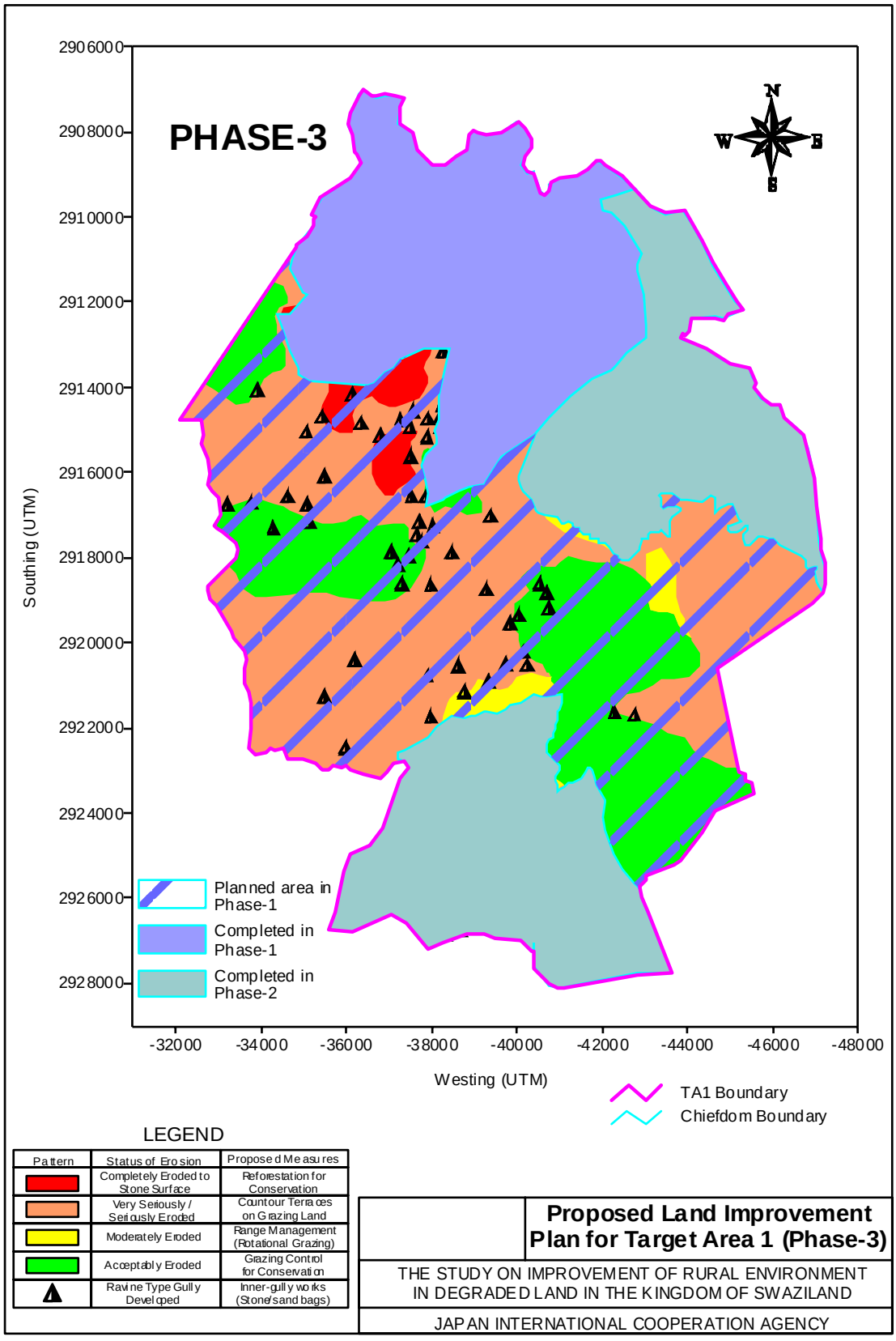


Figure 5-9: Phase 3 Soil Conservation Plan in TA1

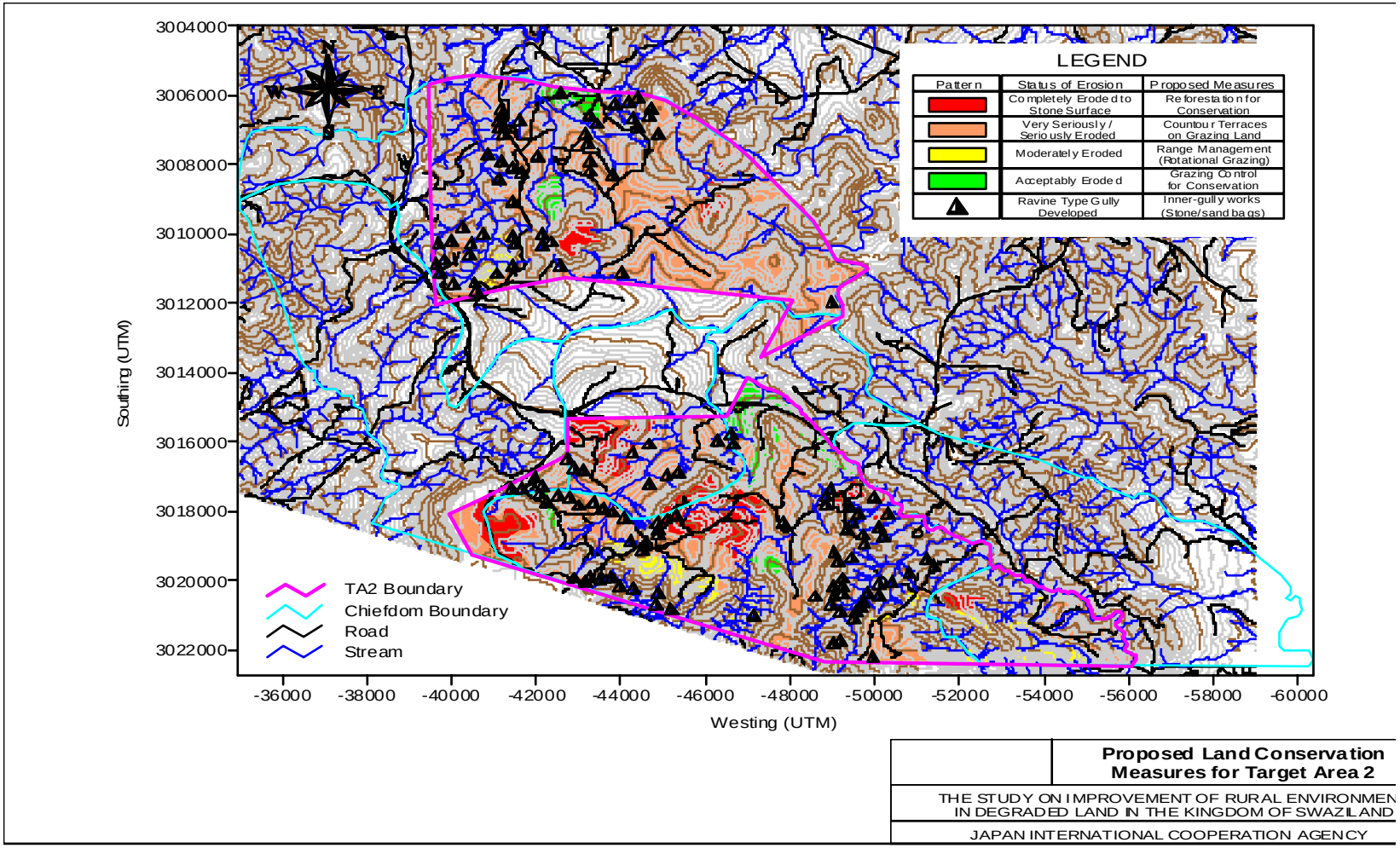


Figure 5-10: Proposed Soil Conservation Measures in TA2

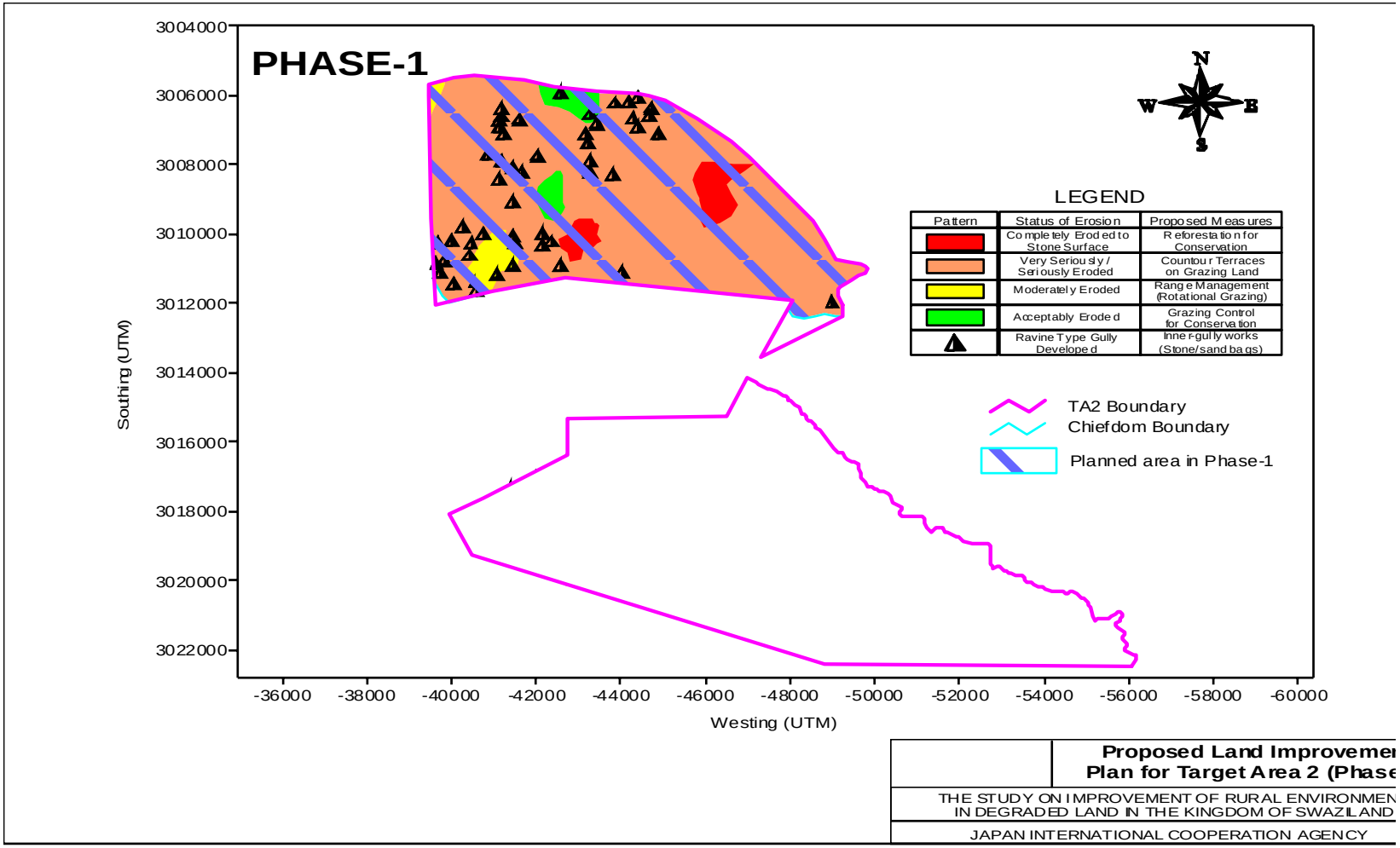


Figure 5-11: Phase1 Soil Conservation Plan in TA2

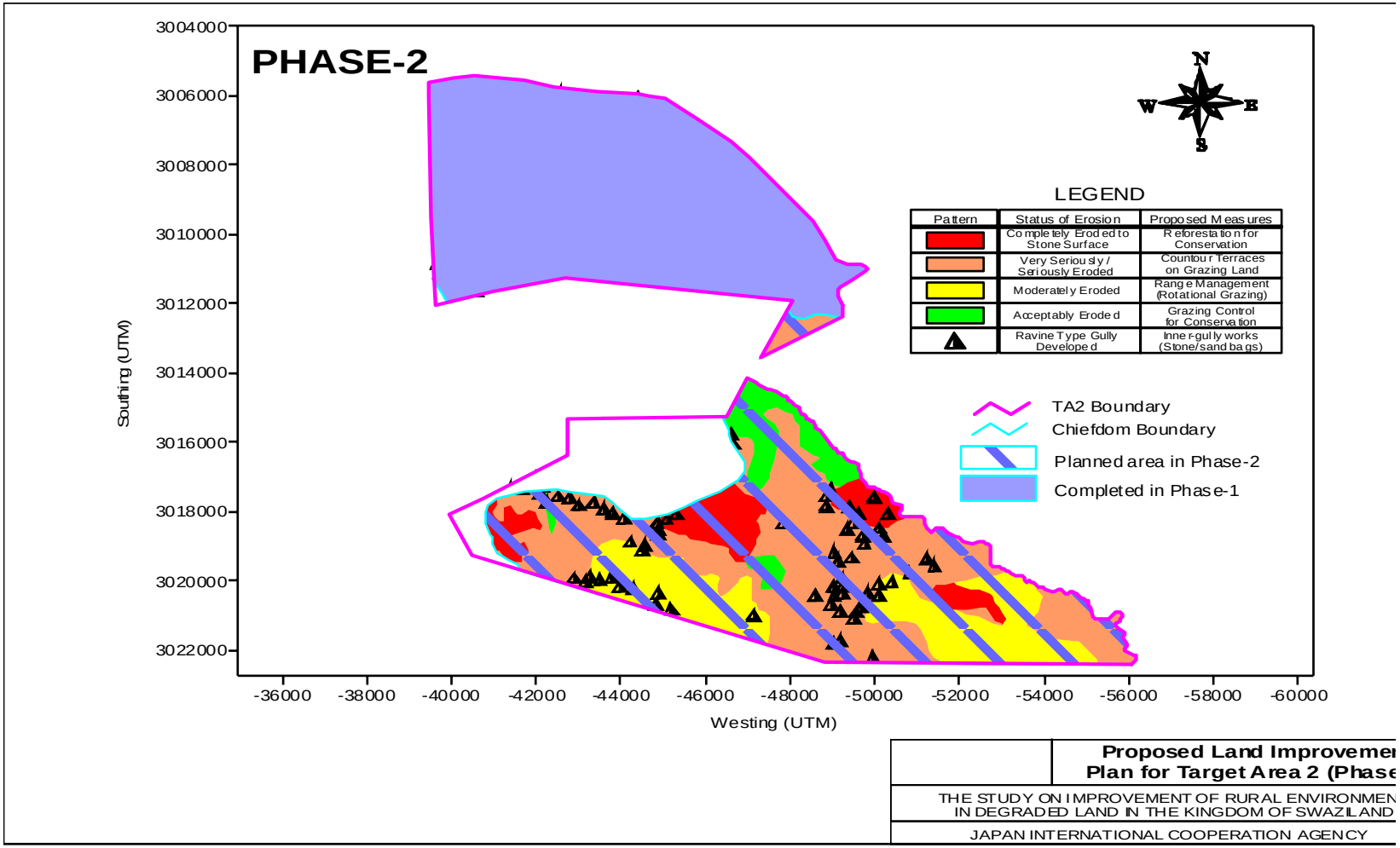


Figure 5-12: Phase 2 Soil Conservation Plan in TA2

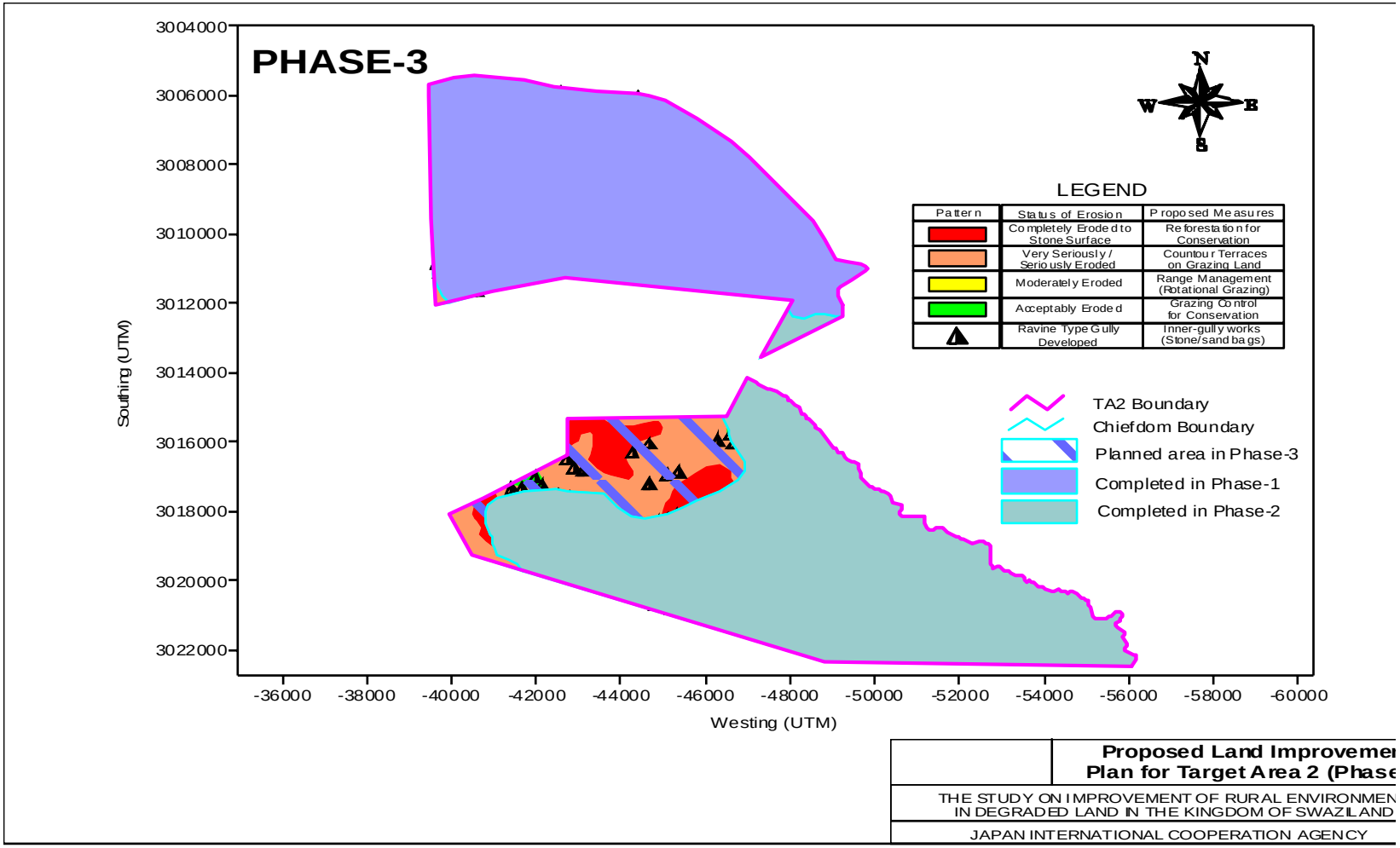


Figure 5-13: Phase 3 Soil Conservation Plan in TA2

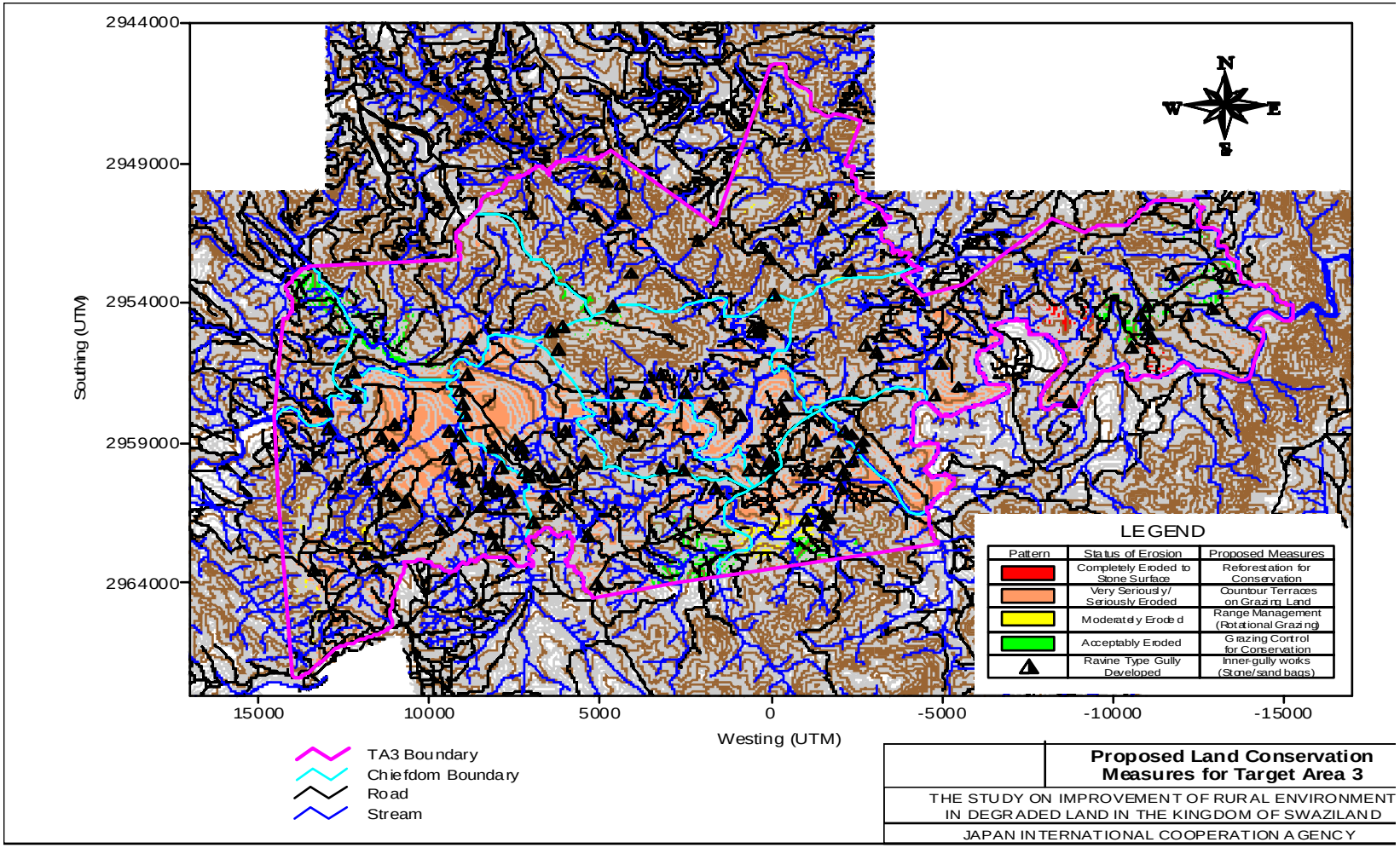


Figure 5-14: Proposed Soil Conservation Measures in TA3

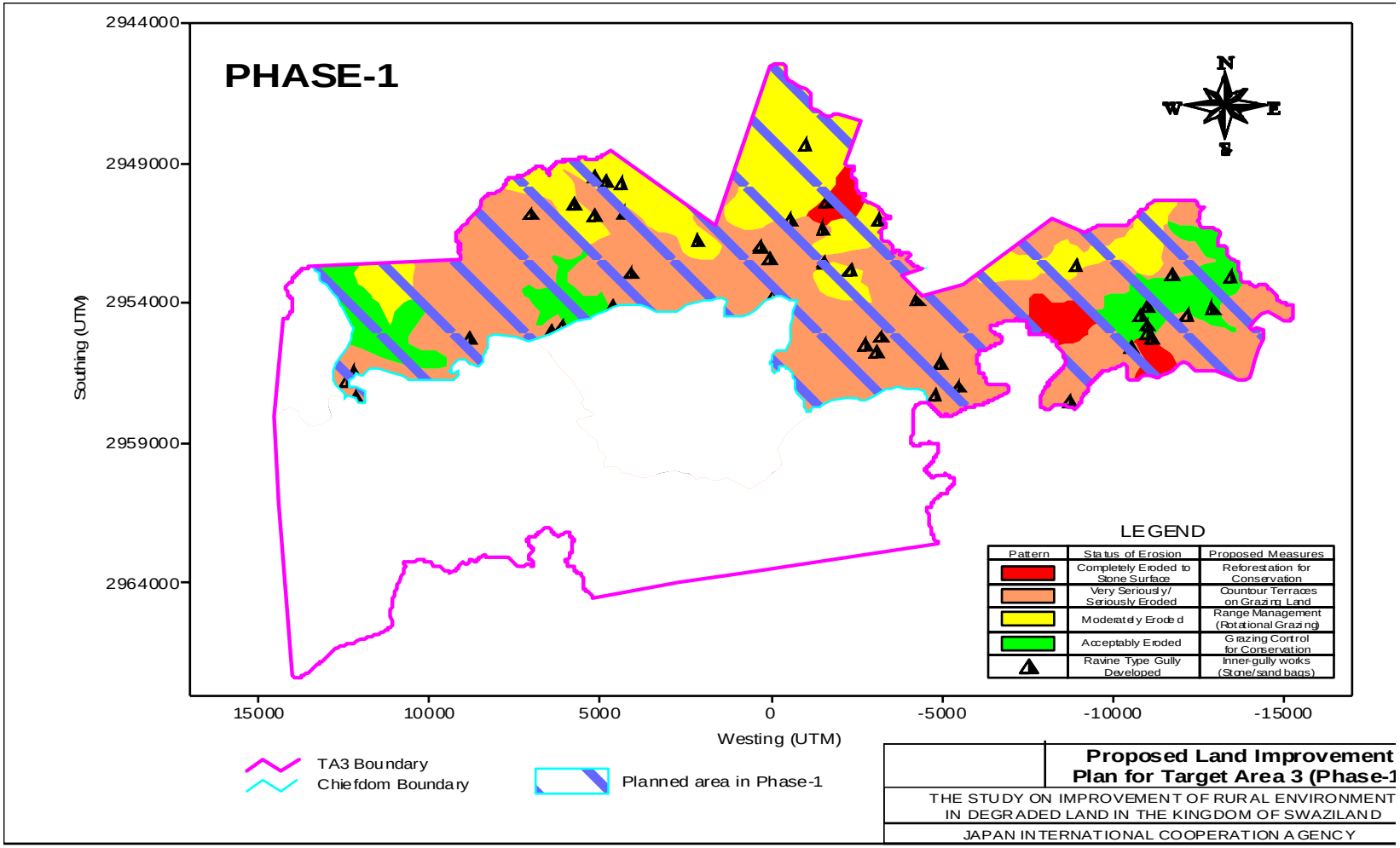


Figure 5-15: Phase 1 Soil Conservation Plan in TA3

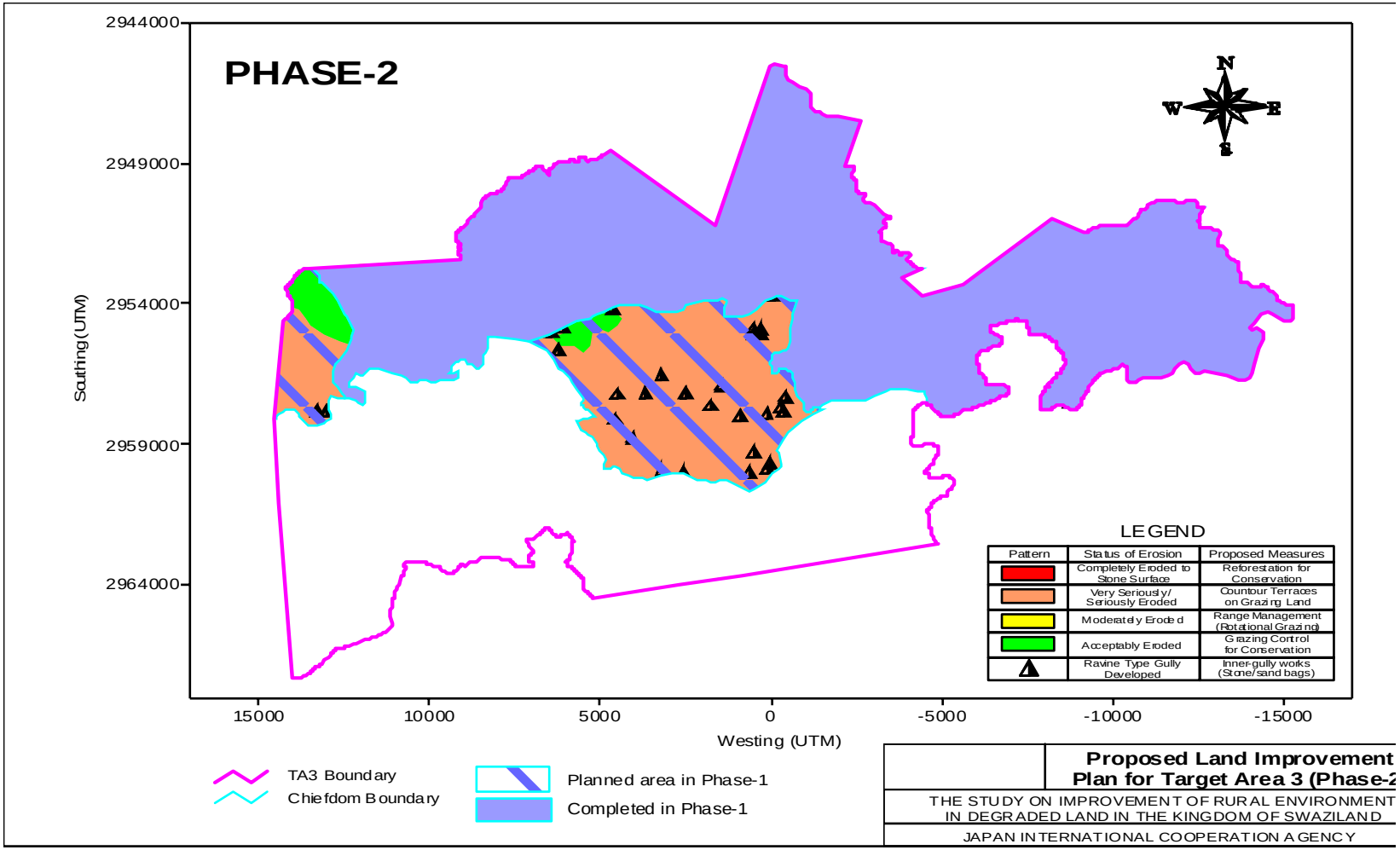


Figure 5-16: Phase 2 Soil Conservation Plan in TA3

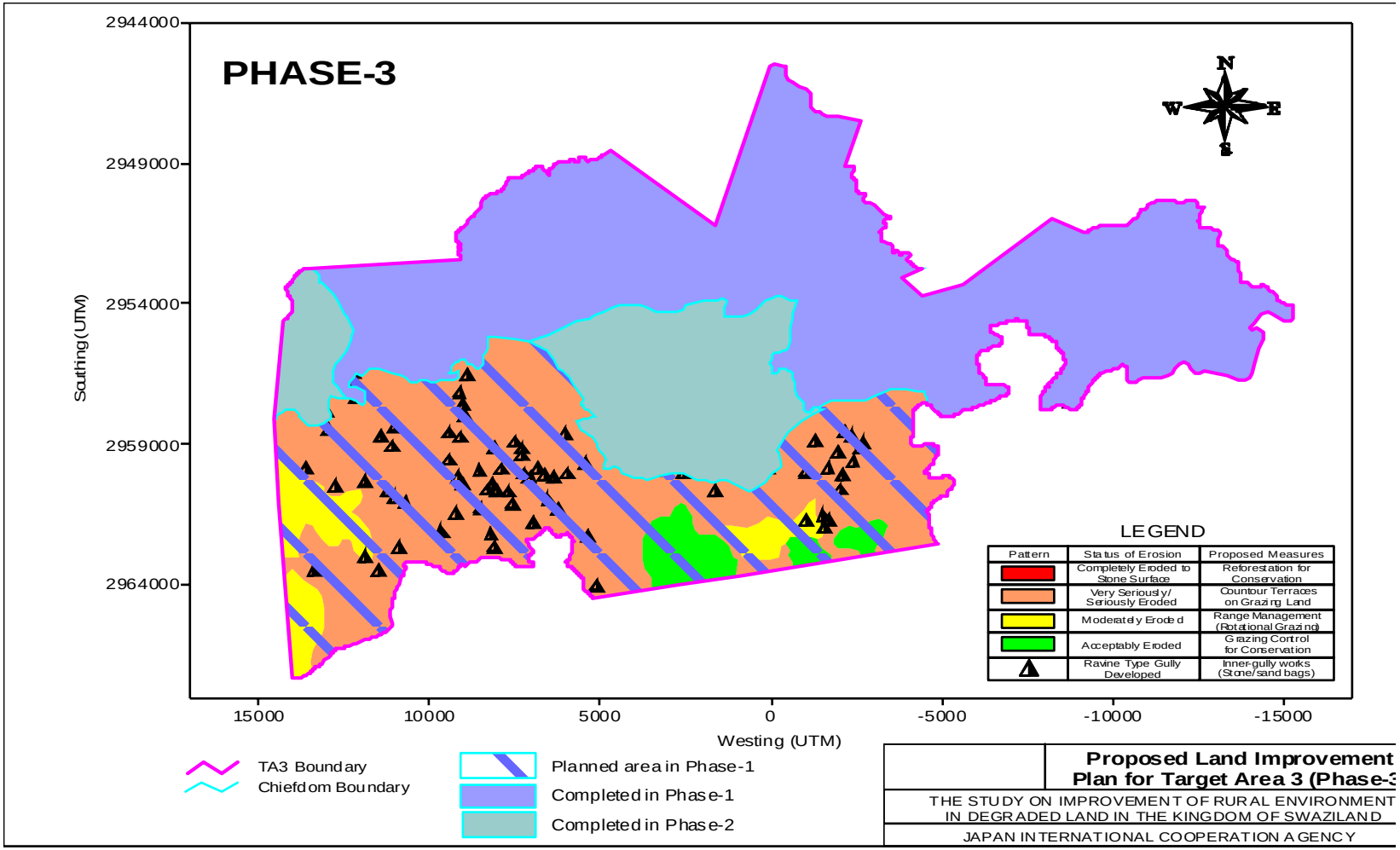


Figure 5-17: Phase 3 Soil Conservation Plan in TA3

As regards inputs, the proposed works can as much utilize locally available free of charge material as possible, such as stone pieces and bundled shrub branches for gully training and rill stabilization, earth for packing in empty bags used for the same purpose. Then, major conceivable constraints may include working season for implementing the proposed sub-components, because contour terracing prefers the period during which surface earth remains moist and soft, while gully training is better performed during dry season since gully floor is not boggy for the training work. The period of contour terracing coincides with busiest farming season. The possible solution is offered in a way that the periods just before the main harvest and post-harvest season can be made use of for these works.

d.1. Contour Terrace

Priority areas of terracing include comparatively steep grazing areas with a gradient of more than 10%, also with long lying slope where length of a slope extends more than 100m. The runoff velocity is obviously faster on such steep slope, especially where barren patches are scattered over the slope. Steeply inclined areas in TA1 are distributed more in north-western than in eastern or southern parts thereof, while Chiefdoms in TA1 selected in Phase I group coincide with the area of steep topography where priority was given. Also, those with gentle topography were selected as Phase III group in TA1. The phasing of Chiefdoms in TA3 resembles with TA1 in the aspect of topography. Whereas, in TA2, Zikhoteni Chiefdom selected in Phase I does not necessarily have steeper slope over grazing land, however, overall grazing areas have longer slope length and too high rate of barren surface than any other part within TA2. In this context the phasing meets the pressing necessity of taking countermeasures to minimize sheet erosion.

Table 5-9: Phased Stages for Contour Terrace

Chiefdom	Order	Basic Parameter			Soil Conservation			
					Contour Terrace			
	*	Total Area	Grazing Area	Cattle Head	Phase1	Phase2	Phase3	Total
		ha	ha	nos	ha			
Eni	I	396	224	350	61			61
Mdayane	II	588	359	596		135		135
Butfongweni	I	829	484	84	133			133
Maliyaduma	II	1,197	755	419		282		282
Ngwazini	II	898	587	699		220		220
Mbeka	III	887	658	294				
Swaceni	III	357	143	91			67	67
Mkhulamini	II	1,350	788	105		296		296
Sankolweni	III	756	563	378			264	264
Ngcayini	I	1,381	713	1,049	196			196
Ntunja	III	969	809	776			379	379
Nkiliji	I	2,012	1,107	1,748	304			304
Nyakeni	III	4,769	3,346	7,760			1,570	1,570
Bhekinkosi	II	1,938	1,164	489		437		437
Nsenga	I	1,173	789	870	216			216
TA1:Kukhanyeni		**19,500**	**12,489**	**15,708**	**910**	**1,370**	**2,280**	**4,560**
Manyadzeni	I	978	634	87	61			61
Mchinsweni	III	228	82	760			800	800
Mabona	II	4,753	3,217	1,216		391		391
Dumenkhungwini	II	919	735	342		89		89
Zikhoteni	I	4,822	2,673	9,497	259			259
TA2:Shiselweni		**11,700**	**7,341**	**11,902**	**320**	**480**	**800**	**1,600**
Bhadzeni II	I	2,701	1,371	1,306	90			90
Dlandleni	III	826	601	78			137	137
Lishikishini	III	4,975	3,201	2,395			729	729
Macdvulwini	I	5,491	3,977	1,305	262			262
Mahhashini	II	844	534	122		198		198
Bhadzeni I	II	2,840	1,382	1,044		512		512
Mgazini	III	3,644	2,015	1,100			459	459
Khabonina	II	921	646	133		240		240
Ngcoseni	III	2,000	1,167	5,721			266	266
Velezizweni	I	6,358	4,352	7,837	287			287
TA3:Ngwempisi		**30,600**	**19,246**	**21,041**	**639**	**950**	**1,591**	**3,180**
Total		**61,800**	**39,076**	**48,651**	**1,869**	**2,800**	**4,671**	**9,340**

Due caution must be exercised to make terraces over steep slope to minimize surface disturbing, and it is advised to make terrace only by manual work with hoes and stone picks instead of relying on bulldozers. Herd keepers in three target areas have to decide their option as to whether they will continue poor pasturing on heavily eroded or deeply incised soil

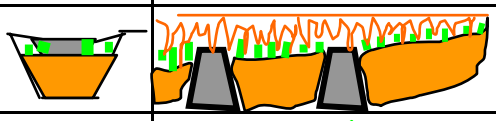
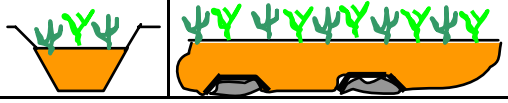
surface by dispensing labor efforts or they will make efforts in order to enjoy grazing on richer grass cover that can only be restored through laborious contour terracing. Tentative target can be set at 5 meter of manual terracing per day per person. Then, if 40 villagers are mobilized in a group for terracing, the group can complete terracing over one hectare of steep grazing field within 1day and a half. At this rate, the group can cover 100 hectare within a year, counting only the working days during off-season. It follows that only day-to-day manual working of 2 or 3 groups per target area are good enough to fulfil the tabulated targets during off-season.

d.2. Gully Training

Many gullies behave like a stream, so even we fill earth inside incised gullies most of the filled earth will be sucked out from them, nor filled earth can stop further incision at their bottom as long as erodible layers still remain over gully-floor. As gully-heads advance by scouring bottom layers with yielded groundwater, it is useless to plant trees around them for the purpose of stopping or retarding gully development. What should be done include installation of check structures traversing gully bottom to facilitate sedimentation over gully floor, planting trees inside them (otherwise gullies swallow surface trees into their bottom floors). Also, it was found that surface runoff flow does little to do with development of aged gullies, and as a result it is useless at all to provide huge gullies with diverting sills trying to intercept surface flow, because overwhelming part of bottom flow stems from groundwater rather than from surface runoff. Even if one construct sills ahead of them, they would be engulfed into the gullies sooner or later. The only exception is road-side or below-culvert gullies that drains enormous concentrated runoff during heavy rainfalls.

The above discussion leads us to a conclusion that gullying is a spontaneous phenomenon that is hardly controllable with human efforts, though it may be triggered and accelerated by artificial disturbing over ground surface. The only manageable stage for gully training confines to initial or younger stage with limited incised section, where the bottom can get shallower within a short period and stabilization can be activated with emergence of vegetative cover inside them. It is readily observed in existing gullies that the shallower the gully bottom lies, the faster development of vegetation cover over gully bottom because of ample sunshine, better ventilation, ideal moisture availability and less acidity prevailing over their bottom. It should be kept in mind that stabilization of a gully takes a long time after the application of relevant training measures. The following figure illustrates the long procedure of stabilizing an active gully.

Figure 5-18: A Proposed Procedure for Gully Training

Year	Works	Material	Purpose	Illustrative Explanation
1st ~ 3rd	Installing Check Structures	Sand bags, Stone pieces, shrub-branches	Filling space with sediment material	
3rd ~ 5th	Overlaying Check Structures	The same as Above, bricks, sand blocks	Making gully shallower	
4th ~ 7th	Creating vegetation cover	Seed of Wild grass, wild tree saplings	Stabilizing surface and bottom floor	
5th ~ 8th	Use of stabilized gully space	Trees grown inside gully	Making use of stabilized gully	

As maintenance after works, gully wall may be widened through slumping, causing subsequent cleavage formation between heck structures and wall. Since muddy earth would

leak from this slit with water flow, sealing work will become necessary before rainy season onsets.

Table 5-10: Phased Stages for Gully Training

Chiefdom	Order	Basic Parameter			Soil Conservation			
		Total Area	Grazing Area	Cattle Head	Gully Training			
	*				Phase1	Phase2	Phase3	Total
		ha	ha	nos	site			
Eni	I	396	224	350	6			6
Mdayane	II	588	359	596		7		7
Butfongweni	I	829	484	84	2			2
Maliyaduma	II	1,197	755	419				
Ngwazini	II	898	587	699				
Mbeka	III	887	658	294				
Swaceni	III	357	143	91			8	8
Mkhulamini	II	1,350	788	105		8		8
Sankolweni	III	756	563	378			13	13
Ngcayini	I	1,381	713	1,049	9			9
Ntunja	III	969	809	776			4	4
Nkiliji	I	2,012	1,107	1,748	3			3
Nyakeni	III	4,769	3,346	7,760			5	5
Bhekinkosi	II	1,938	1,164	489				
Nsenga	I	1,173	789	870	5			5
TA1:Kukhanyeni		**19,500**	**12,489**	**15,708**	**25**	**15**	**30**	**70**
Manyadzeni	I	978	634	87	15			15
Mchinsweni	III	228	82	760			20	20
Mabona	II	4,753	3,217	1,216		30		30
Dumenkhungwini	II	919	735	342				
Zikhoteni	I	4,822	2,673	9,497	25			25
TA2:Shiselweni		**11,700**	**7,341**	**11,902**	**40**	**30**	**20**	**90**
Bhadzeni II	I	2,701	1,371	1,306				
Dlandleni	III	826	601	78			5	5
Lishikishini	III	4,975	3,201	2,395			12	12
Macdvulwini	I	5,491	3,977	1,305	13			13
Mahhashini	II	844	534	122				
Bhadzeni I	II	2,840	1,382	1,044		18		18
Mgazini	III	3,644	2,015	1,100			15	15
Khabonina	II	921	646	133		12		12
Ngcoseni	III	2,000	1,167	5,721			8	8
Velezizweni	I	6,358	4,352	7,837	7			7
TA3:Ngwempisi		**30,600**	**19,246**	**21,041**	**20**	**30**	**40**	**90**
Total		**61,800**	**39,076**	**48,651**	**85**	**75**	**90**	**250**

d.3. Rill Stabilizing

A rill is termed as a state of earliest stage in gully formation. In this context, measures of stabilizing it consist of filling of water insoluble solids like stone pieces, boulders, wooden pieces, twigs and branches inside it to curb velocity of inner water flow as slow as possible. Check drop structures are desirably worked at appropriate intervals to foster sedimentation over rill floor. Most rills are controllable as compared with developed gullies, and priority should be given to treat active rills in order to prevent occurrence of ravine type gullies. Whenever sedimentation takes place upstream side of check structures, transplanting of cactus, aloe, sisal, euphorbia, bracken and other grass or tree species resistant to adverse climatic conditions or xerophytes should be tried to accelerate process of stabilization. Excavation of horizontal ditch or stone bunds ahead rills is sometimes effective in dispersing runoff otherwise concentrating along them.

Special attention should be paid to the priority of rill training in the area where many rills have taken place. Top priority must be given to old or currently passing cattle tracks on which parallel rills are developing. It is the best way to enclose the damaged surface with fence, then start rill training works. Rills occurring in the exposed saprolite rocks in and around geological faults readily and quickly develop into huge dendritic gullies, so proper measures with earlier implementation is advised to villagers concerned.

Table 5-11: Phased Stages for Rill Stabilizing

Chiefdom	Order	Basic Parameter			Soil Conservation			
		Total Area	Grazing Area	Cattle Head	Rill Stabilizing			
	*				Phase1	Phase2	Phase3	Total
		ha	ha	nos	site			
Eni	I	396	224	350	2			2
Mdayane	II	588	359	596		5		5
Butfongweni	I	829	484	84	2			2
Maliyaduma	II	1,197	755	419				
Ngwazini	II	898	587	699		3		3
Mbeka	III	887	658	294			5	5
Swaceni	III	357	143	91			5	5
Mkhulamini	II	1,350	788	105		4		4
Sankolweni	III	756	563	378			5	5
Ngcayini	I	1,381	713	1,049	2			2
Ntunja	III	969	809	776			5	5
Nkiliji	I	2,012	1,107	1,748	2			2
Nyakeni	III	4,769	3,346	7,760			5	5
Bhekinkosi	II	1,938	1,164	489		3		3
Nsenga	I	1,173	789	870	2			2
TA1:Kukhanyeni		**19,500**	**12,489**	**15,708**	**10**	**15**	**25**	**50**
Manyadzeni	I	978	634	87	3			3
Mchinsweni	III	228	82	760			16	16
Mabona	II	4,753	3,217	1,216		7		7
Dumenkhungwini	II	919	735	342		3		3
Zikhoteni	I	4,822	2,673	9,497	3			3
TA2:Shiselweni		**11,700**	**7,341**	**11,902**	**6**	**10**	**16**	**32**
Bhadzeni II	I	2,701	1,371	1,306	4			4
Dlandleni	III	826	601	78			7	7
Lishikishini	III	4,975	3,201	2,395			11	11
Macdvulwini	I	5,491	3,977	1,305	8			8
Mahhashini	II	844	534	122		4		4
Bhadzeni I	II	2,840	1,382	1,044		8		8
Mgazini	III	3,644	2,015	1,100			9	9
Khabonina	II	921	646	133		6		6
Ngcoseni	III	2,000	1,167	5,721			4	4
Velezizweni	I	6,358	4,352	7,837	3			3
TA3:Ngwempisi		**30,600**	**19,246**	**21,041**	**15**	**18**	**31**	**64**
Total		**61,800**	**39,076**	**48,651**	**31**	**43**	**72**	**146**

e. Social and Gender Consideration

Since Gullies are fear of the community people which endangers living environment as well as grazing field for cattle, soil conservation work could contribute to alleviate these fears as well as enrichment of the community environment. In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Inclusion of the poor: The soil conservation work will be implemented as public works. Considering the benefit to the community as much as possible, it is recommended to hire the labour force from the community, especially the poorer people who cannot participate in other supporting activities. The efforts on contribution to soil conservation will be compensated and encouraged by other supporting activities such as community garden and so on, however joining those activities require certain amount of membership fee and there might be some vulnerable groups who cannot participate due to the lack of resources. Considering the equal benefit to the community as much as possible, it is recommended to hire the labour force from the community, especially the poorer people who cannot participate in other supporting activities.

Necessary care not to increase the burden of women: From the experience of the pilot project, women's' participants are more active even for the heavy labor. Since women are relatively responsible to their duties and every participants including men are relying on those responsible women, it is important to consider equal work distribution, if any, not to increase the burden of women only.

Motivation for cooperation: Considering the nature of soil conservation project as public works, which will not be related to direct income generation, the motivation of people to work is not high. In order to encourage the community people, it is important to combine with other schemes, which could improve their livelihood proposed as supporting projects.

5.5.2 Grazing/Range Management Development Plan

a. Objective

The objective of the grazing and range management development plan proposed under this master plan is summarized below.

(1) To attempt to control and regulate the access to the grazing areas and so afford these areas a rest for rejuvenation of the plans,
(2) To reduce stocking rates on the range lands,
(3) To encourage sustained off-take, particularly of fattened stock,
(4) To control access to the water source so as to avoid intrusion of cattle into the water source,
(5) To reduce the level of continuous cattle tracking,
(6) To rehabilitate and re-vegetate the degraded areas, and
(7) To control weedy plants.

b. Justification

The problem of rangeland degradation caused by overstocking observed in 3 target areas as mentioned in 3.1.8.f must be solved by sustainable measures. In this respect, improvement of rangeland through fenced rotation grazing is justified by current policy of MOAC, namely Swaziland Livestock Development Policy 1995 stated in 3.1.8.c and present stocking rate mentioned in 3.2.3. Acceptable results from rotation grazing carried out in the Pilot project in TA-1 and TA-3 (Pilot area in TA-2 has not this component) cited in 4.4.3.4 suggest that the way of range management proposed here is relevant to introduce as a component of M/P. In the rotation grazing area divided into a few camps with water point(s) in each compartment camp can avoid forming a large cattle herd tracking to water points on the same path every day thus finally causing huge gullies.

c. Target Groups

All the community people who presently graze their cattle in the target areas concerned are deemed as target groups in this plan. Besides, those who don't hold cattle now should be added because they are potential grazing population who have easement to exercise cattle grazing on the proposed fenced rotation grazing land whenever they can afford to hold cattle, and who should also have duty to make efforts for conserving rangeland as common property of the chiefdom.

d. Activities

To achieve the said objective, the following activities should be carried out under this grazing and range management development plan as follows.

(1) Fencing of grazing areas in 3 target areas into multiple paddocks and practicing the rotational grazing utilizing the camps to be established under the proposed grazing and range management development plan,
(2) To gradually transfer the livestock, especially cattle, from the present range land to the areas of high yielding perennial fodder and/or forage plants to be established under the proposed plan,
(3) Erection of fattening pens and promotion of holding of regular commercial sales of fattened cattle,
(4) Establishment of useful perennial plants, both herbaceous grasses and woody trees and shrubs, leguminous and non-leguminous,
(5) Clearing of woody and other herbaceous weedy plants, both annual and perennial, by hand or other suitable means,

(6) Provision of extra watering places by building tanks, ideally one in each grazing camp, especially if there is no other form of permanent water, and planning and changing the routes to dip tanks and homesteads, and
(7) Protection of water sources such as springs, sponges, streams and banks of the streams from intrusion mainly by cattle.

In addition to the above, the following activities by the community people and the government staff are needed as follows.

(1) Discussions with each other on rangeland improvement and rational grazing,
(2) Agreements being reached with the community leaders and elders and the soliciting of their explicit support especially with respect to setting of activities and interventions,
(3) Development of plans of operation and infrastructure management plan,
(4) Drafting of by-laws and conditions as necessity arises, as experienced in pilot project (refer to Annex. C),
(5) Setting up of savings funds for maintenance purposes,
(6) Continuous provision of advice and extension by the government staff, and
(7) Sustained attendance at training programs and workshops by the community people.

d.1. Strategies for Implementation of Range Management Development Plan

In all cases, there should be the active participation of the farmers and other people living in the areas that are to be affected by these interventions. Training is vital and must be provided if the momentum of development is to be started and maintained. If these two inputs cannot be guaranteed, it is doubtful whether an attempt should be made to launch the rangeland development plan.

It is proposed that for rehabilitation of the degraded rangelands there needs to be a three-pronged approach:

- Get controlled management of the degraded rangeland grazing areas on which in time there will be an improvement in condition and in the long term an increase in current grazing capacity to potential grazing capacity (development of community grazing schemes)
- Provide an incentive to commercialise livestock production, thereby encouraging increased off-take especially amongst those with the larger individual herds (erection of community feedlots)
- Replace forage on degraded grazing areas with high yielding fodder crops thereby allowing the transfer of livestock off the overstocked rangelands with low carrying capacity to the fodder cropped areas which have a much higher carrying capacity (growth of fodder plots).

In support of these, a number of additional activities can be carried out as dictated by the site needs in each case including:

- Conditioning of livestock
- Soil conservation measures
- Water source protection around rangeland springs and sponges
- Establishment of perennial plants on rangeland
- Weed control.

As shown in Figure 5-21~Figure 5-23, the above mentioned strategies and supports are applied to the mapped areas. In selecting these, such fragmental areas as "long-thin" ones along stream banks are avoided, for cattle herd have to travel a long distance whenever there is a move. In addition, a feedlot capable of feeding 10 heads at a time, coupled with a fodder plot of 4 ha is proposed to establish per mapped area Figure 5-20. This will be able to ease acute shortage of feed during end of dry season in which exhausted beasts tend to die. Over

time it is envisaged that such fodder plot will be diffused over grazing areas, especially on former arable plot but now under long fallow or reverted back to rangeland. Farmers can make use of planting material to plant it around or close to their kraals so as to feed fodder to their livestock kept in kraal at night in need of a supplement of rangeland grass in a system of cut-and-carry feeding.

d.2. Approach and Method to Achieve the Above Development Strategies

It is general idea to give implementing priority to more degraded but recoverable areas, as a lesson learnt in carrying out the pilot project than the less degraded, except the worst degraded areas that would take too long to respond to the interventions proposed here. Notwithstanding, where areas have been placed under apparent threat of rapid degradation should also be dealt with. The idea aims at not merely rehabilitating those areas that have already lost much of their potential viability but also protecting and conserving those which still reserve much of their potential intact but they have nonetheless been subject to threat, because they are generally far more cost effective in conserving resources for sustainable use than seriously damaged areas.

Thus the central idea lies in developing a well-managed grazing area. In a fenced rotation grazing, cattle keepers have to graze their cattle heads they hold now within a fenced camp where cattle herd can thoroughly be fed for weeks before they are shifted to another camp, also have to regenerate grass on the grazed camps until the herd return thereto. Mildly degraded rangeland can meet this requirement when it is converted into fenced camps for rotation grazing, but if people choose severely exhausted rangeland for this purpose, cattle herd would starve in a camp or grass cannot get recovered. This is the reason why moderately eroded grazing fields should constitute major part of the sites for rotation grazing. At any rate, the area chosen as a rotation grazing project has to carry the same number of heads irrespective of whether rotation is practiced or not, otherwise other rangeland will be subject to heavier grazing

However, fenced rotation grazing only cannot give radical solution to sustain current size of cattle herds found over the target areas concerned, since this method can hardly increase grass yield to the degree that can soundly sustain present herds. Grazing areas in the target areas concerned inherently have a low carrying capacity on account of long-practiced over-grazing and futile, eroded soils derived from granites containing poor plant nutrients. In order to keep current herd size in healthy condition, grazing people must convert a part of their rangeland into fodder fields to fortify their feeding base in the long run. In time, such fodder plots can be expanded to the extent that they can absorb larger cattle herds, and feeding base will shift from the rangeland into pen yards or tethered paddocks. Decline of such free grazing with less stocking rate means less cattle pressure over rangeland and less gullies that take place over heavily tracked cattle tracks. However, at the initial stage, the fodder plots better be used to fatten beef cattle kept in feedlots, to attract the farmers and to let them have enough experiences, rather than using produced fodder for supplement grazing.

It is obvious that only the application of rotation grazing to the present rangeland never serves as a radical solution to current status of overgrazing and grazing people cannot evacuate excess herds out of their grazing territory. There is no other way to perfect solution than either to increase feed supply or to reduce excess cattle, while the latter solution has always been rejected by grazing people. In this context, only fodder production can give positive approach to mitigate the overgrazing damages.

Since fenced rotation grazing is not economically viable, it is desirable to promote fenced rotation grazing under a public work system where fencing material has to be supplied through relevant official route to the target groups based on their plans. Farmers will be able whereafter to cover the annual maintenance costs. As for feedlot, initial costs for the establishment of fence and paddock / pen, official procurement of material is needed, but as far as provision of fodder production system is concerned, the beneficiary groups have to provide fodder plots at their own expense. In all cases beneficiary people should provide the

labour for establishing infrastructure. They should also cover the costs involved in the use and maintenance of the facilities provided. It is expected that adequately experienced extension staff will render technical assistance for target groups to ensure appropriate planning and implementation. In addition to the provision of fencing material, a basic toolkit for handling animals is desirably provided for each rotation grazing project with a portable container, containing at least a weigh band, nose tongs, a rope halter, a scale to measure weight up to 25 kg, 10ml and 25ml syringes with spare needles, scalpel and spare blades, antibiotic wound powder, enough anthelmintic to dose the entire grazing herd on entering the grazing project for the first time.

In general terms, after identifying a site in which rotation grazing is conducted in consultation with traditional leaders, area of grazing with an area of 200~400 ha will be selected for providing infrastructure to establish a rotation grazing project. Each project would have a minimum of four but ideally between six and eight paddocks. Ideally too, the number of heads allowed access will have to be close to the carrying capacity of fenced rangeland. The fodder plot can be planted with Pennisetum species (popular in Swaziland with past experiences for usage) that requires maintenance, i.e., dressing of chemical fertilizers as with any other crop.

Major risks and problems likely to accompany with fenced rotation grazing include: (1) conflict with those who don't join rotation grazing since all cattle holders do not necessarily consent to the proposed project, (2) current state of too heavy overstocking relative to actual carrying capacity that may lead to an extraordinary grazing pressure to grass cover on a confined camp (one of the sub-divided fenced blocks for rotational grazing), (3) complaint uttered by inhabitants without cattle on traffic inconvenience brought about by fencing up. (4) conflict on the right of using springs and other water sources in camps, if any users are using them as their water sources, (5) problems likely to arise on the way of managing rotation, such as decision on timing of shifting grazing herd from a camp to another, on allocation of monitoring duty to cattle owners, and (6) current Sisa system possibly has a negative impact in developing both rotation grazing and feedlot, etc. In every case, to solve and settle these, persistent efforts will be required to realize a complete support of all stakeholders to rotation grazing, with some sacrifice for example to install narrow gates for human passage only, to cull surplus cattle by mutual agreement.

It is desirable to make fenced rotation grazing packaged with feedlot, though the decision will be made by the Chiefdom development committee as to whether these two are packaged or not. A feedlot, to be placed for each rotation grazing project, covers an area of 4 ha within which both fattening pen and fodder field are developed. This feedlot has a capacity of accommodating 10 adult beef cattle at a time for three months. As feedlots are more cost-effective and hence economically more feasible than fenced rotation grazing, the beneficiary groups that desire to establish and use feedlot facilities should cover the entire expense for initial establishment and running costs. However, fattening project has high risk of securing outlet of carcass in competition with South African suppliers. Taking this into account, state-sponsored insurance is desirable to safeguard or hedge initial investment that should be borne by the managing beneficiary groups. Material and tools required to establish a feedlot with fodder field include;

- Concrete slabs for paddock
- Feeding trough and watering trough for pen
- Watering reticulation for pen
- Store room for feed, chemicals, tools etc.
- Wheel barrow or scotch cart for fodder carriage
- 4 cane knives (machetes and pangas)
- vaccines against botulism, acaricide and liver-fluke remedy

The sites for a rotation grazing desirably belong to single Chiefdom, and even if a candidate site belongs to more than two Chiefdoms, explicit and active support for mutual cooperation among Chiefdoms concerned, along with the approval of the Chiefs responsible for land allocation is essential to start the project and bring it to a success. Benefits from a feedlot and fodder plot can be shared among participated communities in case it is established through their cooperation.

Details for implementation of these interventions are given below.

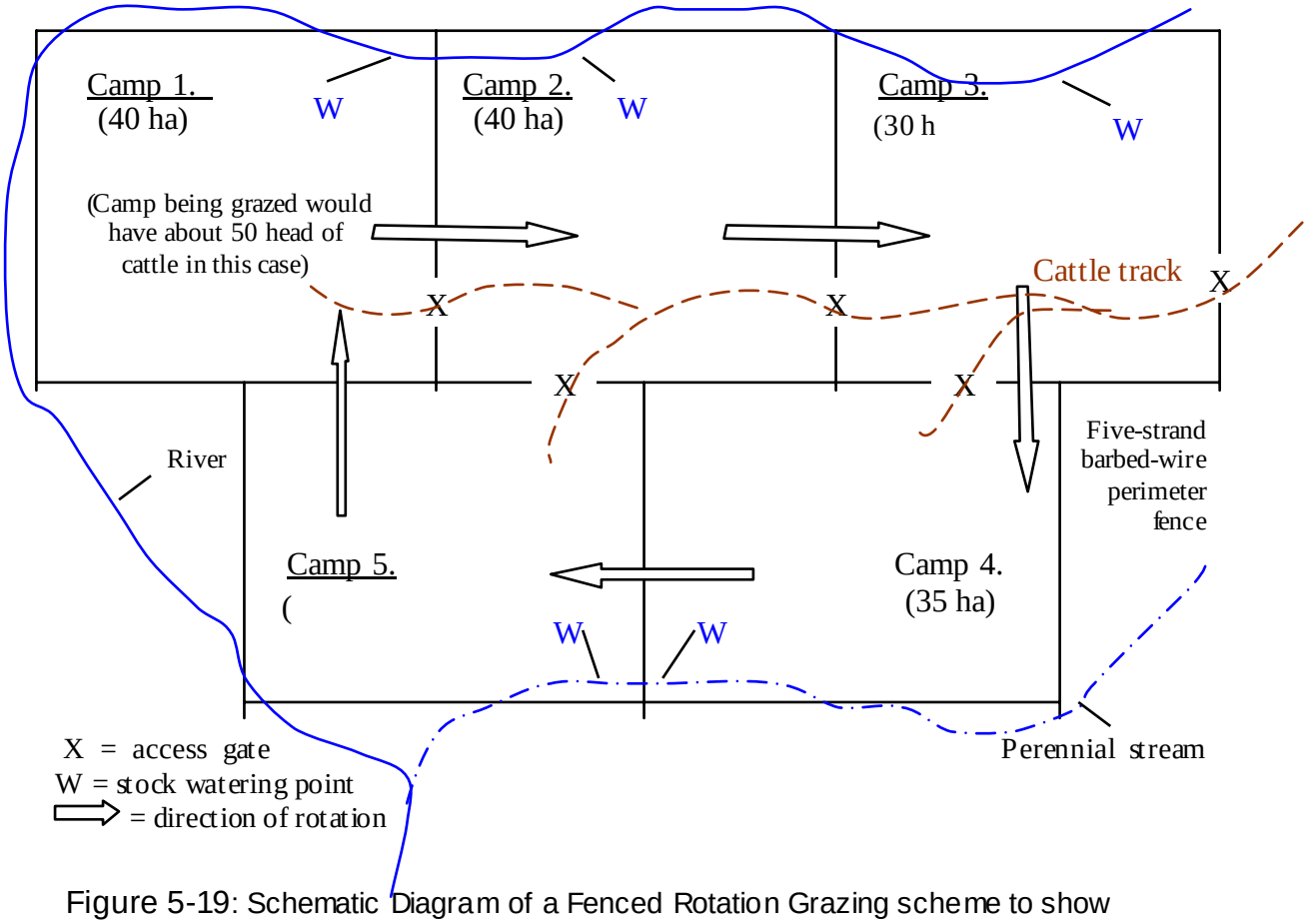


Figure 5-19: Schematic Diagram of a Fenced Rotation Grazing scheme to show Typical Layout, Size, Construction and Method of Cyclic (rotational) use

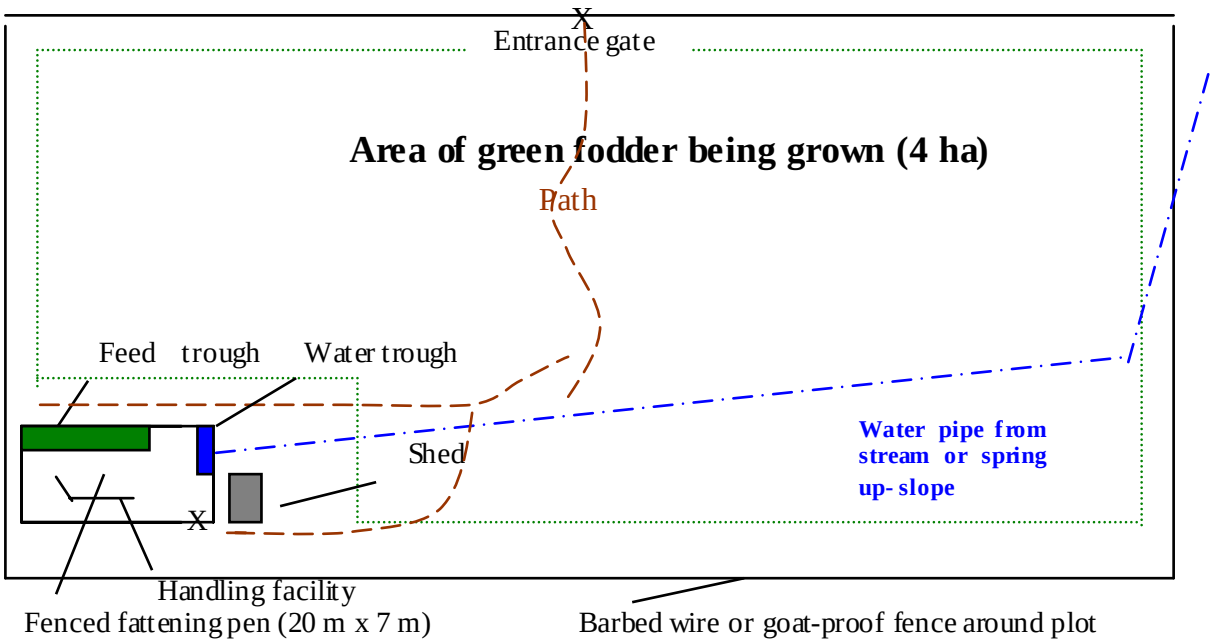


Figure 5-20: Schematic Diagram to show Typical Layout of Fattening Pen and Fodder Plot in a Feedlot

d.3. Fenced Rotation Grazing Schemes

There should be standard fencing to cover the boundaries of the fenced rotation grazing scheme (Figure 5-19) and the sub-divisions. All posts should be securely sunk into the ground and posts accurately lined up. Strands of barbed wire should be pulled tight and tied at the correct height on each post. Allowance should be made for access ("gates") into the different paddocks. In terms of grazing management the correct number of animals allocated to the area (i.e. using the correct stocking rate) should be placed into one of the fenced paddocks. In time (usually one to two weeks, but depending on the scheme, climate and time of year) the herd of animals is moved progressively and successively through all the paddocks, allowing a rest from grazing of about six to eight weeks between each grazing period.

Use of fenced rotation grazing in the form of grazing management demonstration areas (GMDA) is expressly promoted as part of the draft Livestock Development Policy (1995) in respect to range improvement.

In terms of materials, this would consist for each kilometer of four-strand fencing used for paddock sub-divisions of:

- 13 treated wooden straining posts
- 50 treated wooden or metal standard posts
- 180 treated wooden or metal droppers
- 7.5 rolls barbed wire (@ 540 m/roll)
- Tying wire.

Five-strand fencing, used for boundary fences, would require an extra 1 km of barbed wire fencing (+/- 2 rolls) and a small amount extra of tying wire compared to internal sub-divisional four-strand fencing, the numbers of posts, etc., remaining the same. Note that in broken or hilly terrain the numbers of straining posts will need to be increased, possibly by as much as 25 per cent and there will be need for more standard posts.

A savings account should be started (even before erection of the fence), to start to cover for maintenance costs and replacement costs. This will help reinforce in the community the notion that they "own" the facility rather than the organisation facilitating its implementation.

It is expected that the range officer responsible for the supervision of the proposed rotation grazing can highly involved in the project assisting concerned communities to formulate implementation plan, to provide necessary training for managing the planned project.

d.4. Fodder Production

Fodder can be produced using a number of different grass species which are known to be adapted to conditions in Swaziland. These include: weeping lovegrass (*Eragrostis curvula*), giant Rhodes grass (*Chloris gayana*), Smut's finger grass (*Digitaria eriantha*) and the *Pennisetum* fodders. The *Pennisetum* fodders are recommended in the first instance as they are easier to grow and handle as well as being higher yielding but of equally high quality.

Note: In long-term research trials at the University of Pretoria in South Africa on bana grass and Napier fodder (Pieterse & Rethman, 2002) at a site to which bana grass was not well adapted, yields of up to 20.8 tDM/ha were obtained in favourable rainfall years and 15.1 tDM/ha in years of lower rainfall (750 mm). With 0 kgN/ha fertiliser applied the yield was 13.5 tDM/ha, with 100 and 200 kgN/ha 15.1 and 15.3 tDM/ha respectively and with 400 kgN/ha the yield was 16.6 tDM/ha. In dry years when rainfall was below 400 mm, dry matter yields of around 8 t/ha were obtained. These lower yields are similar to those obtained by other popular grasses (usually grown for hay in South Africa), namely Eragrostis curvula and Digitaria eriantha but the yields of 8 tDM/ha for these was obtained in good rainfall years. This shows that the Pennisetum spp. fodders have a high potential for use in the Middle and Highveld areas of Swaziland and are an appropriate choice as not only are

they easy to handle and manage but are also high yielding and give good quality fodder (9.9 % CP at 0 kgN/ha fertilisation rising to 11.2 % CP at 400 kgN/ha fertilisation

***Pennisetum* Grasses**

On areas that are not so badly scalded and eroded, but nonetheless show sheet erosion and rills, bana grass or elephant grass (*Pennisetum purpureum x P.glaucum* hybrid and *P.purpureum* respectively) should be planted out as a fodder crop. Where these fodder crops are to supply feed for beef fattening units, 4 ha should be planted at a time to support 10 beasts being fattened (Figure 5-20). Due to its greater hardiness Bana grass is recommended in TA-1 and TA-2, and either Bana grass or elephant grass for TA-3. Ideally, basal lime and fertiliser should be applied as for a medium to high yielding maize crop, preferably after soil analysis. Current recommendations by the Department of Agriculture in Swaziland are of the order of 1000 to 2000 kg/ha of lime (depending on soil pH) and 400 to 430 kg/ha of 2:3:2 (22) compound fertiliser (or 230 to 250 kg/ha 2:3:2 (38) compound fertiliser). Top dressing will depend on whether there is zero grazing or strip grazing applied – in the former case all nutrients removed (N, P, K) will need to be replaced, whereas in the case of grazing it will be mainly nitrogen (N) (200 kg/ha LAN (limestone ammonium nitrate) split over three or four dressings depending on the length of the rainy season) that will need to be applied. *Pennisetum* stem cuttings should be planted at 1 m x 1.5 m intervals – these should be obtained from the tinkhundla nurseries proposed as part of this land rehabilitation initiative (see Section 5.6.1 b.1) – it is estimated that about 10000 cuttings/ha would be needed. As these fodders are hosts of the maize stalk borer insect pest, as with maize, they should be treated for stalk borer, using for example 150 g Carbaryl/100 m of row, as necessary). Like all crops, these also need to be kept free of weeds. Further details on fodder production are available in the Field Crop,[1]

The planting material should be obtained from field nurseries planted as part of the tinkhundla development initiatives. In addition, wherever possible, the nursery areas should be fenced to exclude livestock with a five-strand barbed wire fence or goat-proof fence as necessary.

As a feedlot activity allows the beneficiary group to add commercial value to beef cattle, all cost for establishing infrastructure and running cost have to be borne by the beneficiary group that planned the project. These groups must first formulate a physical plan for fodder production including both creation of infrastructure and its operation and a plan to clarify how it intends to raise / borrow funds for establishment and maintenance. This plan can be integrated with fenced rotation grazing with the help of range officers who belong to the Department of Veterinary and Livestock Services of MOAC.

d.5. Fattening of Beef Cattle

Where beef fattening units are based on the use of fodder such as bana grass, these should be built as close to the fodder plots as possible to facilitate the feeding of the fodder using cut-and-carry methods, also called zero grazing (Figure 5-20). If the fodder plots are kept in good and productive condition, for fattening purposes cattle can be kept at the rate of about 2 to 3 heads/ha of productive fodder for three months at a time. A balanced ration of fresh fodder, crop residues and a fattening ration will see the animals with high fattening potential being fattened in about 90 to 100 days. If ten heads of cattle are fattened every three months in the four-hectare of fodder plot, this would represent an off-take rate of 40 head per year from the grazing area. On the other hand, if fattening stock with inferior quality is employed in the grazing area, the fattening period can be shortened or more heads of stock can be fattened, because such stock usually has less potential for fattening purpose or it has limitation in gaining body mass. In this case, the stock put under fattening can reach

[1] Horticulture and Pasture Production Recommendations Bulletin produced by the Ministry of Agriculture (Government of Swaziland, 1977).

maximum live weight before the estimated period (three months) and later it only consumes feed without increasing the value as meat. Therefore, the owner stops fattening on the way in order to avoid waste of feed. Thus, feedlot management requires cost and input saving so that the best beef price value can be achieved employing better quality stocks with ideal conformation with higher feed conversion ratio.

The fattening of livestock is expressly promoted in the Livestock Development Policy (1995) document as it promotes the production of high quality beasts that could be useful for export purposes. As well as improving the livelihood of farmers, it could also help relieving pressure on the rangelands if sufficient farmers become involved in the commercialisation of livestock production.

Two options for use of such fodder plots are available where either the cattle are allowed to graze on the area and fed supplements (the less preferred option) or the farmers zero graze the fodders for their animals in pens (the recommended option). Animals should be given access to adequate amounts of clean drinking water daily.

Note: If maize stover were collected and then treated with ammonia, this would form an additional valuable source of feed that could also be used as part of the fattening/finishing ration. Also, to cut costs, farmers in time may wish to mix their own supplements using raw ingredients produced locally and bought in as needed – this would increase profitability.

The plan for a typical fattening pen is shown in Annex C.15

Costs of fattening activity should be financed by the effort of the group established for this purpose. The planning for this activity has to cover marketing route of fattened beasts along with other essential matters such as land acquisition, design of facilities including paddock and pen, layout of water supply, that of fodder plot, input lists and their supply sources as well as cost estimation, role and responsibility of group members, draft of by-laws etc. It is advised that the said planning should be prepared in collaboration with the extension officers stationed at Manzini veterinary and livestock services office and its branch office at Mankayane.

e. Progressive Implementation in Three Target Areas

e.1 Targets

The rangeland management plan complements the soil conservation plan since continued random exploitation of grass resource has resulted in serious soil erosion and land degradation over rangeland in the target areas. This plan envisages major target on the recovery of grass cover over rangeland covering more than 60% of surface area. It also aims at preventing huge gully development along seriously denuded large cattle tracks through compartment fencing over existing paths and tracks where potential risk of huge gully development is anticipated. The planned sites have been selected from moderately degraded land as indicated in Annex C16 and C17. The reason why very seriously eroded parts have been avoided lies in the fact that poor grass condition currently prevalent on such deteriorated surface can hardly feed existing size of grazing herds when they are accommodated in a camp with poor grass cover. Even if the first camp managed to carry the herds, grass within the camp would be too damaged during grazing period to get recovered within expected time span. The target of establishing fodder plot coupled with fenced rotation grazing also resides with alleviation and protection of grazing pressure over present grass cover.

Table 5-12 shows the total areas of suitable sized tracts on present rangeland by TA, where possible numbers of rangeland management activities are proposed. The site location of these proposed range management sites are shown in Figure 5-21, Figure 5-22 and Figure 5-23 and the details are given in Annex C-18.

The timing of implementation of these grazing schemes in the different phases of the proposed implementation schedule is also shown – this follows that of the soil conservation

plan as far as possible. The rate of implementation of proposed feedlots is also shown. There has been no participation nor consultation with communities in the development of this grazing/range management plan – this will need to be rectified and scheme boundaries be resolved before extensive planning and implementation occurs.

Table 5-12: Areas proposed to be brought under fenced rotation grazing management in the three Target Areas and number of corresponding fattening pens and fodder plots (Feedlots)

Target years	TA1	TA2	TA3	Total area	Total units
2004-2009	335 ha	290 ha	750 ha	1,375 ha	
Nos. schemes	3	2	3		8
Nos. feedlots	1	1	2		4
2010-2015	1,125 ha	510 ha	1,485 ha	3,120 ha	
Nos. schemes	5	2	5		12
Nos. feedlots	4	1	1		6
2016-2020	500 ha	650 ha	1,035 ha	2,185 ha	
Nos. schemes	3	3	4		10
Nos. feedlots	1	1	2		4
Total area	**1,960 ha**	**1,450 ha**	**3,270 ha**	**6,680 ha**	
Nos. schemes	**11**	**7**	**12**		**30**
Nos. feedlots	**6**	**3**	**5**		**14**

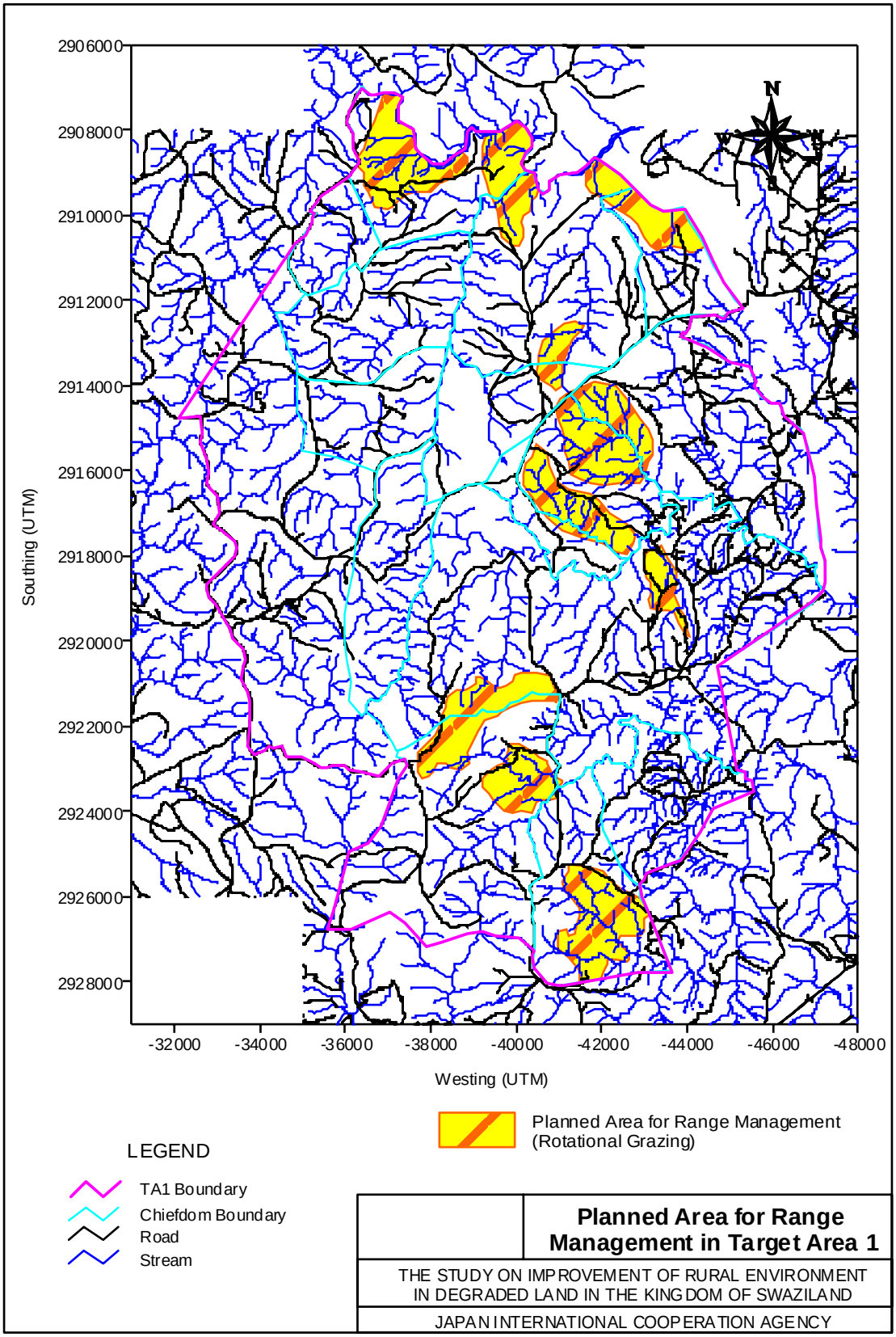


Figure 5-21: Proposed fenced rotation grazing management schemes in TA1

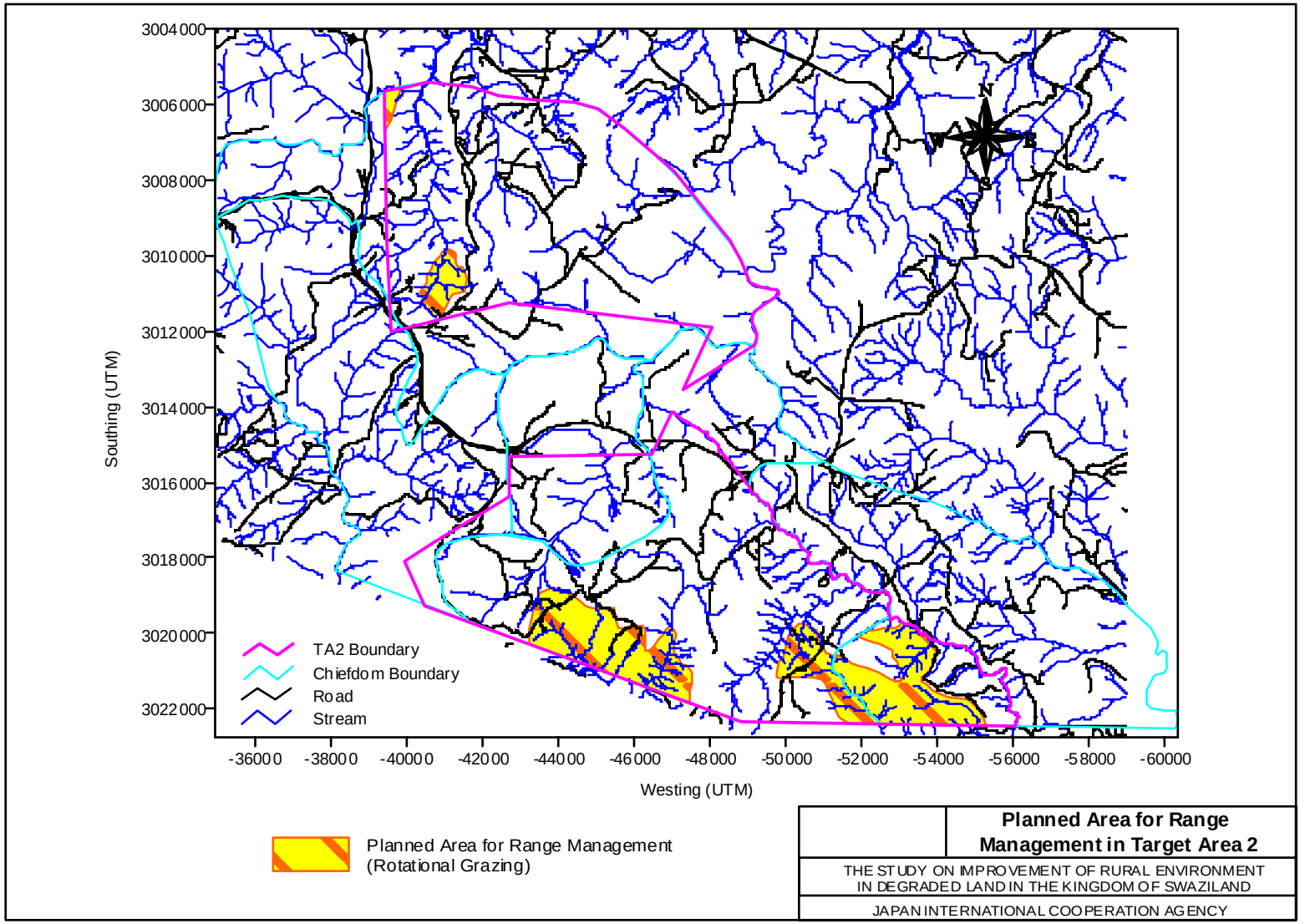


Figure 5-22: Proposed fenced rotation grazing management schemes in TA2

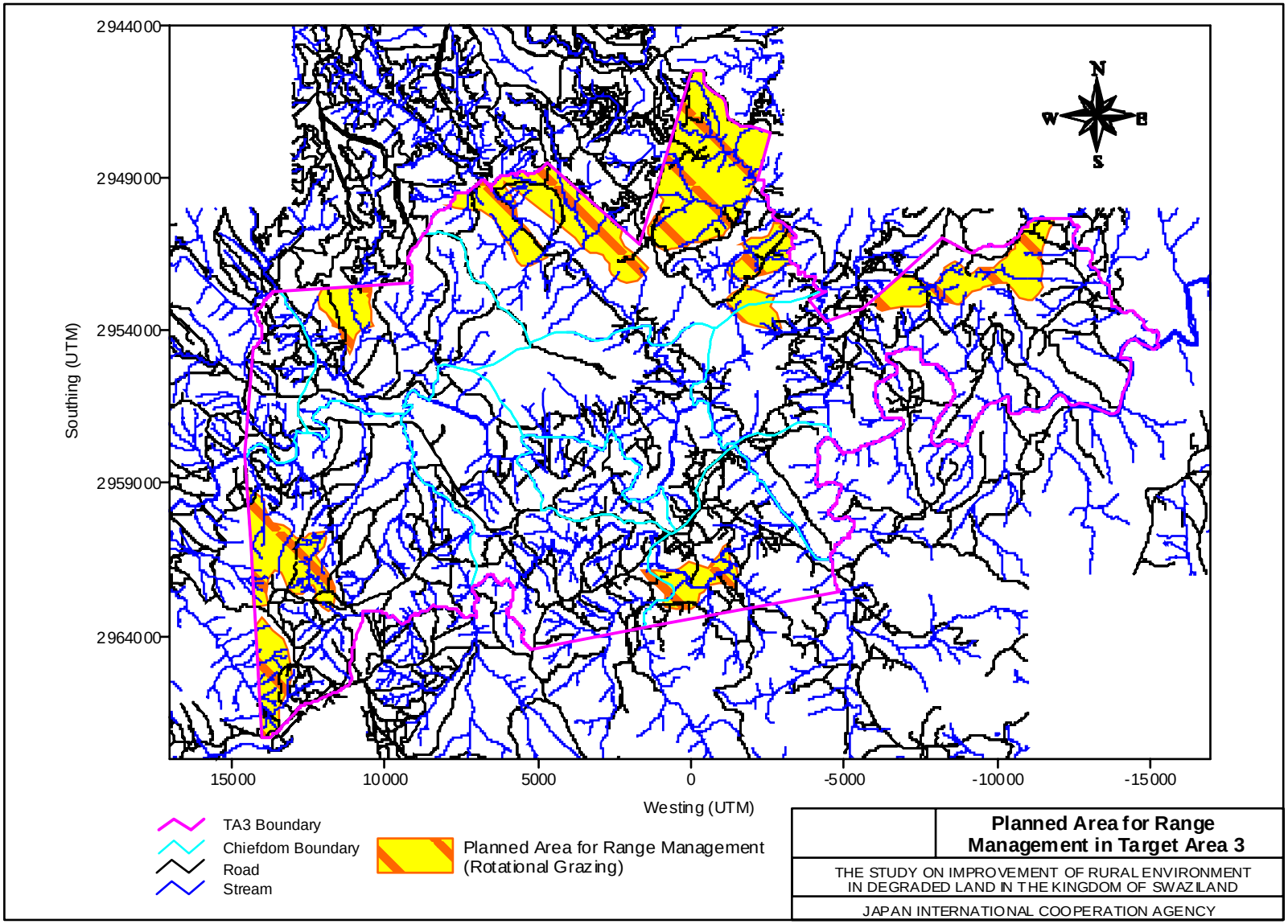


Figure 5-23: Proposed fenced rotation grazing management schemes in TA3

e.2 Achievement, Monitoring and Evaluation

The overall aim of these rangeland development proposals has been to improve rangeland grazing condition so that there is an increase in grazing capacity and, therefore, carrying capacity, and to commercialise the production of cattle so that there is an improvement of quality and condition of beasts sold thereby ensuring a greater price paid for the animals, a greater cash income and thus an improvement of the livelihood of the farmers.

The monitoring indicators shown in Table 5-13 can be used to check on progress of development and implementation.

Table 5-13: Master Plan monitoring indicators for rangeland activities

Objectively verifiable achievement indicators	Means of verification
30 community management groups established	Community management constitutions Community management records Committee meeting minutes
6680 ha rangeland fenced and brought under controlled grazing management, divided between three grazing schemes	Site inspections Community grazing management records Officers' written reports
14 fodder plots, each of 4 ha, established and being used to fatten cattle	Site inspections Officers' written reports Community fodder crop management records
14 feedlots erected and functioning using fodder from the 4 ha fodder plots	Site inspections Community management records Sales records
20 to 30 beasts fattened per beef fattening unit per year	Site inspection Community management records
Regular range, fodder and livestock management extension programme implemented with an absolute minimum of 12 visits monthly per year per group	Extension Officers' reports Community records
Training programme devised and training provided to community management groups on a regular basis	Training programmes Training material prepared Trainers' records Community training assessment records
Training material in the local language prepared before training sessions and made available during training sessions	Training material Extension Officers' reports
At least one exclosure erected per paddock in each grazing scheme, measuring 3 m x 3 m and using surplus fencing materials, to allow monitoring of rangelands	Site visits Range condition monitoring records Officers' written records
Implementation of a rangeland condition monitoring protocol.	Protocol documents Range condition monitoring records Officers' written records
Rangeland condition improved by one condition score class	Range condition monitoring records

e.3 Operation and Maintenance of Range Management

As regards fenced rotation projects, recurrent repair of created fences is required to maintain effective rotation grazing. Regular monitoring and maintenance works as the case arises are planned by the group members according to annual working schedule agreed in Chiefdom development committee sessions. Additional input procurement for such repairing works is usually financed through money raising among members of rotation grazing who hold cattle and use the camps for grazing. Other than repairing of fences separating camps, cattle gates and watering places in camps should be well maintained in order to keep efficient grazing

performances. With regard to operation and maintenance for fodder plots and feedlot facilities, the works and incurred costs can be shared among members of the group who use them. Usually, the accountants of feedlot management groups are responsible for general management, but daily monitoring, catering for storage and repair of feedlot facilities as well as tools/ implements should be shared among members of the beneficiary groups.

f. Social and Gender Consideration

The activity of utilisation of feedlot may create income by selling cattle. It contributes to reduce the number of cattle as well as increase income.

Simultaneously, since rotation cattle management and communal use of feedlot require cooperative work within the community, it is expected that solidarity in the community could be strengthened. The solidarity created may encourage the community people to proceed other community development activities depending on their needs. About the gender issues, although it will take time for women to have initiative for the activity in tradition, some changes in inclusion of women in decision making process as well as number of members have been observed in the pilot project. Thus, it could be expected to bring changes in gender relations in the process of the activity.

In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Sufficient time for awareness changes: Since most of the people do not have the idea of selling their cattle just as regular income, it requires sufficient time to make people aware to utilise their cattle in order to improve their lives rather than just keeping them. Since there is several cases of cattle production around and inside the target areas as commercial base, once people start even with the small number and "see" the effect by themselves, it could be spread as one of income generating activities. Hence, it is important to grudge time for spending for fully explanation at the starting point.

Necessity of frequent meetings at community level: Since the meaning of cattle is very special for the community people, it is important not to excite people on handling of cattle. If the rotation management is disturbed by certain community members, for example, it may cause furious disputes, since it is the issue related to cattle. Considering this point, frequent meetings with the committee members and neighbours will be necessary to have consensus what they are doing among the community.

g. Need for Consideration on Sisa System

In Swaziland, there exists a traditional cattle ownership called Sisa System. This system has been adopted and practiced nation-widely for a long time. It allows a non-community resident to own cattle and leave its management to the community people. It also allows the owners and keepers to gain profits reciprocally. Under the system, the cattle owners are generally more affluent than the community people and therefore own more cattle than community people.

It is reported that 20-30% of the total cattle in 3 target areas are under control of Sisa System, and each owner has more than 10 cattle, and in some cases 30-50 heads of cattle are owned only by one owner. Thus, the existence of this traditional system complicates solving the grazing management problems not only in 3 target areas but also in the whole country. However, to achieve the targets given in the proposed grazing management plan, aggressive participation by the residents who own the cattle under Sisa System is a must. Considering that it seems very difficult to change in a short time the prevailing social culture and economic systems especially in the communities which largely depend on cattle, JICA study team proposed that the following measures should be taken by MOAC in collaboration with all the other government agencies concerned.

(1) MOAC should hold workshops several times and explain the contents of the proposed M/P to the owners of the cattle under Sisa System to obtain understanding and cooperation from them prior to implementation of the proposed grazing management plan.

(2) MOAC should take necessary measures, for example, in implementation of the proposed grazing management plan, MOAC should ask the non-community residents who own the cattle under Sisa System to share the implementation cost of the proposed grazing management plan, for example, to contribute in proportion to the heads of cattle they own etc.

5.5.3 Agro/Community Forestry Development Plan

a. Objective

This plan has dual objective, firstly to increase tree canopy in three TAs for land conservation, secondly to meet acute demand or depleting wood resources particularly that of firewood. To achieve the general objective of master plan, the following projects are planned stage-wise for each Target Areas. In addition, capacity building of the community and Forestry Section is proposed so as to facilitate the proposed development plans as well as creating the necessary sustainability. All the planned projects supplement the greater objective of soil conservation measures as well as achievement of other objectives of the land improvement.

b. Justification

Conservation and development of forestry resources have both direct and indirect bearing on land rehabilitation in the three Target Areas. Trees conserve soil resources and through their sponge like effect, are quite effective in regulating water flow. It is a common knowledge that trees resources tend to build soil, an important counter measure to soil erosion. Additionally, trees are important economic resources providing firewood and construction material. The communities in the target areas are almost entirely relying on wood resources for energy purposes.

Specifically, the primary role of tree in soil conservation and fertility improvement arises from their ability to supply organic matter in form of litter and root residues. This is prime mover from, which stem other soil – improving processes. Briefly, other soil improving aspects of trees that stem from organic matter are:

Physical effects which lead to binding of soil particles which in turn lead to erosion resistance and better water holding capacity due to improved soil structure. Improvement of soil structure leads to better permeability, aeration of soil and infiltration of water, which in turn sustains various categories of water reservoir for domestic and other purposes. Put it simply, forestry supports agriculture and other life- support systems.

Chemical effects associated with tree conservation are mainly in form of increased nutrient recycling without leaching and synchronizing them with plant requirements, enhanced availability of micro nutrient uptake, and increased cat-ion exchange which also means better retention of fertilizer nutrients. Biological effects lead to favourable environment for nitrogen fixation, enhanced faunal activities and balanced mineralization.

Bearing in mind the above role of trees in environmental conservation, rural area environmental improvement as well as income generation potential for rural areas, appropriate development plans are made for each Target Area. Specifically, the plans deal with activities for establishment of integrated tree nursery, afforestation of stony surface, woodlot development and wattle management. The implementation of these activities is justified as follows.

b.1. Establishment of Integrated Tree Nursery

Currently there is no tree nursery in TA1 and TA3. Most people have not planted any trees in their fields and one of the reasons was lack of tree seedlings in these target areas. TA-1 also has serious shortages of firewood. A tree nursery is therefore proposed during the first phase that runs between 2004 and 2009 to provide the necessary planting material for the farmers use and for rehabilitation purposes. The nursery will produce both tree seedlings and fruit trees for use by all the people in TA1. The nursery will also be used by the community as a training area on matters of tree seedlings growing, grafting and some parts of the nursery area will be used for field demonstration on various technologies of agroforestry. Currently there is no tree nursery in this TA-3. Though relatively endowed with forest resources in Chiefdoms such as Macdvulwini, there are several other chiefdoms, which are bare of trees and need substantial planting. A tree nursery can produce both tree seedlings and fruit trees for use by all the people in TA3.

b.2. Afforestation of Stony Surface

There are wide stony surface areas in the Target Areas, currently not productively used due to extreme degradation. Planting of selected tree species not only will produce wood material, but will also environmentally improve site in the long run.

b.3. Woodlot Development

b.3.1 TA1

There is very little wood resources in TA-1. Survey of woodlots in TA1 indicated a total of 11.5 ha of some scattered eucalyptus woodlots, which are totally inadequate for poles and firewood purposes. Wood fuel deficits as calculated from consumption and sustained supply were high as indicated in Table 5-14:

Table 5-14: Projected firewood deficits in TA1

Period	2004-2009	2010-2015	2016-2020
Projected Consumptive Demand Quantity (t/year)	8,921	11,007	13,374
Estimated Internal Supply Quantity (t/year)	3,829	4,368	5,009
Projected Deficit (tonnes/yr)	-5,092	-6,639	-8,365
Projected Deficit per capita (kg/yr)	-544	-621	-685
Deficit Percentage (%)	-133	-152	-167
Period	2004-2009	2010-2015	2016-2020

These huge deficits, unless addressed by the project, will lead to more poverty and land degradation. Crop yield will also continue to decrease as people continue using crop residue for firewood instead of ploughing the same back to the soil. There is also a need for construction wood both at the household level use and communal use in schools, dips, hospital and other public purposes.

b.3.2 TA2

There is very little wood resources in Target Area 2. Survey of the few existing woodlots indicated that only 6.5 of eucalyptus plantation exists at the moment. These are not adequate and more woodlots are proposed to supply poles and firewoods. This area has one of the most serious wood deficits. Family spend large amount of their scarce income (E1,225 per household per annum) in buying fuelwood. Woodfuel deficits as calculated from consumption and sustained supply were high as indicated in Table below:

Table 5-15: Projected firewood deficits in TA2

Period	2004-2009	2010-2015	2016-2020
Projected Consumptive Demand Quantity (t/year)	14,566	17,046	19,816
Estimated Internal Supply Quantity (t/year)	6,044	6,929	7,895
Projected Deficit (tonnes/yr)	-8,522	-10,117	-11,921
Projected Deficit per capita (kg/yr)	-812	-843	-870
Deficit Percentage (%)	-141	-146	-151

These huge deficits unless addressed by the project will lead to more poverty and land degradation. Crop yield will also continue to decrease as people continue using crop residue for fuelwood instead of recycling it back into the soil. There is also a need for wood material for other purposes.

b.3.3 TA3

Other than Macdvulwini and adjacent areas, there is very little wood resources in Target Area 3. As a result Woodfuel deficits as calculated from consumption and sustained supply were high and were expected to increase in the future unless intervention in supply and simultaneous demand management are undertaken.

Table 5-16: Projected firewood deficits in TA3

Period	2004-2009	2010-2015	2016-2020
Projected Consumptive Demand Quantity (t/year)	21,751	27,396	33,765
Estimated Internal Supply Quantity (t/year)	13,680	15,566	17,771
Projected Deficit (tonnes/yr)	-8,071	-11,830	-15,994
Projected Deficit per capita (kg/yr)	-373	-479	-567
Deficit Percentage (%)	-59	-76	-90

These huge deficits unless addressed by the project will lead to more poverty and land degradation. Crop yield will also continue to decrease as people continue using crop residue for fuelwood instead of ploughing the same back to the soil. There is also a need for construction wood both at the household level use and communal use in schools, dips, hospital and other public purposes.

b.4 Wattle Management

Though wattle woods have been important firewood and pole resources, majority ceased their wood management as bark industry declined, entailing to random spreading into grazing ground. Too densely growing thin stands in abandoned lots has little value for firewood, bark collection and pole wood. In the light of acute firewood shortage taking place even in TA-3 with ample tree cover, it is significant to improve wattle utilization through this M/P from efficient use of resources point of view.

As concern current distribution of wattle lots, TA-1 has about 292 ha of uncontrolled brush, TA-2 has only 65 ha of wattle plantation, but there find over 400 ha of escaped and thick shrub lots along hill ridges in TA-3. Wattle development would take advantage of the new market for Swazi Wattle Industry that currently suffers from deficit of bark supply. Wattle is one of fast-growing alien species that can thrive everywhere, but degraded wattle woodlots perform low yield ranging 3 ~ 6 m^3 per ha. Better management can elevate yield performance up to 40 m^3 per ha, ten fold as high as this level. Now a wattle industry in Shiselweni is open demanding for bark to serve for tannin production.

c. Target Group

Afforestation project will be undertaken at Community level in a participatory approach. Hence the local community will carry out most of the activities on tree planting after being trained by the Forestry staff posted in LudzeLudze in TA-1, Nhlangano in TA-2, and Ngwempisi in TA-3. Direct beneficiary population is therefore deemed as target groups to whom official support be rendered to make activities sustainable.

d. Activity

d.1. Establishment of integrated tree nursery

d.1.1 TA1

A tree nursery was proposed around Nsenga High School where Chiefdom has agreed to allocate site for the planned nursery. Several sites have been offered inside and outside of the school compound, but a candidate site outside the school has access to water fountain that has once been used by the school as a potable water source, yielding around 7 m^3 per day. This site, located on gentle slope with well-drained fertile soils, is recommendable with relative advantage such as easy access of water source, potential leading role supposedly played by this high school staff for training and planting promotion campaign.

In terms of seedling production, the seedlings from the nursery will serve various components of the Master Plan and also some support programmes. Specifically, the seedlings will go towards main components of master plan, namely afforestation of stony surface, woodlots, wattle development and also the support components such as live fence and wind breaks. Agroforestry component will be useful to tackle wood scarcity. Each homestead will be expected to plant for the respective plan period. In this case it is taken as at the rate of 20 trees per homestead to contribute to sustainable fuelwood supply. Hence major seedlings production will be given in Table 5-2.

Table 5-17: Seedling production from the nursery in TA1

Period	2004-2009	2010-2015	2016-2020	Total
2,468 homesteads	6Yrs	6Yrs	5Yrs	17Yrs
Main Components	337,500	537,500	718,750	1,593,750
Support components	38,400	39,600	35,400	113,400
Agroforestry	296,160	296,160	246,800	839,120
Subtotal	672,060	873,260	1,000,950	2,546,270
Add for sale 10%	67,206	87,326	100,095	254,627
Total production	739,266	960,586	1,101,045	2,800,897

Notes:
1) Refers to seedlings requirement for stony afforestation, woodlot and wattle development
2) The seedlings will be used for support component of live fence and windbreaks,
3) The seedlings will be used for 2468 homestead planting @ 20 trees per homestead per year.
4) These are the seedlings which will be sold by farmers to other farmers within and outside
5) the Target Area

It is expected that farmers will be given from the nursery agro-forestry seedlings of *Sesbania sesban* and raise for their own use and for sale to interested people within proposed agro-forestry system. Another supporting activity, improved fallow (refer to d.1 of 5.6.2.Agro/Community Forestry Development Plan) requires enormous amount of agro-forestry tree seedlings in the order of 10 thousand saplings per ha. This number of seedlings can be supplied only from large size nursery like one established in TA-2.

As regards planned tree species, the trees to be grown will go towards afforestation, rehabilitation and agroforestry purposes. Some of the plants grown will also be for fruit purposes. The species will be as outlined below.

Table 5-18: Tree species to be grown in the tree nurseries TA1

Rehabilitation	Woodlot	Agroforestry	Live fence
Acacia xanthophlloea	*Acacia mearnsii (wattle)*	*Calliandra calothyrsus*	*Dovyalis caffra*
Albizia falcata	*E. grandis*	*Parinari curatellifolia*	*Bauhinia rufescens*
Faidherbia albida	*Eucalyptus saligna*	*Sclerocarya birrea*	*Hakea saligna*
Podocarpus falcatus	*E. camadulensis*	*Gliricidium spium*	*Ziziphus mauritania*
Syzygium cordata	*Cassuarina equisetifolia*	*Leucaena leucocephala*	
Khaya anthotheca		*Sesbania sesban*	
Lonchocarpus capassa		*Cajanus calliandra*	
Robinia pseudoacacia			

As for nursery design, the design of sapling production will be similar to the Pilot Nursery at the Zikhoteni Chiefdom. Basically, there will be light house of 150m^2, nursery shed with a lockable store 100 m^2. Seedbeds to accommodate about of 200,000 seedlings per annum to be constructed each 1.2 m wide and about 20 metres long. On the whole size of active seedbeds will vary with annual seedlings requirements

The guidelines on nursery establishment should be followed: Briefly the following points should be noted in the course of nursery construction:

- Seedbed to be 1.2 meters wide by 20 meters long in order to fit in about 2500 seedlings per bed.
- Spacing between seedbeds to be one meter.
- Central main spacing to be 2 meters to allow for wheel barrow and material movement.
- Permanent nursery shed to be 2 meters high from seedlings.
- Semi-permanent shed to be 90 cm high from the tree seedlings and removable – Any suitable material can be used (sack cloth, timber, or reeds.)
- Black polythene sheets are better than transparent ones for control of weeds and should be open ended to avoid root culling.

Seedlings containers, a polythene tube of a diameter 6 cm by 15 cm long is adequate for most forest trees. For fruits, the polythene tubes should be bigger at around 13cm diameter and 23 cm long for small fruits and 18cm diameter by 23 cm long for large trees. As much as possible the pots should be open to prevent root coiling and for ease of root pruning.

d.1.2 TA2

Already a tree nursery has been built at Zikhoteni and there is no need for providing another nursery during the M/P. The seedlings from the nursery will serve various components of the Master Plan and also some support programmes. Specifically, the seedlings will go towards main components of M/P, namely afforestation of stony surface, woodlots, wattle development. Also, the support components such as live fence and windbreaks. Agroforestry component will raise trees in the same rate for meeting demand of population to contribute to sustainable fuelwood supply for the 1,966 homesteads. Hence major seedlings production will be envisaged in the below Table.

Table 5-19: Seedling production from the nursery in TA2

Period	2004-2009	2010-2015	2016-2020	Total
1966 Homestead	6Yrs	6Yrs	5Yrs	17Yrs
Main Components	312,500	543,750	543,750	1,400,000
Support components	18,800	19,200	13,800	51,800
Agroforestry	235,920	235,920	196,600	668,440
Subtotal	567,220	798,870	754,150	2,120,240
Add for sale 10%	56,722	79,887	75,415	212,024
Total production	623,942	878,757	829,565	2,332,264

Notes :

1) Refers to seedlings requirement for stony afforestation, woodlot and wattle development:
2) The seedlings will be used for support component of live fence and windbreaks,
3) The seedlings will be used for 1966 homesteads @ 20 trees per homestead.
4) These are the seedlings which will be sold by farmers to other farmers within and outside the Target area.

It is assumed that farmers will grow *Sesbania sesban* seedlings for their own use and sale to other farmers within agroforestry system. The trees to be grown will go towards afforestation, rehabilitation and agroforestry purposes. Some of the plants grown will also be for fruit purposes. The species will be the same as specified in Table 5-17, except *Lonchocarpus capassa, Robinia pseudoacacia and Cassandra equisetifolia* that are better excluded here because the clinate is too dry. The polythene tube of a diameter 6 cm by 15 cm long will continue to be used.. For fruits, the polythene tubes should be bigger at around 13cm diameter and 23 cm long for small fruits and 18cm diameter by 23 cm long for large trees. As much as possible the pots should be open ended to prevent root coiling.

d.1.3 TA3

The nursery in TA-3 will be established at the compound of Ngwempisi RDA which falls under Ngcoseni. The area is well drained with a gentle slope and the seedlings thus produced would be quite safe. The nursery will require approximately 7 m^3 of water per day and this can be obtained from the water supply system which is being used by the RDA. The RDA management has concurred to water use. Hence for this nursery the main work to be conducted as far as water supply is concerned will be water tank and distribution pipes.

The seedlings from the nursery will serve for various core and supporting components proposed to the M/P, such as planting over stony surface, creation of community wood-lots, wattle management, improved fallow, planting of fruit trees around homestead and on contour terraces for grazing field, establishment of windbreaks and live fences etc.

Table 5-20: Seedling production from the nursery in TA3

	2004-2009	2010-2015	2016-2020	Total
696 Homesteads	6Yrs	6Yrs	5Yrs	17Yrs
Main Components (nos)	275,000	370,000	773,750	1,418,750
Agroforestry (nos)	443,520	443,520	369,600	1,256,640
Subtotal	718,520	813,520	1,143,350	2,675,390
Add for sale 10% (nos)	71,852	81,352	114,335	267,539
Total production	790,372	894,872	1,257,685	2,942,929

Notes :

Refers to seedlings requirement for stony afforestation, woodlot and wattle development:
The seedlings will be used for 3696 homesteads @ 20 trees per homestead per annum.
These are the seedlings which will be sold by farmers to other farmers within and outside the Target area

The trees to be grown will be delivered towards afforestation, rehabilitation and agroforestry purposes. Some of the plants grown will also be used for planting fruit orchards. The species will be as outlined in Table 5-17, except *Lonchocarpus capassa, Robinia pseudoacacia Cassandra equisetifolia* and *Cajanus calliandra* that are less tolerant to aridity

The design of tree nursery will be similar to the Pilot Nursery at the Zikhoteni Chiefdom. Basically, there will be light house of 150m^2, nursery shed with a lockable store 100 m^2. Seedbeds to accommodate about of 200,000 seedlings per annum to be constructed each 1.2 m wide and about 20 metres long. On the whole size of active seedbeds will depend on the annual seedlings requirements.

The guidelines on nursery establishment should be followed: Briefly the following points should be noted in the course of nursery construction:

- Seedbed to be 1.2 meters wide by 20 meters long in order to fit in about 2500 seedlings per bed.
- Spacing between seedbeds to be one meter.
- Central main spacing to be 2 meters to allow for wheel barrow and material movement.
- Permanent shed to be 2 meters high from seedlings.
- Semi-permanent shed to be 90 cm high from the tree seedlings and removable – Any suitable material can be used (sack cloth, timber, or reeds.)
- Black polythene sheets are better than transparent ones for control of weeds

For most forest trees, a polythene tube of a diameter 6cm by 15cm long is adequate. For fruits, the polythene tubes should be bigger at around 13cm diameter and 23 cm long for small fruits and 18cm diameter by 23 cm long for large trees. As much as possible the pots should be open at the bottom to prevent root coiling.

It is advised for all the Target Areas that group members of participating beneficiary communities in charge of forestry activities manage the nursery. To keep rational and sustainable use of the nursery, consultations are held among them to discuss on demand for seedlings for planned components, on production schedule, with the technical and material support by Forestry Section of RDA. Ultimately, nursery beds are allotted to the members, who are to sow tree seed and to tender saplings on their allotments.

d.2. Afforestation of Stony Surface

Although vast stony areas extend over hill-top rangeland, they have been left untapped, without contributing to grazing resources, on account of difficulty in restoring vegetative cover. Aiming at minimizing heavy runoff from these areas and improving contribution degree for cattle feeding, afforestation on these areas is advised in the M/P. Chiefdoms that identified as stony surface areas in the Study are to undertake afforestation. Here, the on-going guidelines on afforestation should be followed as to planting specification. 2,500 seedlings per ha is recommended as the standard planting density where remnant indigenous vegetation such as *Tricalysia capensis Ficus sicamorus* and *Croton megalobotrys* should be protected. Proposed species include; *Acacia albida, A. xanthophloea, Albizia falcata, Khaya anthoteca, Lonchocarpus capassa, podocarpus falcatus, Robinia pseudo-acasia, Syzygium cordata*.

The major activities proposed for the stony surface afforestation in each area will be:

- Detailed participatory identification and planning with the local community and Forestry Section staff
- Fencing of the area thus identified.
- Undertaking appropriate land preparation that will be site specific.
- Demarcation and staking
- Hole digging and microcatchment preparation
- Planting of saplings
- Weeding and other cultural interventions.

d.2.1. TA1

The chiefdoms to be given priority are Eni, Swaceni, Sankolweni and Nsenga. The afforestation activities over the master plan period are proposed as indicated in Table below. For proceeding with the said activities, reference should be made to the Integrated Nursery Guidelines provided in Annex B.5.

Table 5-21: Stony surface afforestation areas (ha) and sequence of planting in TA1

Chiefdom	2004-2009	2010-2015	2016-2020	Total
	6Yrs	6Yrs	5Yrs	17Yrs
Eni	25	10	35	35
Swaceni	-	10	55	65
Sankolweni	-	40	155	195
Nsenga	65	70	-	135
Total	90	130	210	430

d.2.2. TA2

The Chiefdoms to be given priority are Manyadzeni, Mchinsweni Mabona Dumekhungwini and Zikhoteni.

Specifically the community has requested afforestation of Mantambe area in Manyandzeni Chiefdom, which should be undertaken under this component. Also the community has requested for afforestation to protect a stream banks (Mgwawhume River in Mgiswani area) and selection of tree species which includes Syzygium will be made. The afforestation will be adjacent to a small wattle and eucalyptus woodlot planted by the Government in late 1980s.

Here again, for TA2 the same guidelines as applied to the afforestation in TA-1 are used for planting specification. As for the major activities in TA-2, the same activities as in TA1 are planned to fulfil the objectives thereof.

The afforestation activities over the master plan period are proposed as indicated in Table below.

Table 5-22: Stony surface afforestation areas and sequence of planting in TA2

Chiefdom (unit: ha)	2004-2009	2010-2015	2016-2020	Total
	6Yrs	6Yrs	5Yrs	17Yrs
Manyandzeni	10	-	-	10
Mchinsweni	-	-	110	110
Mabona	-	60	-	60
Dumenkhungwini	-	10	-	10
Zikhoteni	40		-	40
Total	50	70	110	230

In TA-2, planting on stony surface will not necessarily be done on blocks of substantial scale but can be applied to smaller sites with limited surface area, because the significance of this planting lies in adding value to wasted land which could not be used for other purposes but trees are doing well.

d.2.3. TA3

The chiefdoms to be given priority are Macdvulwini and Velezizweni. Also, the community of Macdvulwini that

implemented fenced-off soil conservation terracing in the Pilot Study has requested to plant trees on the terraces under this activity. Here in TA-3 also, the same guidelines and contents of planting works as applied to TA-1 can be followed for planning and outplanting thereof.

The afforestation activities over the master plan period are proposed as indicated in Table below.

Table 5-23: Stony surface afforestation areas and sequence of planting in TA3

Chiefdom Unit : ha	2004-2009 6Yrs	2010-2015 6Yrs	2016-2020 5Yrs	Total 17Yrs
Macdvulwini	20	25	50	95
Velezizweni	60	95	160	315
Total	80	120	210	410

The figure in Macdvulwini indicates power of trees to literally grow on rocks. The above tree has split the rock into two pieces and continues to grow getting nutrients from dissolved rock particles and in the end will reduce the rock to soil suitable for other plants including agricultural crops.

d.3. Woodlot Development

This component has objective of alleviating suffering firewood deficit in three TAs as much as possible. In view of current acute deficit and enabling local consumers to harvest wood as early as possible, fast-growing and readily tending firewood varieties of eucalyptus have been recommended for outplanting in village woodlots.

The trees to be planted in respect to woodlot will be those which are suitable for firewood and poles. In this respect, the following species will be planted. *Eucalyptus saligna E. grandis, E. camadulensis, Cassuarina equisetifolia*.

The major activities for the woodlot development in each area will be:

- Re-examination of areas with suitable land for woodlot without sacrificing grazing area.
- Fencing of the area thus identified
- Undertaking land preparation
- Demarcation and staking
- Hole digging and water micro-catchments preparation
- Planting of the tree
- Weeding and other cultural interventions.

Existing guidelines (Annex B-5 and B-6) used in pilot tree planting in TA-2 can be applied to planting specification for this component.

d.3.1. TA1

Woodlot planting will take place in the following Chiefdoms: Maliyaduma. Mbeka, Mkhulamini, Ntunja, Nyakeni, Bhekinkosi and Nsenga.

Table 5-24: Woodlot development areas (ha) and sequence of planting in TA1

Chiefdom	2004-2009	2010-2015	2016-2020	Total
	6Yrs	6Yrs	5Yrs	17Yrs
Maliyaduma	-	30	-	30
Mbeka	-	-	30	30
Mkhulamini	-	15	-	15
Ntunja	-	-	20	20
Nyakeni	-	-	15	15
Bhekinkosi	-	20	-	20
Nsemga	30	-	-	30
Total	30	65	65	160

d.3.2. TA2

Woodlot planting will take place in the following Chiefdoms: Manyadzeni, Mchinsweni, Dumenkhungwini and Zikhoteni.

In fact, the community, facilitated by an NGO undertook the planting and used already prepared guidelines. The same community is expected to continue with the afforestation. The trees to be planted in respect to woodlot will be those which are suitable for firewood and poles. In this respect, the following species will be planted. *Eucalyptus saligna E. grandis, E. camadulensis, Cassuarina equisetifolia*.

The major activities for the woodlot development in each area are as same as described in TA1.

Table 5-25: Woodlot development areas and sequence of planting in TA2

Chiefdom	2004-2009	2010-2015	2016-2020	Total
Unit: ha	6Yrs	6Yrs	5Yrs	17Yrs
Manyandzeni	25	-	-	25
Mchinsweni,	-	-	25	25
Dumenkhungwini	-	30	-	30
Zikhoteni	40	-	-	40
Total	65	30	25	120

The height of the dominant trees of the plantation had attained a height of 165 cm, up from 15 cm in a period of 6 months. The area is quite degraded and threatened by advancing gullies. A cross breed of *E. grandis* and *E. cammadulensis* seems to be doing well in otherwise highly degraded area. Aquasoil was used to trap moisture.

d.3.3. TA3

Woodlot planting will take place in the following Chiefdoms: Lishikishini, Bhadzeni 1, and Mgazini.

Table 5-26: Woodlot development areas and sequence of planting in TA3

Chiefdom	2004-2009	2010-2015	2016-2020	Total
Unit: ha	6Yrs	6Yrs	5Yrs	17Yrs
Lishikishini,	0	0	40	40
Bhadzeni 1,	0	20	0	20
Mgazini	0	0	40	40
Total	0	20	80	100

d.4 Wattle management

The main activities to be undertaken will be:

- Delineation of the three subcategories of wattle tree ownership
- Discussion with the various owners on planned activities
- For communal new areas, fencing of plots identified.
- Preparation of specific wattle management plans.
- Undertaking land preparation which may include uprooting exhausted coppice stumps.
- Enrichment planting
- Hole digging and water micro-catchment preparation
- Planting of the tree
- Slivicultural operations of thinning and coppice selection
- Wattle plantation containment and management.

Management and control of wattle expansion is one the most important task to be undertaken. To check on the uncontrolled expansion of wattle trees, appropriate boundary marking, using non-invasive tree species, will be made. Additionally, sustainable management techniques of wattle woodlots will be initiated This strategy will minimize current antagonism on wattle trees which have spread to grazing lands, with original planters claiming ownership of such trees even when they have spread beyond their original site.

For space of woodlot planting of new areas, planting will be two meters by two meters. For the degraded areas, planting will be enrichment planting. So also the areas which are privately owned and showing very low stocking. On the whole, the programme is planned for 1250 seedlings per ha or a spacing of 2.8 meter by 2.8 meter. The tree species to be planted will be *Acacia meamsii* because of high concentration of tannin.

d.4.1. TA1

Wattle development and management will be undertaken in the following Chiefdoms: Mkhulamini, Ngcayini, and Nyakeni.

The following table indicates planting area and the order of planting.

Table 5-27: Wattle management planting areas and sequence of planting in TA1

Chiefdom Unit (ha)	2004-2009	2010-2015	2016-2020	Total
	6Yrs	6Yrs	5Yrs	17Yrs
Mkhulamini	-	40	-	40
Ngcayini	30	-	-	30
Nyakeni	-	-	25	25
Total	30	40	25	95

d.4.2. TA2

Support to wattle outgrowers is necessary because at the moment in Shiselweni there is a big unsatisfied market for wattle bark and wood. According to Shiselweni Wattle Industry, the industry requires 33,600 of bark to produce 12,000 tonnes of tannin at a ratio of 2.8:1. This translates into an area of 8960 ha of wattle to be well managed on 9 year rotation to sustain the current demand. With TA2 having only 65 ha and other TAs combined area of 1,102 ha, there is a big scope of area addition and intensified management for higher yield of wattle woodlots.

Currently farmers are not allowing trees to grow to maturity due to shortage of cash income. There is a need to help them with profession and financial backup to enable them get cash

income on annual basis with wattle trees as collateral- funds to be recovered on sale of timber and bark on attainment of appropriate rotation. The other issue comprises low bark yield inherent to old plantation though remaining few, and this can be overcome by uprooting old and tired stumps and replacing them with new saplings that can yield several folds as much as the bark weight per ha obtained from old wattle woodlots.

Wattle development and management will be undertaken in Chiefdoms of Manyandzeni, Mchinsweni, Mabona and Dumengkhungwini. A wattle forest in Mavundlute Hills in Mabona Chiefdom, next to Masipula Hogh School, was once well stocked one, but now it has been heavily invaded by *Lantana camara*. This will managed better through such intervention as propose here. The intervention activities include enrichment planting together with thinning of poor stands, removal of invasive shrub species and regenerative promotion in order to bring forest into normal status with a view to producing a variety of forestry products inclusive of bark that is badly needed by the Swazi Wattle Company in Nhlangano town.

The main activities to be undertaken here are the same as what is listed in d.4.1, but the following two items are added.

- Preparation of detailed sites specifically provided for wattle management plans
- Organization and support of Wattle Cooperatives and out-growers farmers

The following table indicates planting area and the order of planting.

Table 5-28: Wattle management planting areas and sequence of planting in TA2

Chiefdom Unit: ha	2004-2009 6Yrs	2010-2015 6Yrs	2016-2020 5Yrs	Total 17Yrs
Manyandzeni	20	-	-	20
Mchinsweni	-	-	165	165
Mabona	-	180	-	180
Dumenkhungwini	-	55	-	55
Total	20	235	165	420

d.4.3. TA3

In addition to these sites, other areas in Ngcoseni, next to Musa School, where the degradation of woodlots is observed, is included for enrichment planting and management on the fairly degraded forest of wattle. Previous survey of woodlots indicates that the area under wattle is 910 ha, substantially more wattle woodlots than other Target Areas. However the woodlots are highly degraded as evident from wattle woodlots around Musa School. The yield of these woodlots could substantially be increased. Wattle development and management will be undertaken in the following Chiefdoms: Macdvulwini, Mgazini, and Khabonina.

The following table indicates planting area and the order of planting.

Table 5-29: Wattle management planting areas (ha) and sequence of planting in TA3.

Chiefdom	2004-2009 6Yrs	2010-2015 6Yrs	2016-2020 5Yrs	Total 17Yrs
Macdvulwini,	60	0	0	60
Mgazini	0	0	39	39
Khabonina	0	16	0	16
Total	60	16	39	115

e. Strategies for component management and ownership of all the components cited above

The community will manage the nursery, with technical support from the Forestry Section. Discussion will be held with the local community to finalize details of modalities on sustainable management of the tree nursery. Ultimately, groups of farmers, and school shall each be given a number of nursery beds to manage. The school and the community should use the proceeds from the sale of plants. Nsenga High School has indicated interest in running some parts of the nursery for training purposes.

Afforestation and woodlot planting project in TA2 will be carried out at community level (catered by forestry sub-committee) coordinated with the Forestry Section staff at Nhlangano as well as coordination with Hluti RDA Office. In TA1, afforesstation and woodlot planting project will be carried out in collaboration with Ludzelize RDA Office. Also in TA3, afforesstation and woodlot planting project will be carried out in collaboration with Ngwempisi RDA Office and Headquarters of Forestry Section of MOAC. Regarding the implementation of the projects, the first priority should be put on TA2.

The proposed wattle management will deal with upgrading of the existing wattle woodlot and development of new ones in appropriate places. The project in collaboration with the community will designate three types of woodlots:

1. Purely privately owned and some look like a reasonably managed plantation;
2. Owned by specific number of households who already know their parcel boundaries and
3. Communally owned by the whole community.

For case 1, the farmers will be assisted with advice and extension. For case 2, replanting and better delineation of boundaries for better management and for case 3, these will mainly be new plantations for communal purposes. It may be more prudent to assign each household specific compartment for better management and follow-up.

f. Social and Gender Consideration

Especially from the nursery management, it is expected to gain income by selling the seedlings grown in the nursery. Simultaneously, as the location of nursery is proposed to be close to school areas in general and is recommended to include school children for their cares, it could be part of environmental education to raise awareness toward importance of growing trees in their living areas.

Since it is also planned to plant fruit trees in their land, it could be expected to produce fruits for home consumption as well as for selling. Since women have also control to sell them as extra income, it may increase the opportunity of women to widen their lives.

Apart from the effect of planting trees such as soil conservation as well as production of forestry products, improvement of living environment is also expected by planting trees on contour terraces as well as afforestation. In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Clear demarcation of the duty and benefits: In this Master Plan, the nursery is planned to be managed with the form of pursuing individual benefits with dividing the nursery beds into the members, in order for each of them to take care on their own responsibilities. Simultaneously, the areas to be taken care by each participant will be also marked in the afforestation site, in order to make it clear the duty as well as acquirement of the forestry product of each participant. Since unclearness of benefit will lead uncooperative management as well as luck of ownership of the management, it is important to consider the device as proposed in the master plan.

Selection of tree species considering gender balance: It is proposed in this Master Plan that the community people will select the species of trees of the seedlings to be grown in the nursery besides the species proposed in the list. Since there is a tendency that relatively bigger commercial such as wattle management for sale to private company will be managed by men, and contrarily smaller and informal business such as selling fruits will be managed by women. Accordingly, it is essential to consider the combination of tree species with considering the gender-balanced effects.

5.5.4 Capacity Building Development Plan

a. Objective

The objective of the capacity building development plan is to ensure the smooth implementation of the master plan through the capacity building activities to be conducted by the MOAC and other government agencies concerned for the frontline agricultural extension providers (RDA staff) and community people including community traditional leaders and the committee members. Capacity building development plan consists of several components including: i) Inkhundla and chiefdom workshops; ii) leadership training; iii) technical training programme; and iv) monitoring and evaluation workshops.

b. Justification

b.1. Need for Capacity Building at Central Government Level

b.1.1 Land Use Planning Section as the Project Supervisor

Through the capacity building activities during the study, community people acquired the knowledge and skills necessary for the management of the pilot projects, and these capacity buildings brought about changes in the community people. And it is expected that the knowledge and skills thus acquired can act as strong tools for implementation of the projects proposed in this M/P, which contain various components.

It has been identified, however, that further capacity building targeting at not only the community people of different levels but also the government staff is necessary for continuous implementation of the proposed soil conservation plans for 3 target areas, because the said capacity buildings were made only for a limited time, thus only a limited numbers of community people could participate in the programme.

Also it has been identified that the present staff structure of LUPS does not seem to be in a position to carry out the proposed projects properly. Out of the total staff in LUPS, there are only 7 technical staff. of these technical staff, there is only one soil conservation expert. All the staff are stationed in Mbabane office and there is no LUPS staff in regional as well as sub-regional level. Under such a situation, it will be absolutely difficult for LUPS to carry out the projects properly.

The need to increase the number of staff in LUPS is also pointed out in the ZIMKEN report in 2001.[2] This report proposed the establishment of six core departments and one standalone unit in MOAC. In the proposed structure, establishment of Department of Land Use Planning and Rural Development is recommended.

At the moment, it is not certain whether the reorganization plan proposed by the said report will be taken up by the government or not. However, it is clearly pointed out in this report that the present staff at the Land Use Planning Section is not sufficient to carry out the works given the volume of work to be done. In addition to the present staff, the following positions are proposed.

[2] Report on Reorganization of the Ministry of Agriculture and Cooperatives, February 2001

- 4 Land Planning Officers (1 per region)
- 4 Soil Surveyors (1 per region)
- 4 Soil Conservation Officers (1 per region)
- 4 Assistant Soil Conservation Officers (1 per region)

The above proposal is based on the fact that LUPS has no staff at regional level. Due to shortage of professional staff, particularly in the field of soil conservation, planning as well as implementation of the projects is absolutely difficult. This situation will be further aggravated in the coming years.

Under such a situation, there is urgent need for MOAC to prepare a capacity building plan to train the government officers at national level so that they can have practical knowledge on the soil conservation project management skills for its effective implementation, because under this M/P it is expected that the Land Use Planning Section should play a leading role for smooth implementation of the said soil conservation projects.

b.1.2. Need for Capacity Building of RDA Offices as Frontline Service Providers

Rural Development Area (RDA) offices were established for the implementation of Rural Development Area programme in 1970s. After the termination of the programme in 1980s, RDA offices are providing agricultural extension services for SNL farmers through its 17 RDA offices.

There are 4 RDA offices relevant to the target areas, viz. Central (Ludzeludze), Luve, Ngwempisi and Hluti offices. These RDA offices are presently equipped with the following staff and equipment.

Table 5-30: Outline of RDA Offices Relevant to the Target Areas

Name of RDA	Central (Ludzeludze)	Luve	Hluti	Ngwempisi
Relevant TA	TA1	TA1	TA2	TA3
Staff	1 Extension Officer	1 Extension Officer	1 Extension Officer	1 Extension Officer
	15 Field Officers	5 Field Officers	3 Field Officers	8 Field Officers
	1 Horticulturist	1 Home Economist	3 Tractor Drivers	1 Horticulturist
	1 Tractor Pool Supervisor	5 Tractor Drivers	1 Tractor Pool Supervisor	1 Tractor Pool Supervisor
	3 Mechanics		1 Tobacco Specialist	1 Home Economist
	1 Forester			2 Cooperatives
				1 NMC
				1 CCU
Tractors	4 units	4 units	6 units	6 units
Pick-up	1 unit	1 unit	1 unit	1 unit
Motorbikes	3 units	2 units	2 units	2 units

Note: NMC = National Maize Corporation; CCU = Central Cooperative Union

The main activities of these extension service staff include general extension, horticulture, poultry, fisheries, tractor hire services, home economics, beef, diary, cooperative development and forestry. Although some Rural Development officers are stationed at either RDA offices or regional extension service offices, their activities do not seem to be very active due to limited budget in rural development operations. As Land Use Planning Section has no staff at regional level, support from RDA extension staff is indispensable for the implementation of Pilot Project.

In this regard, there is urgent need for MOAC to prepare the capacity building plan to train RDA staff so that they will have practical knowledge on the project management skills for the implementation of the development projects. Such training needs could be attained through the implementation of the soil conservation projects.

b.2. Need for Capacity Building at Community Level

b.2.1 *Inkhundla* Centre as Development Core for the Communities

An *inkhundla* consists of several chiefdoms and acts as the engine of development and the central pillar underpinning the political organization and economic infrastructure of the country through which social services are facilitated and delivered. The *inkhundla*, as a local authority area, is under the general administration of an executive committee called *Bucopho* (*Inkhundla* Committee). *Bucopho* consists of persons elected from the chiefdoms within an *inkhundla*. *Bucopho* operates under the chairmanship of the elected member of Parliament (MP) who supervises the activities of the *inkhundla* and also convenes and presides over meetings of the *inkhundla*.

Each *Inkhundla* office has a Constituency Development Committee consisting of a Constituency Headman (*Indvuna Yenkhundla*), a Member of Parliament (MP), and Councillors (*Bucopho* members). One of the main functions of the Constituency Development Committee is the appraisal of development project proposals prepared by the community people. Most of these proposals are prepared by the community groups for the prospective funding, such as E 40 million of Regional Development Fund, which was launched by His Majesty King Mswati III and E 3.85 million of Empowerment Fund provided by DPM office. The funding mechanism is shown in the following table and figure. Application form for the Fund is attached in Annex H.8.

Table 5-31: Funding Mechanism for Community-based Projects

	Agencies/Institutions concerned	Roles and Responsibility
Central	Deputy Prime Minister's office	-Allocation of funding -Preparation of documents for the purchase of materials
Region	Regional Development Committee (Administrator, Secretary, MP and chiefs)	Approval of the proposals
Constituency (*Inkhundla*)	*Inkhundla* Development Committee (Constituency Headman, MP and Councillors)	Appraisal of the project proposals
Chiefdom Community	Chief's kraal (*umpakatsi*) Development Committee Community Groups	- Preparation of project proposals - Execution of the approved projects

Note: MP = Member of Parliament; Councillor = Bucopho member

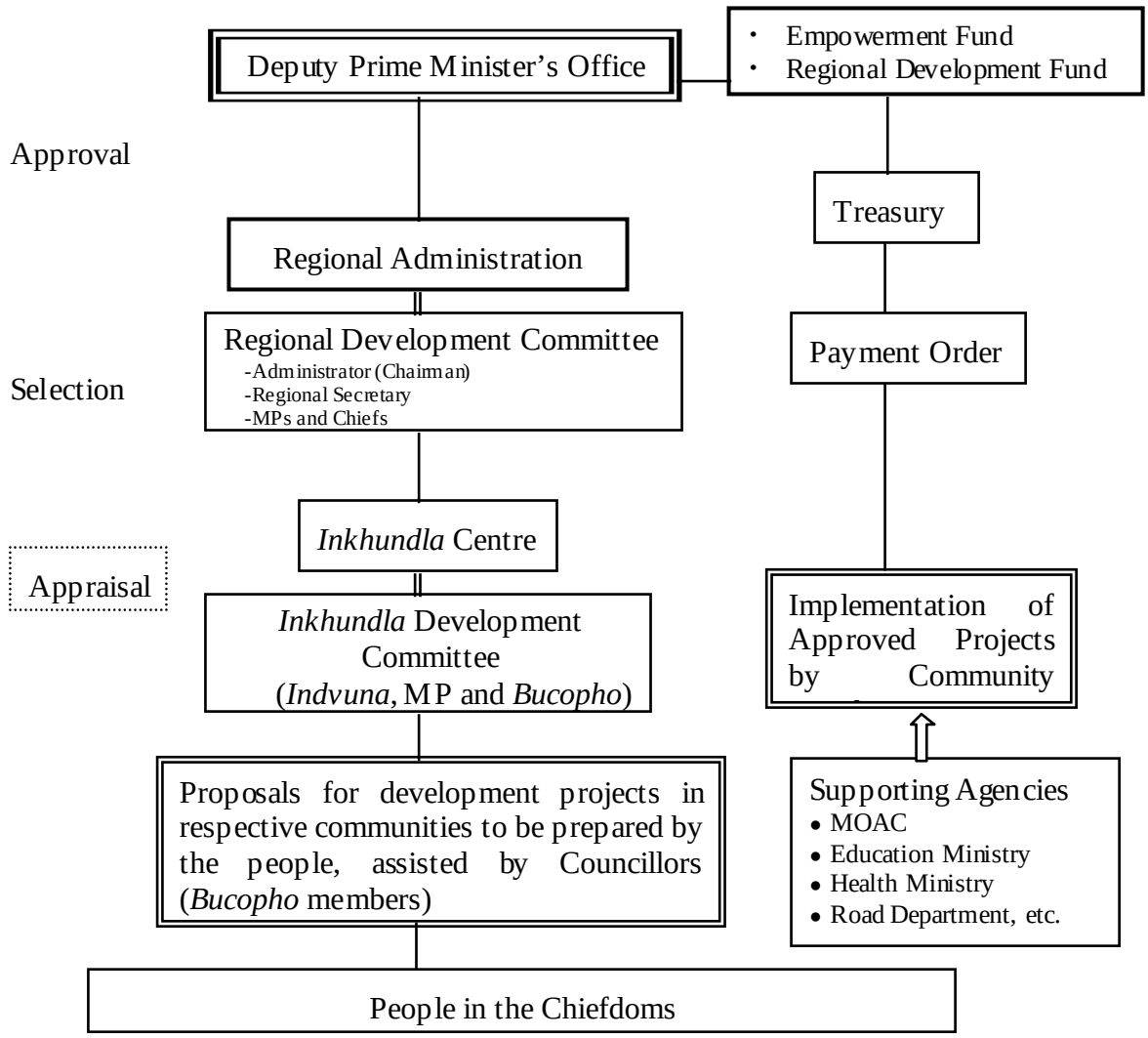


Figure 5-24: Funding Mechanism for Community-based Projects

As depicted in the above flow chart, the *Inkhundla* Development Committees hold regular meetings to appraise the development plan proposals prepared by the community people and submit the selected proposals to the regional office for approval.

Observations made by the Study Team indicate that few *Inkhundla* Development Committee members have competent knowledge on the development planning and appraisal method. It will be necessary, therefore, to carry out training program for these members to improve the capacity of development plan management skills.

b.2.2 Need for the Capacity Building Plan for the Community Leaders

Chiefdom is the area under the control of a chief. Every chief's residence (umpakatsi) is headed by a chief who is appointed by the king after the chief has been selected by the family council (*lusendvo*)[3]. The position of a chief as a local head of one or more areas is usually hereditary.

A chief usually appoints a headman (*indvuna*) as his deputy. Chiefs rule their chiefdoms with assistance from a headman and a council of advisers (*bandlancane*).

[3] Family council (*Lusendvo*) consists of the homestead head, his brothers, his adult sons and brothers' sons, among others.

Chiefs, headmen, and advisers are considered to be community leaders. Participation of these community leaders in the project is indispensable as these leaders have the traditional legal right to decide on the land allocation needed for the project. It will be necessary, therefore, to hold workshops or seminars on awareness raising on the seriousness of land degradation, leadership, conflict resolution, etc. so that these leaders will have better understanding on the significance of the projects.

b.2.3 Need for the Capacity Building Plan for Community Development Committee Members

During the second field survey, three workshops at each *Inkhundla* centre (nine workshops in total) were conducted for the formulation of the Master Plan. The number of participants in a workshop ranged from 30 to 70 people. Among these participants, members for the Community Development Committee (CDC) were selected at each Target Area for the implementation of the Pilot project.

Although some of these members have experience in conducting the projects, most of them are lacking the knowledge in the project planning and project management skills. Therefore, there is need for the PMU to prepare and carry out the training program for these members.

b.2.4 Need for the Capacity Building Plan for the Community People

Community people in general are not well aware of the seriousness of land degradation that is caused by several human activities in agriculture, forestry, mining and construction. Overgrazing, deforestation, improper land management on arable land, and road construction are attributable to soil erosion and land degradation in rural areas. There is need, therefore, to prepare and conduct capacity building for community people on the seriousness of land degradation.

At the same time, the community people are lacking the knowledge about the projects proposed in the Master Plan, such as fenced rotation scheme, feedlot fattening unit, nursery, agro-forestry, etc. Therefore, it will be necessary for the PMU to prepare the technical training programme in the fields of fenced rotation scheme, feedlot fattening unit, nursery, agro-forestry, etc. so that the participants in these schemes can implement the projects properly after the completion of the project facilities.

c. Target Group

Main target groups for the capacity building development plan are: i) traditional leaders at each community; ii) development committee members; and iii) community people who will participate in the projects.

d. Activity

In consideration of capacity building needs as mentioned above, stage-wise capacity building plan has been planned for the purpose of upliftment of project management skills at central government level, *Inkhundla* level and community level. The capacity building activities will be carried out in the following steps.

Step 1: Establishment of Project Management Unit (PMU)
Step 2: Inkhundla workshops for the project implementation
Step 3: Chiefdom workshops for the project implementation
Step 4: Leadership trainings
Step 5: Technical trainings
Step 6: Monitoring and evaluation workshops

d.1 Establishment of Project Management Unit (PMU)

The existing PPMU will be converted into the Pilot Management Unit (PMU) prior to the implementation of the Master Plan.

d.1.1 PMU Functions

One of the main objectives of the Master Plan is to formulate the well-coordinated organization for successful implementation of the Master Plan among the government agencies, local authorities and community people. The project, therefore, requires a sound management structure to ensure the coordinated delivery of goods and services. For that purpose, the establishment of Project Management Unit (PMU) has been proposed. PMU will be called as the Pilot Project Management Unit (PPMU) at pilot project implementation stage and the Project Management Unit (PMU) at the Master Plan implementation stage.

PMU will act not only as the implementing body for the projects proposed in the Master Plan, but also as the capacity building body for the government agencies staff who will be involved in the Master Plan through in-service training during the implementation of the project. In addition, capacity building activities for local traditional leaders and community people will also be conducted through the training program prepared by the PMU. In the execution of community development activities, participatory approach would be extensively utilized.

a.1.2 Organizational Structure of PMU

Organizational structure for the PMU will basically be the same as the PPMU. The PMU will be led by a Project Manager and will have the project management staff who are in charge of the main tasks of; i) community development; ii) monitoring and evaluation; and iii) technical support.

Under the project management staff, a project coordinator will be assigned in each target area. Project coordinators will be selected from either extension officers or rural development officers (RDO) who are usually stationed at RDA offices relevant to the target areas.

As recommended in the preceding section, there should be two project coordinators for the projects to be conducted in Kukhanyeni area (TA1) so that the eastern part of the area will be covered by Luve RDA and the western part by Ludzeludze RDA. Organizational structure of PMU is depicted in the following figure.

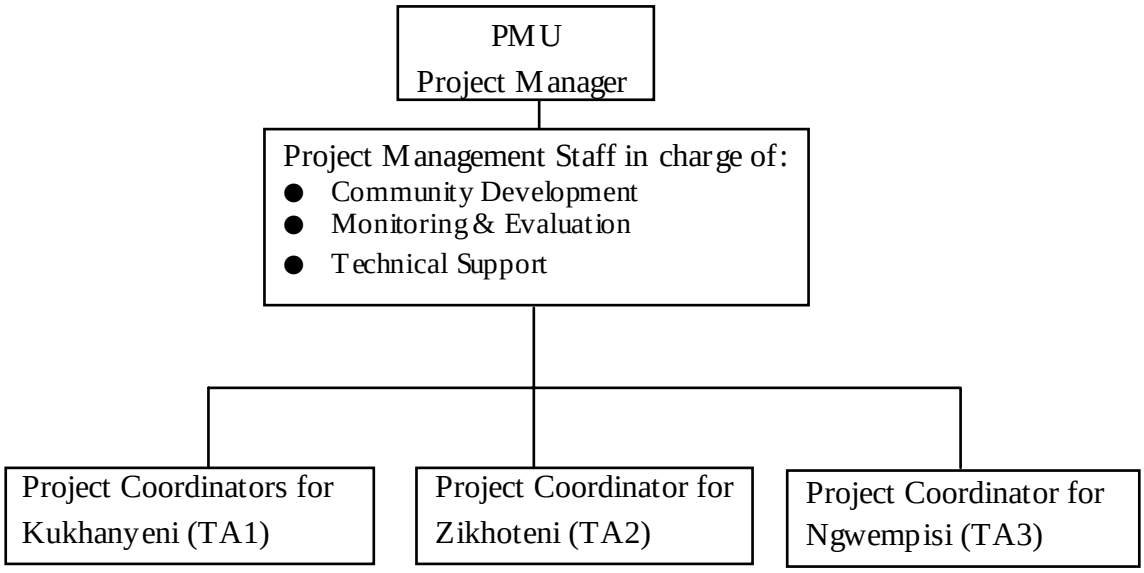


Figure 5-25: Organizational Structure of Project Management Unit

d.1.3 Project Coordinators for Kukhanyeni Area (TA1)

During the implementation of the pilot projects, the project coordinator for Eni & Ngcayini projects was an extension officer of Ludzeludze RDA. In the Master Plan stage, however, the eastern part of Kukhanyeni area will be covered by Luve RDA. It is recommended, therefore, that there should be two coordinators for the projects to be conducted in TA1. These RDAs will be technically supported by the Agriculture office of Manzini region.

d.1.4 Project Coordinator for Shiselweni Area (TA2)

The project coordinator will be the extension officer at Hluti RDA. Due to the fact that this RDA is physically remote from the target area, it is strongly recommended that Shiselweni agriculture office at Nhlangano should extend their support more frequently for this RDA office. In the field of forestry section, there is one forester stationed in this office at Nhlangano, who can provide technical support for the forestry activities such as tree nursery, afforestation and improved fallow.

d.1.5 Project Coordinator for Ngwempisi Area (TA3)

The project coordinator will be the extension officer at Ngwempisi RDA. Some technical staff at Mankayane agriculture office of Manzini region will give technical support for this RDA in the fields of range management, tree nursery, afforestation, improved fallow, improved cooking stove and so on.

d.1.6 Technical Support from Relevant Departments for PMU

Technical support was given by various Departments and Sections within the MOAC during the implementation of the Pilot Projects. For instance, the Forestry Section provided the technical support in the fields of nursery operation, seedlings production and afforestation activities through its organizational structures at the central, regional as well as RDA levels. Department of Livestock and Veterinary Services (DLVS) provided technical support on range management projects through its Manzini regional office. Department of Agriculture

also provided technical support on vegetable production through its Crop Production Unit at Manzini and their RDA offices. Technical support from these agencies should be continued during the course of implementation of the Master Plan.

d.1.7 Community Development Committees for Project Implementation

The establishment of a Community Development Committee (CDC) is indispensable for the implementation of the Master Plan at community level. CDC will be established under the approval and support from chiefdom authority.

CDC will be led by a committee chairperson who will be assisted by a vice chairperson, a secretary, a treasurer, and some other members. Under the CDC, there will be sub-committees in the fields of soil conservation, grazing, feedlot, nursery, afforestation, improved cooking stove, spring protection, and so on. CDCs are sometimes called as the "Umbrella Committee". A list of members of CDCs established in the target areas during the implementation of the pilot projects is presented in Annex H.9.

Although the roles and responsibilities of each CDC and its sub-committees should be discussed in their committee meetings, the outline of its roles and responsibilities is presented below.

The roles and responsibilities of a CDC will be:

(1) Keeping records on the progress of all the projects
(2) Coordination of all the development activities relevant to the Master Plan
(3) The solution of disputes among the stakeholders
(4) Maintaining contacts with government agencies concerned
(5) Selection of users for training when necessary

The roles and responsibilities of Sub-committees are summarized below.

(1) Keeping records on the progress of each project
(2) Maintaining contacts with CDC members
(3) Collection of funds and fees from members
(4) Procurement of materials for operation and maintenance works
(5) Conducting operation and maintenance works
(6) Holding sub-committee meetings when necessary

d.2 *Inkhundla* Workshops for the Project Implementation

At the initial stage of the project, *Inkhundla* workshops will be organized by the PMU in the relevant *Inkhundla* centres.

Main items for discussion will be: i) selection of the projects; ii) selection of project sites; and iii) project implementation schedule.

Participants will be the constituency headman, the member of Parliament, Bucopho members and representatives from each chiefdom.

d.3. Chiefdom Workshops for the Project Implementation

After the *Inkhundla* workshops, chiefdom workshops will be organized by the PMU. Main items for discussion will be: i) selection of the development committee and sub-committee members; ii) listing of the project participants in each project; iii) agreement on work sharing and cost sharing for the project implementation.

Participants will be the chief, indvuna, members of *bandlancane*, a *Bucopho* member and community people who are interested in the project.

d.4. Leadership Training for Community Leaders and Committee Members

At the initial stage of the project implementation, the leadership training will be organized by the PMU.

Leadership training can be categorized into: i) training for traditional leaders; and ii) leadership training for committee members.

Training programme for traditional leaders aims at sensitizing the traditional leadership on the importance of their support on the development activities. Importance of leadership will be emphasized on the issues of conflict resolutions and their roles to unite the whole community in support of development projects.

Leadership training items for the traditional leaders will include the following.

- Background information on the proposed projects
- Importance of support on the development activities
- Traditional leaders' understanding on the projects
- Role of traditional leadership in community development
- Conflict resolution
- Gender issues

Leadership training will also be necessary for the development committee members who will play the pivotal role in the implementation of community projects. Participants will learn: i) how to learn more about working as a team in development projects; ii) how to solve problems; and iii) how to take good decisions.

Leadership training items for the committee members will include the following

- Definition of a leader
- The qualities of a good leader
- Identifying root causes of leadership problems
- Managing relations with traditional authorities
- Establishing accountability
- Holding meeting
- Community mobilization and organization
- Development of plans of operation
- Motivating and working with communities
- Motivating and working with elders
- Making constitutions
- Gender issues

An example of a seminar for the leadership training is presented in Annex H.8. Outline of the leadership training programme conducted during the pilot projects implementation is presented in Annex H.10.

d.5. Technical Training Programme

At the construction stage, the technical training programme will be prepared by the PMU. The participants will be the development committee members, sub-committee members and community people who will participate in the project.

At least three days of training course will be prepared in the fields of soil conservation, range management, forestry, horticulture, etc. during the implementation of the projects. PMU will prepare the training schedule and invite trainers from the relevant agencies. Sub-committee members will contact the participants and will prepare the place for the training course.

Outline of the technical training programme is as follows.

(1) Soil Conservation

Soil conservation training programme will include the components of: i) on-site training on gully training and rill stabilizing; ii) on-site training on contour terracing; and iii) leadership and enlightenment on soil erosion. Particular attention should be placed on the importance of awareness building and sensitization for the community people, including school pupils. Awareness building on the importance of soil conservation will be included as one of the training items for the enlightenment of adults as well as school children.

(2) Range Management

Range management training programme will include the components of: i) leadership training for sub-committee members; ii) range management training; iii) animal fattening and feedlot management; iv) fodder production; and v) dairy management. Refer to Annex C.4.9 for the detailed information on these training items.

(3) Agro-forestry and community forestry

Agro-forestry and community forestry training programme will include the components of: i) nursery management; ii) afforestation; iii) wattle development; iv) agro-forestry; and v) backup services. Backup services include the short international courses for RDA forestry officers. Refer to Annex B for the detailed information on these training items.

(4) Horticulture

Horticulture training items will include the following:

- Planning a vegetable production program.
- Land and seed bed preparation (Demonstration)
- Seedling production
- Agronomic practices and crop management
- General pest management
- Disease control on vegetables
- Variety recommendations for various vegetable crops
- Basic equipment for vegetable production.
- Harvesting and packaging.

Table 5-32: Number of Sessions for Technical Training Programme

Target Area	Training Items	Phase 1	Phase 2	Phase 3	Total
TA1	Soil Conservation	15	6	9	30
	Range Management	9	23	9	41
	Agro-forestry	10	10	10	30
	Horticulture	10	15	20	45
TA2	Soil Conservation	15	6	9	30
	Range Management	7	8	9	24
	Agro-forestry	10	10	10	30
	Horticulture	5	5	5	15
TA3	Soil Conservation	15	3	12	30
	Range Management	12	14	14	40
	Agro-forestry	10	10	10	30
	Horticulture	5	10	10	25
Total		123	120	127	370

Note: 1/ Soil conservation training includes the sub-components of: i) gully training and rill stabilizing; ii) contour terrace; and iii) leadership and enlightenment.
2/ Range management training programme includes the sub-components of: i) leadership training for sub-committee members; ii) fenced rotation; iii) feedlot management; iv) fodder production; and v) dairy management. Refer to Annex C.4.9 for the training needs on range management training programme.

The outline of the technical training programme conducted during the implementation of the pilot projects is presented in Annex H.10.

d.6. Monitoring and Evaluation Workshops

At the mid-point of the project implementation, the monitoring tours and mid-term evaluation workshops will be organized by the PMU to assess the progress and the results of the project implementation. The results of the evaluation will be carefully reviewed and will be reflected on the subsequent stage of the project implementation.

One or two years after the completion of the project facilities, another inter-location tours and the evaluation workshops will be organized by the PMU to assess the progress and results of the project implementation. The projects conducted in other chiefdoms within the same Inkhundla will be mutually visited by the participants to compare one project to another.

Summary of the implementation for the capacity building plan is presented in the following table.

Table 5-33: Summary of Implementation of the Capacity Building Plan

	Phase 1	Phase 2	Phase 3
	2004 – 2009	2010 - 2015	2016 – 2020
Inkhundla Workshops	▬	▬	▬
Chiefdom Workshop	▬▬	▬▬	▬▬
Leadership/Technical Training	▬▬▬	▬▬▬	▬▬▬
Monitoring & Evaluation	▬▬▬▬	▬▬▬▬	▬▬▬▬
Workshops (Nos.)	33	33	33
Technical Training (Nos.)	132	131	136
Chiefdoms in TA1	Eni, Ngcayini, Butfongweni, Nkiliji, Nsenga	Mdayane, Maliyaduma, Bhekinkoshi, Ngwazini, Mkhulamini	Sankolweni, Ntunja, Nyakeni, Swaceni, Mbeka
Chiefdoms in TA2	Zikhoteni	Mabona, Dumenkhungwini	Mchinsweni, Manyandzeni
Chiefdoms in TA3	Macdvulwini, Bhadzeni 2, Velezizweni	Bhadzeni 1, Mahhashini, Dladleni	Lishikishini, Mgazini, Dladleni, Ngcoseni

Note: Refer to Annex H.11 for detailed implementation plan

e. Social and Gender Consideration

Since capacity building development is the component related to every activities, various social and gender impacts could be expected, which have been explained in each field of plans. Here, the overall impacts which could be expected by communal work as general and the effects by trainings will be described.

e.1. Social and Gender Impacts

Strengthening of solidarity among the community: It is expected to strengthen solidarity among the community by implementation of the communal activities proposed in the Master Plan, since 1) frequent discussions among members and with the people from other chiefdoms encountered in the trainings, and 2) learn the efficiency by the work under solidarity. The solidarity created may encourage the community people to proceed other community development activities, which is not limited to soil conservation depending on their needs.

Widening network within/outside of the chiefdom: Widening network within/outside of the chiefdom could widen information to be obtained, not only limited to the information directly related to the each activity. Widening information network means widening choices to find how they improve their lives with their own way.

Improvement of Management skills of development committee: It could expect to sstrengthen the development committee contributes for further community development with respect to negotiating with external donor or calling agencies to ask for other assistance, as well as consulting and facilitating community people.

Empowerment of women: Swazi culture is said to be male-dominated culture. However, as it could be confirmed in the pilot projects, some changes in gender roles, such as involvement of women in decision-making as well as the series of activities, could be happened. Those changes in awareness could be happened not only in female members, but also male members by the accomplished fact through the activities. For example, most of the active participants have been women than men in the pilot projects. In the self-evaluation workshop, 90 % of the presentators who presented their results of activities were women. It shows that women became more active compared to the beginning stage and at same time, male members have also agreed the contribution and efforts of women.

It could be said that the activities have created more access for women to participate in the social activities, and if there are opportunities, they will be great contributors.

Traditionally, there are few women in the decision-making in inner council and in other existing community based organizations, apart from the ones of women focused. However, since women have started to be involved in the decision making process at activity level, those actual situation may have a positive affect to tradition.

e.2. Necessary consideration

In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Selection of member considering gender balance: Half of the development committee members are recommended to be women to have much impact on changes in gender issues. As it was confirmed in the pilot project, providing access to participate to any activities may widen the opportunities of community people to improve their lives, especially relatively vulnerable population like women, and once they start participating, they play great role in the communal activities. Contrarily, the division of tasks should be carefully divided to be equal and agreed among by all participants, regardless of men and women.

Training considering gender and other social issues: Tradition including gender issues as well as other social issues is important to be kept for human beings from one aspect, however part of it might be a factor to hinder development to improve their lives. The issue of the "meaning of cattle" of community people, for example, it should be focused not only in the training for range management committee members, but also in the training for all community, since all of the community people might be potential cattle owners. Further, gender balances are changeable and may create more effective output as it could be expected in community garden activity.

Training on management including chain of command: The issue of disputes which occurs in the community is one of the serious factor for hindrance of development. In order to train the conflict solving skills, the leadership training is included as one of the important components in the Master Plan. Since the effectiveness of leadership training targeting traditional authorities, which included the programme of chain of command have been confirmed to be effective in the pilot project, the continuous training will be indispensable in order to ask for their cooperation.

5.6 Supporting Plans for Implementation of the Proposed Master Plan

5.6.1 Grazing/Range Management Development Plan

a. Objective

The supporting components proposed here include establishment of fodder field nursery, provision of training, advice and extension, draught animal conditioning, water source protection, development of alternative water points, establishment of perennial fodder, herd transfer from range to productive pasture and weed control. These components are selected as supporting activities by the reason that if target area population will try and realize what are suggested here simultaneously with implementation of main components, they can positively support the efforts of undertaking main components of grazing improvement, rangeland development and the effects will be enhanced. Hence, the main objective of the proposed supporting activities resides with provision of complementary practices for making performance of proposed main components.

b. Justification

Creation of fodder field nursery can support cattle holders who want to open fodder plots for obtaining supplemental feed to fatten or maintain their herds, because seed and cuttings are not easily available in procuring material at the beginning of fodder production. As to provision of training, advice and extension, it is self-evident that population in target areas who do not have experience on the proposed new range management acutely need such form of initial support. Development of alternative watering sites is one of the indispensable efforts to complete fenced rotational grazing and feedlot fattening. Because these activities absolutely need water sources but relevant sources are not necessarily found around planned sites. Establishment of perennial fodder bases on existing rangeland can secure feed supply, thus reducing mortality of steers and heifers especially during dry and deficit season. Herd transfer from rangeland to productive pasture can support improvement in grass regeneration and thicker cover owing to reduced grazing pressure on rangeland. Weed control also supports desirable restoration of useful grasses on rangeland by eliminating harmful or useless weed species that are more competitive than palatable and nutritious pasture grasses. The above mentioned supporting components can directly support smooth and efficient implementation of main components through provision of additional tools and subsidiary or appurtenant/ complementary measures.

Conditioning of draught animal does not seem to directly support main components, but this practice brings merit of labour saving to participants in grazing management thus enabling them to orient saved energy to the works for rangeland improvement. Water source protection around springs and sponges has similar role because it can also give indirect support for their users by providing them with sanitary living environment so that they can keep their health and devote themselves to conservation or range management works.

c. Target Groups

The target groups to be included in this supporting plan are the community people in 3 target areas who own the cattle and who do not own the cattle as well.

d. Activities

The common process for each activities under this supporting plan are summarized below.

(1) Holding the discussions with communities where there are shared grazing areas,
(2) Agreements being reached with the community leaders and elders and the soliciting of their explicit support,

(3) Development of infrastructure plans,
(4) Establishment of management structure, institutions, and organizations to oversee the developments,
(5) Development of plans of operation and maintenance and " infrastructure" management plans,
(6) Drafting of by-laws and constitutions as necessary,
(7) Setting up of savings funds for maintenance purposes,
(8) Continuous provision of advices and extension by the government staff, and
(9) Sustained attendance at training by the community people and the imposition of these.

d.1 Establishment of Nursery for Fodder Production

To promote this supporting plan, it is necessary to establish the fodder nurseries to expand the fodder production to meet the requirement according to the proposed grazing/range management development plans. Because, planned amount of production of nutritive fodder will help promote the proposed rotational grazing, inviting the cattle into the fenced areas, where cattle are fed by the fodder for a limited period with the fodder that will be produced with the help of the nursery, then, the cattle are taken back to the ordinary grazing areas on the communal lands, i.e., on the SNL. During this period, i.e., when cattle are kept in the fenced areas, pressure by the cattle on the SNL will be reduced to some extent, and the reduction of the pressure will contribute to recover the grass production on the Swazi Nation Lands, although the contribution is small and slow. In addition to the above, under the proposed rotational grazing, there will be a possibility of selling the cattle that have been fed by the nutritive fodder.

In establishing the fodder nurseries, it is important to pay attention to the procurement of planting material of fodder. In this regard, it is considered that several numbers of field nurseries with a size of about 1.5 ha will be necessary to produce cuttings of such fodder as napier grass (*Pennisetum purpurium*,) and vetiver grass (*Vetiveria zizanioides*,). It is advised to establish grass nurseries near the planned fodder plots, for example near Tinkhundla centers concerned from transport point of view.

For each 1 ha of fodder crop established, there will be a need for 10 000 shoot cuttings – these can be obtained from an area of 0.05 ha (500 m^2, assuming 20 shoot cuttings/m^2). In the case of Vetiver, for each 100 m of line, there will be a need for 2000 tiller shoots – these can be obtained from an area of 0.005 ha (50 m2, assuming 40 tiller shoots/m2). These fodder materials produced in the nurseries should be produced and distributed free of charge to communities and farmers who have plans to utilize the material. Further, as a protective measure, the nursery should be surrounded by goat-proof fencing. Surplus fodder produced from this nursery can be given to farmers living close by in exchange for working in the nursery.

As mentioned earlier, the establishing cost of fodder base can be borne by the beneficiary, judging from result of economic analysis, apart from whether community people recognize this and decide to start fodder production at their expense or not. However, the nursery, quite different from feedlot, hardly makes profit from poor client farmers. Taking it into account, official budget is desirably appropriated to partly cover the cost for establishment of the nurseries.

d.2 Provision of Training, Advice and Extension

Extension Officers who have been trained in range management, forage agronomy and animal production and nutrition should be based at suitable and relevant centres such as the RDA Centres at Luve/Ludzeludze, Hluti and Ngwempisi respectively – it is felt that if these officers are based at the RDAs there is a greater likelihood of them becoming involved than if they are based at the regional centres of Manzini and Nhlangano. The Officers in each case will need to be very active and motivated and preferably experienced if they are to achieve

their objectives. The Officers' extension programmes should aim to include a visit to each grazing scheme/ fodder plot/ fattening unit/ community participating at least once a month, and should allow the Officer to make additional follow up visits as necessary in between the monthly visits. It is anticipated during construction periods, much closer supervision would be needed and some considerable time will need to be spent in the field with the farmers. Notes, such as those used in the training of farmers during the pilot phase for example should be prepared in Seswati and distributed during training and extension sessions. See Annex c.14 on training needs.

The strengthening of livestock and range management extension services would be in keeping with the recommendations of the Swaziland Beef Production, Processing and Marketing Study (Whelan and Associates, 1999) and the draft Livestock Development Policy (1995).

d.3 Alternate Conditioning and Production of Cattle on Fodder Plots

As with dairy production, the feeding of draught animals is not "fattening" as such but does lead to improvement of strength and endurance of draught animals to work and would also lead to a removal of cattle from the rangelands to the improved highly productive fodder crop areas.

The level of feeding required would be merely to allow the animals to feed well on the fodder crop. About three to four oxen could be kept per hectare depending on availability of re-growth – these are being conditioned rather than fattened and are certainly not producing milk, hence there is no need for additional supplements.

Note that this form of use of the fodder plot would be an alternative appropriate use of the fodder plot if there were no cattle ready to be fattened at this time of year (in winter immediately before the ploughing season). The benefit to the oxen is that they would be stronger and able to work faster and for longer each day, thus helping to ensure timely planting of crops – a factor significantly affecting crop yield.

Where these activities occur at established existing beef fattening units farmers should be responsible for payment of the maintenance costs of the unit and feed costs of their draught animals.

d.4 Development of Alternative Watering Sites

At appropriate sites, small "tank dams" should be developed to provide water within the grazing areas to the livestock – this would ensure that livestock do not have to trample over the rangelands along cattle tracks to watering sites. In addition these tank dams could help in catching soil eroded off the slopes, preventing it from entering the river systems and silting them up. Tank dams could vary in size from 25 m^2 to 250 m^2 surface area and be usually no more than about 1 m deep - by being small if the dam wall breaks there will be no serious flood damage and they would be able to make repairs easily. Once silted up, new tank dams should be established as they are effective in catching silt, which would otherwise enter the streams and rivers adversely affecting their flows. If they are chosen so that there is an impervious layer beneath them they will hold water for a reasonable length of time and so allow livestock to drink from them rather than having to trek down the hill every time they want a drink.

In terms of materials all that would be required is a choice of site with a shallow slope and some means of scooping soil from the upslope side (perhaps using an ox-drawn mouldboard plough, community manpower using picks and shovels, tractor drawn disc plough or even a bulldozer) to create a hollow and the material so scooped would be used to form a low dam wall no more than 1 m in height. This wall should be protected using a soil protecting grass such as couch or vetiver.

d.5 Establishment of Perennial Plants on the Rangeland

This component aims to stabilize and enrich top-soils that have already lost its useful plant cover. To materialize this component, rangeland to be treated for rehabilitation is first diagnosed into two cases. In the first case, where land is assessed as too degraded to allow only primary recovery, selected plant species that can thrive over barren rangeland surface are very limited. For such case, only vetiver (*Vetiveria zizanioides*) and couch (*Cynodon dactylon*) that are robust enough as well as tolerant to arid and futile condition can be grown. In the second case, perennial plants can be grown on the wasted crop fields, as is often seen in the crop fields of the communities.

Vetiver Grass

On areas that are badly scalded and eroded, vetiver grass (*Vetiveria zizanioides*) should be planted in lines designed to develop into hedges catching any soil being eroded from further up the slope as well as stabilising the ground locally. Lines as deep as possible should be dug by way of land preparation, fertiliser added to assist in establishment and two slips planted every 10 cm along the line. The slips can be raised at local inkhundla nurseries as proposed in d.1 of this Section, proposed as part of land rehabilitation measures. Ideally a ploughed line would be drawn on the contour as land preparation and a sub-soiler ripper used to shatter any hard pan below the surface. Manure (5 kg N, 4 kg P, 4 kg K per tonne) would make an ideal fertiliser applied at the rate 50 to 75 kg per 100 m line of vetiver, otherwise 10 kg of lime and 4 kg of 2:3:2 (22) (or 3 kg 2:3:2 (38)) compound fertiliser per 100 m line of vetiver - this fertiliser is not necessarily needed but is added to increase the chance of successful establishment. Lines should be planted along the contour at vertical intervals of 1 m elevations on flatter ground and with no more than about 10 to 20 m maximum between contour lines, and at 1 to 2 m elevations on steeper ground and embankments, gully sides, etc. They should generally be kept ungrazed until the hedges are well established and there is the development of plant cover between the vetiver hedges.

The choice of vetiver is made as worldwide (and even in Swaziland) there have been many instances of the successful use of vetiver in soil conservation interventions. Although as yet it is not being promoted in Swaziland it is rather more widely in use in South Africa. Its major beneficial features are that it is perennial, tough and adapted to harsh environments, and is relatively unpalatable. It will form a solid hedge to catch silt whilst allowing water to seep through, and has a strong fibrous rooting system to hold the soil together and obtain water from deep in the profile. It is sterile and will not spread and become a weed species, and, once established, requires little maintenance. Finally, planting material is available in small quantities in Swaziland, and it is very readily and easily available in South Africa, from which to get started.

Since all the proposed works and material can be completed and procured locally by the effort of community people offering voluntary field labor, cost covering by force account can be dispensed.

d.6 Transfer of Livestock from Rangelands to Productive Pasture

The introduction and use of fodder crops have officially been promoted in the Livestock Development Policy (1995) document as it promotes the production of high quality beef cattle that could even be exported as well as relieving grazing pressure on the rangeland. This is because fodder plots are intrinsically more productive than the rangeland and provide more nutritious fodder. Opportunities here suggest to plant fodder on fallow land as this will help to cover the land surface, thus protecting it from soil erosion. Runner type grasses should be encouraged such as *Chloris gayana* (Rhodes grass), *Digitaria eriantha* (Smut's finger grass) rather than tufted grasses like *Eragrostis curvula* (weeping love grass) as these create greater basal cover and hence more protectively functioning. Interested farmers can be targeted and they can use it in three different ways, i.e., as grazing, foggage (deferred or aftermath grazing

often in tethered manner) or cut it as hay. The proposed tethering of livestock would work well on these fodder ground– the site of tethering would be changed at least once if not more times a day and the livestock can eat contentedly, ruminating and depositing their dung directly back onto the field, thus reducing the effects of nutrient transfer as well.

As wider areas are rehabilitated and transformed into established, high yielding perennial fodder fields and as these fields have considerably higher carrying capacities than the rangeland, it will be possible to transfer cattle from the rangeland to these fodder field. In time, the stocking rates on the rangeland will be decreased to the point where they are within the grazing capacity of the rangeland. In this way destocking of the rangeland can be achieved over time. Basically the greater the area of fodder produced the greater will be the level of destocking of the rangeland, provided the rangeland is no more restocked. In terms of materials, requirements will include:

- Farmers' fallow fields/other land allocated
- Fodder seed for planting on farmer's plots
- Establishment and first-year maintenance fertilizer including lime
- Fencing (only where needed in summer).

d.7 Weed Control

The woody weeds that persist and are encroaching into different areas include the Mauritius thorn (*Caesalpinia decapetala*) (*lugagane*), cherry pie (*Lantana camara*) (*bukhwebuletane*), guava (*Psidium guajava*) (*ligwava), Diospyros dichrophylla) (umchafutane),* wattle (*Acacia mearnsii) (umftolo).* The weedy grasses, typically found in overgrazed sites, include *Sporobolus africanus (umsungutane), Eragrostis plana,* annual *Eragrostis spp., Aristida spp.*, couch grass (*Cynodon dactylon) (ngwengwane*) (on more heavily grazed slightly fertile sandy loam soil areas), *Paspalum scobiculatum*. Very limited in the area, but a rapidly growing threat nonetheless, is *Chromolaena odorata* (*wandile*). Other weedy species indicative of poor conditions include the *Aloe* spp. (*inhlaba*) and bracken (especially on acid or acidifying soils) (*Pteridium aquilinum*) *(lihlindzafuka*). The problem with the encroaching trees is that they are encouraged by overgrazing and reduction in vigour of grasses and then once established tend to shade out the grasses, thus starting a vicious circle. The aim should be to target areas where there is a bad weed problem, clear the weeds and then prevent their re-infestation – this may have to go on for a few years.

Government policy is to control local and alien invasive plants. The woody and forb weeds can be controlled by cutting down the plants, making sure whilst doing this that their roots are also removed. Due to expense, chemicals are generally not recommended. In the case of wattle, ownership of woodlots should be established, along with woodlot boundaries and plants encroaching outside these areas removed. A very important part of this activity would be to regularly scout for and remove any new shoots as they start to establish themselves.

For the grasses, these are the unpalatable ones remaining following extensive overgrazing usually over a considerable time period – they are usually hardy pioneer species and they can best be removed or controlled by resting to allow the taller higher succession grasses a chance to set seed and eventually to swamp out the unpalatable ones. The rests in the grazing rotation should be designed to allow for recovery of plant vigour, seeding, and seedling establishment, and with the occasional judicious burn.

In terms of material requirements, all that would be required would be:

- Labour to do the work
- Axes to cut down trees and shrubs
- Mattocks to dig up roots of trees and shrubs
- Prevention of access to areas being rested during the growing season by all livestock.

This clearing practice does not require any substantial cost only if community people offer their field labour and their farming implements like sickles, pangas and slashing bars.

e. Progressive Implementation in Three Target Areas

e.1 Proposed Phasing

Though concrete schedule should be fixed in the sessions of development committee meetings, the following pace and schedule is proposed in the following table.

Table 5-34: Proposed Allocation of Range Supporting Plan initiatives in Target Areas

	2004-2009	2010-2015	2016-2020	Total units
TA1				
1. Fodder nursery	1 per TA			1
2. Allocation of range officers to RDAs	1 per TA RDA			1
3. Small commercial dairy unit		1 dairy unit with fodder plot per TA		1
4. Water source protection	1 per chiefdom	1 per chiefdom	1 per chiefdom	45
5. Tank dams	1 per chiefdom	1 per chiefdom	1 per chiefdom	45
6. Range revegetation	3 plots per TA	3 plots per TA	3 plots per TA	90 ha
7. Pasture plots	3 plots per TA	3 plots per TA	3 plots per TA	18 ha
8. Weed control	10 ha per TA	10 ha per TA	10 ha per TA	30 ha
TA2				
1. Fodder nursery	1 per TA			1
2. Allocation of range officers to RDAs	1 per TA RDA			1
3. Small commercial dairy unit		1 dairy unit with fodder plot per TA		1
4. Water source protection	1 per chiefdom	1 per chiefdom	1 per chiefdom	15
5. Tank dams	1 per chiefdom	1 per chiefdom	1 per chiefdom	15
6. Range revegetation	3 plots per TA	3 plots per TA	3 plots per TA	90 ha
7. Pasture plots	3 plots per TA	3 plots per TA	3 plots per TA	18 ha
8. Weed control	10 ha per TA	10 ha per TA	10 ha per TA	30 ha
TA3				
1. Fodder nursery	1 per TA			1
2. Allocation of range officers to RDAs	1 per TA RDA			1
3. Small commercial dairy unit		1 dairy unit with fodder plot per TA		1
4. Water source protection	1 per chiefdom	1 per chiefdom	1 per chiefdom	30
5. Tank dams	1 per chiefdom	1 per chiefdom	1 per chiefdom	30
6. Range revegetation	3 plots per TA	3 plots per TA	3 plots per TA	90 ha
7. Pasture plots	3 plots per TA	3 plots per TA	3 plots per TA	18 ha
8. Weed control	10 ha per TA	10 ha per TA	10 ha per TA	30 ha
Summary				
1. Fodder nursery	3			3
2. Allocation of range officers to RDAs	3			3
3. Small commercial dairy unit		3		3
4. Water source protection	30	30	30	90
5. Tank dams	30	30	30	90
6. Range revegetation (10 ha each)	9 plots-90 ha	9 plots-90 ha	9 plots-90 ha	27 plots-270 ha
7. Pasture plots (2 ha each)	9 plots-18 ha	9 plots-18 ha	9 plots-18 ha	27 plots-54 ha
8. Weed control	30 ha	30 ha	30 ha	90 ha

e.2 Achievement, Monitoring and Evaluation

The overall aim of these rangeland development proposals has been to improve rangeland grazing condition such that there is an increase in grazing capacity and, therefore, carrying capacity, and to commercialise the production of cattle such that there is an improvement of quality and condition of beasts sold thereby ensuring a greater price paid for the animals, a greater cash income and thus an improvement of the livelihood of the farmers.

The monitoring indicators shown in Table 5-35 can be used to check on progress of development and implementation.

Table 5-35: Supporting plan monitoring indicators for rangeland support activities

Objectively verifiable achievement indicators	Means of verification
Nursery established	Check on nurseries at *Tinkhundla* sites Check productivity and use of nurseries
Range management officers appointed	Check RDA staffing list Check responsible officers' reports
Regular extension programme implemented with an absolute minimum of 12 visits monthly per year per group and covering any support plan initiatives as well as master plan interventions	Extension Officers' reports Community records
Training programme devised and training provided to community management groups on a regular basis	Training programmes Training material prepared Trainers' records Community records
Training material in the local language prepared before training sessions and made available during training sessions	Training material Extension Officers' reports Check post training reports/farmers' evaluation
Small dairy units set up and functional	Check plans of operation Inspect sites Farmer/community records Monitor production, productivity and sales
Water source protection	Check plans of operation Inspect sites and check constructions Community records Officers' records
Tank dam construction	Check plans of operation Inspect sites and check structures Community records Officers' records
Range revegetation	Check plans of operation and implementation Inspect sites and check establishment Community records Officers' records
Pasture plots	Check establishment of plots Check productivity and use of plots Farmer records Officers' records
Weed control	Check range condition before and after initiatives implemented Community records Officers' records

5.6.2 Agro/Community Forestry Development Plan

a. Objective

This plan has dual objective, firstly to increase tree canopy in three TAs for land conservation, secondly to meet acute demand or depleting wood resources particularly that for firewood. The techniques introduced below can support local population to make their environment greener and also to offer material to minimize land degradation that is inevitable in human activities.

b. Justification

Community forestry development plan consists of improved fallow, promotion of alley cropping, creation of windbreaks and shelter-belts, conservation of indigenous fruit trees, support to wattle growers cooperative and conservation of indigenous (species) forest. First two components fall category of agro-forestry (hereinafter abbreviated as AG) practice, where improved fallow can support soil conservation through augmenting vegetative cover on fallow land by means of AG species. Alley cropping, practiced on arable plots, also plant AG species and this can reduce soil loss thereon. Windbreaks and shelter-belts can support soil conservation as they can attenuate wind erosion through planting of trees in line. Conservation of indigenous fruit trees along with that of indigenous forest can also support restoration of vegetative cover over concave topography and existing woods, thereby contributing to soil conservation. Lastly, support to wattle growers cooperative can indirectly support to land conservation by promoting wattle planting on bare, wasted surface. These six sub-components as a whole will support proposed main component activities, for example tree nursery production by sustaining demand for seedlings, community forest plantation by raising concrete objectives and basis of usage.

c. Target Group

Traditional division has ruled out that women in a household usually fetch firewood and consume it in their kitchen. It follows that women sustaining households is targeted so far as firewood supply is concerned. However, many of forestry and agro-forestry activities have function of conserving land and water, and from this point of view it will be necessary to involve men in rural communities. As all Chiefdoms have development committees where all such common activities are dealt, it can be said that the committee be selected as a target group.

d. Activity

The following table summarizes support components of activities in each TA.

Table 5-36: Support components in three TAs

Support component		2004-2009	2010-2015	2016-2020	Total 17yr
TA-1	Improved fallow (ha)	42	50	60	152
	Windbreak (ha)	3.6	3.6	3	10.2
	Live Fence (m)	300	450	675	1425
	Indigenous fruit trees conservation (ha)	2	3	2	7
	Seedlings needed	38,400	39,600	35,400	113,400
TA-2	Improved Fallow (ha)	30	40	50	120
	Windbreak (ha)	1.8	1.8	1.2	4.8
	Live fence (m)	100	150	225	475
	Seedlings needed	18,800	19,200	13,800	51,800
TA-3	Improved fallow (ha)	25	30	35	90
	Indigenous forest conservation (ha)	25	50	150	225

Notes on support component:

1) **Improved fallow**: It is expected that each farmer will have 0.25 ha under improved fallow and that each area will start with 30 farmers per year.
2) **Windbreak**: Some areas are windswept and require windbreaks to protect crop and livestock. A windbreak will be about 3 metres wide and about 2000 metres long making each 0.6 ha. One windbreak can be established per year. Spacing will be 1 metre x 1 metre, making seedlings requirement of approximately 10,000 plants per ha.
3) **Live fence**: This will be important around home compounds and field gardens where perennial crops are normally grown. The live fence is sustainable with minimum repair work.

d.1 Improved fallow

This practice aims at faster recovery of soil fertility on fallow land by planting seedlings of AG species as sources of green manure prior to reusing land for cropping. It is expected that each farm household practices improved fallow on 0.15 ~ 0.25 ha of fallow land and also estimated that the practice begins with 30 farm households per annum. 33 farmers in TA-1, 30 farmers in TA-2 and have so far been sensitized on benefits of improved fallow. Benefits of the technology and establishment procedure has been translated into Swati and distributed to the pilot farmers. Under this plan, more farmers will join in this practice during the M/P period. In TA-2, farmers have already been requesting for seedlings. It is expected that once the initial farmers have grown seedlings currently being grown at Malkerns, more seedlings for improved fallow will be produced by farmers themselves to meet demand of the extra households recruited for the technology. In TA-3, improved fallow technology should be undertaken among the farmers who are interested in increasing soil fertility of their farms. Already sensitization has been undertaken by many farmers and 23 of them have already registered for the initial on-farm trial.

d.2. Alley cropping promotion

Alley cropping is advised to practice on crop (chiefly maize) fields as AG practice, i.e., means of supplying green manure and of minimizing soil loss through runoff. This has not been practiced in TAs, but is advised to increase supply of soil organic matter and nitrogen, of green fodder to livestock especially in dry season.

It will be introduced at community level in Ngcayini, an area where many grass strips have been worked but they are very narrow and in cases totally encroached by cultivation. This practice employs seedlings produced under improved fallow with Government support that has to provide only extension services.

d.3. Windbreaks / Shelterbelts

Target areas are subject to strong southerly gale during dry season that causes wind erosion and even gives damages to roofs etc. Two major windbreaks are proposed for mitigating heavy wind erosion over almost barren rangeland as well as scenery beautification.

One windbreak starts at the top of hill next to the grain store Sankolweni and runs down to Phowe River. The second windbreak starts at the bottom of the hill and runs up to Sigombeni High School. These are generally wind swept area and windbreaks are expected to demonstrate environmental role of this afforestation type. *Cassuarina equistifollia* and also local varieties of avocados (*Persea americana*) could be planted in greening the wind swept area. Appropriate land preparation for planting for each wind break, about 2,000metres by 3 meters will need to be undertaken.

The right photo is a typical case of windswept grazing land in most of the Target Areas which could be improved by planting windbreaks of assortment of tall trees such as *Cassuarina equisetifolia* below and also local avocardo trees which grows quite tall. Wind erosion is a contributing factor to land degradation.

In TA-2, across the stream of Ngwane, a target of protection, there lies a badly windswept grazing land (Mhlabatsini grazeland) in Sivule area. In this area,

planting of a shelterbelt is recommended. Planting will be made along the range to make maximum beneficial impact on crop protection. Tall growing trees are preferred for windbreak because protection distance from the edge of a windbreak is proportional to its height.

d.4. Live Fence

Live fence has such advantages as long-lasting and cost dispensable, serving also as windbreak and sources of herbal medicaments, or edible fruits. This can be most readily applied to school fencing, fodder field or orchard fencing because it provides more robust blockade against invasion of grazing animals and trespassers. Wire fences have frequently been stolen but live fences are hardly subject to theft damages. Live fence has been requested on several fora and the idea behind the concept is those live fences are permanent and can long be sustained. In addition, some wood products can be obtained from live fences. For schools and compounds, the fence provides desirable microclimate in addition to protection of property against grazing. The technology will be concentrated initially in high potential areas in the grazing land and around schools to also function as a wind break.

Currently, a lot of fences are left unrepaired and it is expensive to maintain such dead fences. In practice, trees are felled to provide poles for fence construction and in some other cases considerable amount of wood branches are used in fencing with endless repetition after the wood has decayed. Where a fence has not been established, people spend a lot of time tending livestock. Live fence on the other hand is only costly initially but much cheaper in the long run. Study by ICRAF in Burkina Faso (International Centre for Research in Agro-forestry- annual report 1995) indicates that discounted costs of live fence are about 70 % lower than those of dead fence. In addition, live fence can be made to produce benefits in form of fodder, fruits and firewood. It was noticed that benefits of live fence can be about two and half times the discounted costs, making it financially a very appropriate agro-forestry technology. Therefore, a live fence for cattle kraals and in the fields is a feasible technology, and this may be demonstrated at community level in TA-1 at Eni Chiefdom.

In TA-2, live fence will be undertaken initially in the schools, which have requested for windbreak support from the Forestry Section. Once the technology is introduced, more farmers are expected to apply live fence for their fields.

d.5. Conservation of indigenous fruit trees

The indigenous forest is seriously degraded in most places. Species diversity has considerably been reduced through alien species' invasion and taller stands have been felled for firewood and homestead construction purposes. Natural role of forest in soil erosion control has been diminished and generally the forests are quite unproductive. In many cases they have been invaded by invasive species such as *Lantana camara*, guava (*Psisium guyava*)and mauritius thorn (*Caesalpinia decapetala*).

Field survey indicated that farmers had conserved a few trees in order to sell fruit, especially marula (*Sclerocarya birrea*) in TA-2 and TA-1 served for local wine. In one particular instance, some *Syzygium cordatum* trees (bearing sweet edible fruits) in Ngcayini Chiefdom had been conserved but recent cultivation was encroaching into these protected stands. The project aims at establishing conservation strategy at the site. In addition, other areas of potential development of indigenous fruits in the rest of Target Area will be investigated and developed. The most suitable indigenous fruits (particularly lowveld mangosteen = *Garcinia livingstonii*, sicamore fig = *Ficus sicamorus* wild medlar= *Vangueria infausta* wild mango = *Cordyla africana*) could also be domesticated for household consumption and for income generation. Development of indigenous fruit could minimize malnutrition problem in some scattered cases.

d.6. Support to wattle growers cooperative

There is already a wattle growers' cooperative with about 28 Farmers in Shiselweni. They get wattle timber and bark mainly from farmers in private farms but a few are also from Swazi National Land. The cooperative has difficulties in pricing and marketing of their commodities. Support of the cooperative could lead to more output from farm after overcoming some of the constraints encountered by the cooperative. The cooperative could also be assisted with capacity building for challenging duties by way of training and initial staff development. Currently, the association has a lean staff of one secretary and one clerk.

d.7. Indigenous forest conservation

TA-3 has somewhat different problems than other Target Areas. Some parts of the TA-3 such as Macdvulwini have reasonable amount of wood resources. These wood resources are however not being properly managed so that there is a concern about decrease of these forest in near future. Therefore, there is a need to inject high forestry management standards as well as innovative conservation practices of especially indigenous forest.

To fulfill what is proposed, it is necessary to draft a constitution by which existing indigenous stands can be protected from random cutting and felling. Complementary planting of saplings raised in community or TA nursery is in some cases required to meet the objective. Villagers should be trained how to collect natural seed and how to break their dormancy to use in nurseries for propagating endangered indigenous tree species.

5.6.3 Livelihood Improvement Plan

a. Community Garden

a.1. Objective

The main objective of community garden as one of the supporting plans is summarized below.

(1) To economically support the community people concerned so that they can aggressively as well as continuously take part in the proposed soil conservation projects to be carried out at different places of the communities.

(2) To directly contribute to prevent the community lands from further degradation through implementation of the community garden plan.

a.2. Justification

To implement the community garden plans as one of the supporting plans to achieve the targets included in the proposed M/P may be justified mainly from the following.

(1) It has been proved through implementation of the pilot projects that community garden projects can bring about additional income to the community people by selling vegetables that were produced in the individual plots of the community garden, which makes the community people active as well as strengthens the tie among community people who have participated in the project. This change in the community people will be useful for implementation of the proposed soil conservation projects in the future.

(2) Implementation of the community garden projects directly contributes to the soil conservation, because in the areas where the community garden project is implemented, the land is well treated and planted with vegetables periodically. This activity in the garden directly contributes to the soil conservation, although the areas that can be brought under control may be limited.

(3) Community garden project gives higher income generation compared to other supporting projects. Accordingly, by implementing the soil conservation project, there may be a

possibility of creating a mechanism that utilizes a part of income obtained through implementation of the community garden project for further continuation of the soil conservation activities in the community. This mechanism is important to keep the equitability among the community people who take part in the different kind of supporting plans that have relatively big differences in terms of income; also this mechanism should be expanded as much as possible to attain the important purpose of achieving the participatory implementation of the proposed soil conservation projects.

a.3. Target Group

The possible target groups of the community garden project are all the community people who are interested in the project. However, preferably, people who are interested in the project and who are living within walkable distance to the community garden site should be given the first priority to be selected as the members.

a.4. Activity

In implementation of the community garden projects, following activities will be required by the community people in collaboration with the community development committee, government staff, inviting the NGOs where necessary.

(1) To organize the workshops under the leadership of the community development committee to explain the intension and contents of the projects to the community people. In addition, the following should be discussed and decided in the workshops among the community people.

- Location and size of the community garden.
- Acquisition of the land in consultation with the chief and elders.
- Selection procedures of the members of the community garden.
- Preferable size of the membership.
- Preferable size of a plot owned by a selected member and agricultural crops to be grown.
- Expected roles of the selected members of the community garden project.
- Necessary contribution by the selected members to the projects by money and labor.
- Function and management of the organization to be established under the project.
- Establishment of the rules and constitution to be observed by the selected members.
- Method of participation in the project and obligation of the selected members.
- Basic planning of the community garden, crops to be planted, size of a plot owned by the individually selected members, opening of the bank account etc.

(2) To discuss among the selected members and work out the mechanism that can save the extra benefits, which will be borne by selling the agricultural products produced in the community garden, so that the extra benefits can be utilized as the fund for continuous implementation of the soil conservation projects in the community. It is important to materialize this mechanism with the understanding and cooperation of the selected members. In this regard, the community development committee is requested to guide the selected members in better way.

(3) To undertake implementation of the community garden in collaboration with the members selected and the government staff, inviting NGOs where necessary.

(4) To take care of the completed facilities under the project in collaboration with selected members and community development committee etc.

a.5. Strategy

(1) Implementation of the community garden project should be carried out paying attention to the provision of full explanation of the project to the interested community people prior to its implementation. The contents to be explained should include; 1) nature of the project, 2) selection procedures of the members, 3) obligations of the selected members, 4) organization and rules to be established and observed by the selected members, and 5) necessary contribution by the selected members etc. The said explanation should be made in the workshops under the leadership of the community development committee attended by all the community people including the chief and the elders to obtain mutual understanding of the project among the people.

(2) From the social and gender points of view, it is necessary to avoid jealousy by non-participants in the community garden project as much as possible. Accordingly, it is recommended to include all the stakeholders in the selection process of the members to participate in the project to reach the harmonized consensus among the community people. Further, it is strongly recommended to put certain obligation to the selected members to share their benefits with the community, i.e., to restore some amount of cash as the maintenance fund for continuous implementation of the soil conservation projects in the community. This mechanism is explained in section 5.1.3 of the report.

(3) For successful implementation of the community garden project, horticultural extension staff in RDA and NGO or young volunteers should play role of training and assisting growers with cultivation techniques and procurement of seed and other material.

(4) As to the water resources for irrigation of the community garden, it is recommended to adopt gravity irrigation method, utilizing small streams that are available near the site of the community garden as much as possible, and introduction of pump irrigation method to the community garden should be avoided from the economic point of view as well as from the view point of maintenance of irrigation systems.

a.5. Social and Gender Consideration

Since the community garden activity purely aims to increase income as well as improve the diet at household level by means of vegetable production, it contributes to improve livelihood.

Especially, it is suitable and effective as informal income of women, because 1) women do not need to leave the community to work, 2) it is a labour- intensive work cultivating higher valued crops, and 3) it gives women control to handle cash profited by the garden. Especially having control to use cash may provide great changes in the social status of women. In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Device to avoid jealousy by non-participants: Since the garden may produce vegetables as visible benefits, there are lots of demands for being a member of the community garden. In order to avoid jealousy by non-participants, it is important to include all stakeholders for the selection process to reach to the consensus. Further, it will be recommended to put certain obligation to the selected members to restore their benefit to the community, i.e. restore certain amount of cash to a maintenance fund for soil conservation as communal activity.

b. Water Source Protection

b.1. Objective

Protection of the water source in community area will achieve the following objectives

1) Protect community water source from degradation by erosion and pollution.

2) Effective usage of existing resources.

3) Reduce working loads and time especially for women and children.

b.2. Justification

Through the activities done in the pilot projects, the effectiveness of achievement was confirmed as follows.

1) Protect Community Water Source
Water source was protected by the fence from invasion of other animals, so that the pollution of water does not happen and the quality of water is much safer than before.

Furthermore, because the facility was surrounded by the fence, sense of ownership of the facility was generated and community people start to think that it needs to be maintained properly.

2) Effective usage of existing resources
Community people understood that effective usage of existing resources is important and this will help to maintain environment at the same time. Human and cattle needs to found the way to coexist without damaging the existing environment.

3) Reduce Working Loads and Time
It was found possible to reduce the working loads and time for taking water to their house by providing water tank besides water intake structure. And concrete washing basins were installed so that the ladies can wash clothes without bending their waists. These changes improved their livelihood tremendously especially for women and children.

b.3. Target Group

Target group for this water source protection is the people who utilise the particular water source for their life. Various numbers of people are using those water source depend on the site, but around 20 homesteads are normally utilizing one water source in rural area.

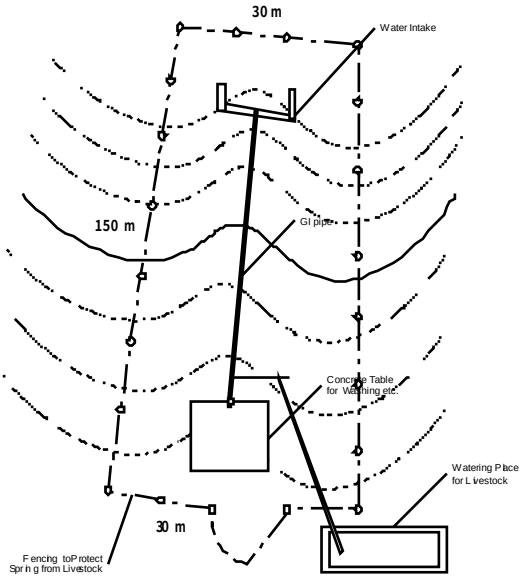
b.4. Activities

Firstly, the fence shall be erected around the water source and these area included within the fencing should ensure that the water remains clean and the wet areas free of trampling and paddling. Secondly, small livestock water troughs to provide water away from the sensitive water points should be established. This will ensure that there is a reduction in cattle tracking to water points.

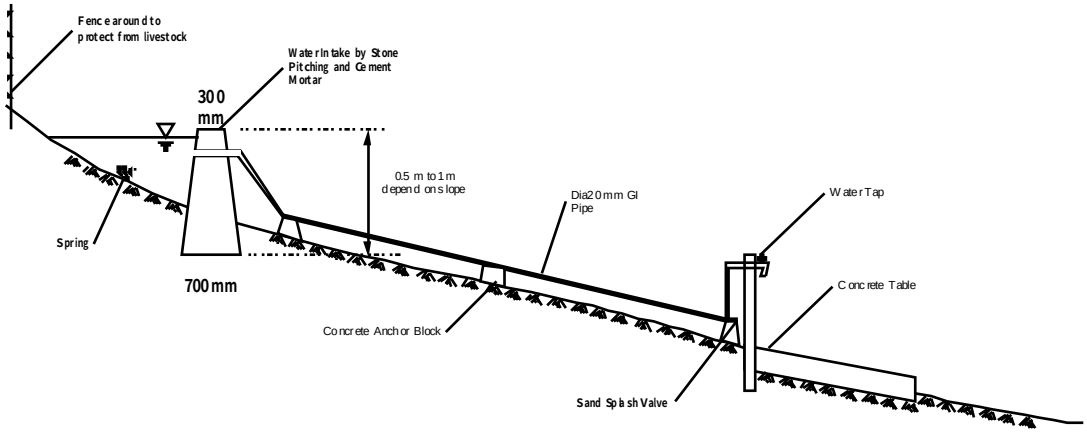
Thirdly, at appropriate places, a sump should be built from bricks and cement from which water is led to a small storage tank and then into a pipe with a tap to a water trough from which livestock can drink and humans can gather fresh clean water. In addition, concrete tables or sinks on or in which washing can be done by women along with a simple shower room might be built (Figure 5-26) to ease the plight of women at having to carry bathing and washing water to homesteads which may be some considerable distance away.

In terms of materials, the fence should be erected using treated straining posts and standards, set in concrete on the corners; goat-proof fencing should be used wherever needed. The

piping should be 13 mm (1/2-inch) piping. Construction should be in brick, cement and concrete and materials whatever available in surroundings.



Plan of Spring Protection



Cross Section of Protection of Spring

Figure 5-26: Schematic Drawing of Protection of Portable Water Supplies

b.4.1. Phased Targets In Three Target Areas

The Waster Source Protection is designed merely to complement the Master Plan's initiatives by encouraging community participation, easing the plight of rural dwellers and in some instances allowing income generation. In order to fulfil these objectives, proposed target was tabulated in Table 5-37 based on one water source protection in one chiefdom in one phase.

Furthermore, extension of activities inside chiefdom will be expected since nature of the work is attractive to the communities.

Table 5-37: Phased Target in each Target Areas

	Phase 1 2004-2009	Phase 2 2010-2015	Phase 3 2016-2020	Total
TA1	15	15	15	45
TA2	5	5	5	15
TA3	10	10	10	30
Total	30	30	30	90

b.4.2. Achievement, Monitoring and Evaluation

The objective of the water source protection project is to secure protected clean water sources established in rangelands near homestead. (Refer to PDM in Annex G.2.6.) The projects also serve to protect some of the rangeland's natural resources. The monitoring indicators shown in Table 5-38 can be used to check on the progress of development and implementation for this project.

Table 5-38: Monitoring indicators for water source protection project

Project	Verification Indicators	Means of verification
Water source protection	• water quality (e.g. coliform) • number of users • average water volume collected by a household • Grass coverage in the fenced area	• Monitoring report by the project coordinator • Community records by the sub-committee members

b.5. Social and Gender Consideration

Through water source management activity, the quality of life will be improved in terms of 1) sanitary water could be also obtained which may reduce water-oriented diseases, 2) burden of women and children will be reduced from fetching water from unequipped water source, and 3) improve the living environment by way of facilities prepared as annexes. In order to ensure the positive impacts, it is recommended to consider the following points in soil conservation project from social and gender perspective.

Device to avoid jealousy by non-selected areas: Since the facilities provided for water source protection is relatively modern for the community people and seems to be attractive in general, it is anticipated that there are lots of demand by several homesteads for installation of these facility. In order to avoid jealousy by un-selected areas, it is important to include all stakeholders for the selection process to reach to the consensus. Further, it will be recommended to be open for utilisation of the facilities made to the neighbours, although it is depending on the relationship among them.

c. Improved Cooking Stove

c.1 Objective

Promotion of improved cooking stove in target areas could achieve the following direct and indirect objectives.

1) Reduction of firewood consumption,
2) Creation of time by reducing cooking time,
3) Improvement of living environment and,
4) Utilise as a tool to promote participation of community people, especially women.

c.2 Justification

Since there are needs to reduce the amount of fuel wood for the purpose of conserving trees as well as reducing expenses on purchasing fuel wood and the burden of fetching them, it is recommended to promote the improved cooking stove. Through activities done in the pilot projects, the effectiveness of achievement was confirmed as follows, and moreover, there are more direct/indirect impacts analysed below.

1) Reduction of firewood consumption: The firewood consumption could be reduced by 40 to 50%. It contributes to improve their lives in various ways, such as reducing saving time for fetching fuel wood, reduce the expenditure for fuel wood, as well as conserving forests from cutting trees for fuels.

2) Creation of time by reducing cooking time: According to the result of the monitoring survey, the cooking time have been reduced by 60% due to 1) Can reduce time needed for fetching fuel wood, and 2) Can cook various food at the same time. The owners can utilise those saved times for working in the community garden, making mats for extra income generation, and so forth.

3) Improvement of living environment: Installation of cooking stove may improve living environment in terms of; 1) avoiding danger from fire inside the kitchen, and 2) modernise the kitchen. The community people can arrange the shape of the stoves depending on their needs and tastes creatively. Modernising kitchen encourages women to have confident that they can improve their lives by their own ability.

4) Motivate people, especially women to be confident to participate in communal work: Analysing the case of the pilot project, participated women have already started to diffuse the cooking stove by their own capacity and some women have organised themselves for next target such as community tourism with taking advantage of the cooking stove committee (TA1). As it could be seen in this example, it could be the chance to motivate the community people, especially women to have confident in themselves, which may be crucial for promoting other communal activities.

c.3 Target Group

Under the concept above, the target group is all homestead, which have interest within the target area, regardless of the location of chiefdoms, especially women. Since it assists a lot to reduce consumption of fuel woods, priority will be set on homesteads in potential deforestation areas.

c.4 Activities

c.4.1. Inputs

The cooking stove which will be promoted does require only the materials which people can collect within their community, such as soil, water, stones and cow dung.

c.4.2. Major Activities

Firstly, the demonstration of the stove will be necessary with training the people those who have interest to construct them in each chiefdom. Since there are some women who gained the skill during the pilot project, it is possible to ask for the demonstration to them. *Secondly*, the cooking stove committee will be organized with the participants who have got the skill of construction and the ones who have interests. *Thirdly*, the committee will diffuse the cooking stove depending on the needs of homesteads within the community. The procedure how to construct the stove is explained in ANNEX F.

c.4.3. Strategy for Diffusion

Improved Cooking Stove will be promoted in two ways. *One* is diffusion under the coordination by the government, home economic section which is in charge of promotion of cooking stove under MOAC. This section could promote the cooking stove under coordination with RDA extension staff with utilising the skilled community women who have gained the skill to construct stoves, starting from potential deforestation areas. In this case, it is required for the government to prepare transportation in order for efficiency.

The other is totally- community-based diffusion. In each TA, there are several women who have gained the skills through the pilot projects. They are already motivated to promote cooking stoves and are promoting them continuously within their chiefdom though the speed of adoption is not fast. These women are key resource persons who are able to be extensionists. The network among three (3) TAs have been started to be built already and Intra-Inkhundla tour held in the end of the pilot projects also contributes to expand the network.

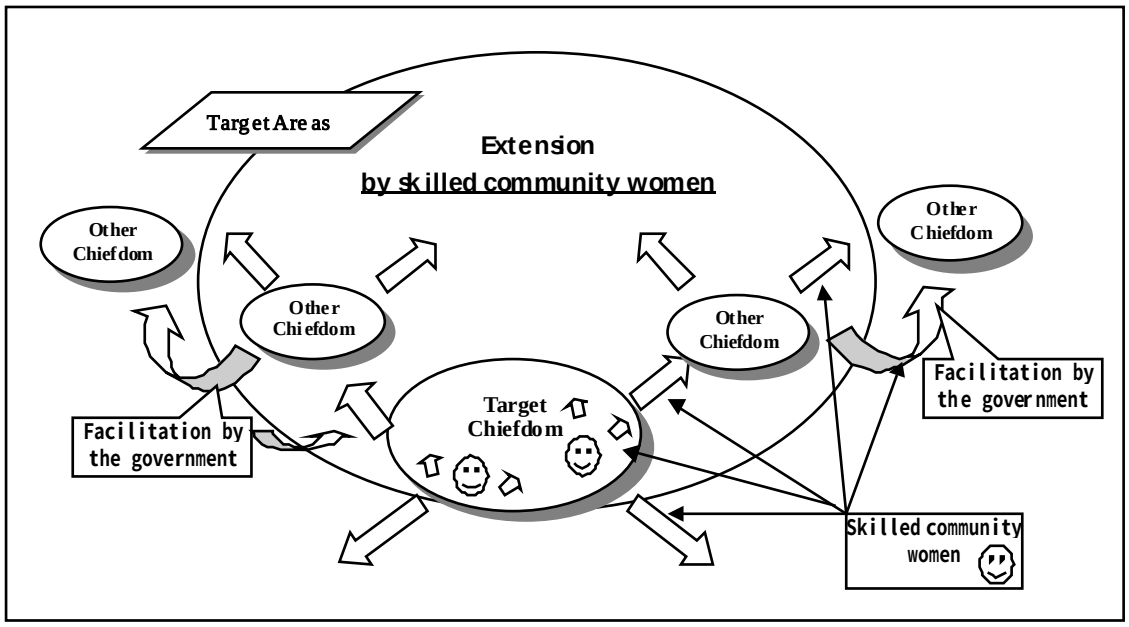


Figure 5-27: Strategy for Diffusion

Since construction of cooking stove does not require any cost, the community people may promote by themselves if there are needs in this way.

c.4.4. Necessary Follow-up

As explained in the former section, it could be diffused by the community people by themselves, however, it would be more effective if there were supports by the government staff in terms of transportation among/outside of chiefdom.

Other support measures for improvement of living environment may also assist to promote cooking stove, such as cooking seminars using the stove, etc.

c.5 Social and Gender Consideration

c.5.1. Expected Social and Gender Impact

All effects which could be obtained through promotion of cooking stove activity are social and gender related impacts, which are explained as justification of the project. The following points could be specified.

Income generation: Since reduction of consumption of fuel wood is expected, reduction of expenses for fuel wood will be expected.

Improvement of living environment: Installation of cooking stove may improve living environment in terms of; 1) avoiding danger from fire inside the kitchen, 2) alleviate backache of women as they do not need to bend down for cooking, and3) modernise the kitchen. The community people can arrange the shape of the stoves depending on their needs and tastes creatively. Modernising kitchen encourages women to have confident that they can improve their lives by their own ability.

Empowerment of women: *Firstly*, since the cooking stove requires 40-50% of firewood than the past, it reduces the burden of women and children who have been fetching firewood. *Secondly*, as the activity creates time by reducing cooking time, it may contribute to widen the range of activities of women. *Thirdly*, analysing the case of the pilot project, participated women have already started to diffuse the cooking stove by their own capacity and some women have organised themselves for next target such as community tourism with taking advantage of the cooking stove committee (TA1). As it could be seen in this example, it could be the chance to motivate the community people, especially women to have confident in themselves, which may be crucial for promoting other communal activities.

c.5.2. Necessary Consideration

The people who do not have proper information on the method of construction of cooking stove may misunderstand to think that it is costly or the method of construction is complicated, and lose the chance to participate in. In order for avoiding these misunderstandings, the proper equal information distribution is necessary by the efforts of cooking stove committee members as well as extension workers by means of demonstration.

As a placement in the Master Plan, since promotion of cooking stove contributes to encourage women to participate in social activities, it is recommendable to include this activity as one of the supporting projects to improve degraded soils.

5.7 Estimated Implementation Cost of the M/P

5.7.1 Unit Cost for Main Components of M/P

In order to work out the implementation cost of the M/P, following unit costs were calculated based on the experiences of the various Pilot Projects. Each unit cost was divided in to two categories which were hard components and soft components. Hard components include such items as materials, tools, equipment and skilled Labours. Soft components include such as design, supervision, community development, project management and so on. The team has utilized NGOs for covering these soft components in the pilot phase but Government can take over those components in order to save implementation cost in the M/P phases.

a. Soil Conservation

Unit Cost of contour terrace is summarized as follows.

Table 5-39: Unit Cost of Contour Terrace

Description		Amount (Emalangeni)	Unit Cost (E/ha)	Unit Cost (US$/ha)
Total Area = 3 ha				
A	Hard Components			
	Fencing	3,000		
	Fertilizer	369		
	Seed	30		
	Hand Tools	1,000		
	Fuel for Dozer	450		
	Water Container	78		
	Pegs and Lime	265		
	Bulldozer	3,000		
	Sub Total	8,192	2,730	350
B	Soft Components			
	Design, Supervision Management	3,808		
	Sub Total	3,808	1,270	163
	Total	12,000	4,000	513

Unit Cost of Gully Training is summarized as follows.

Table 5-40: Unit Cost of Gully Training

Description		Amount (Emalangeni)	Unit Cost (E/site)	Unit Cost (US$/site)
Per location				
A	Hard Components			
	Transport of sand, stone, rock	1,200		
	Cement	1,000		
	Hand Tools	500		
	Builder	2,000		
	Machinery	1,100		
	Sub Total	5,800	5,800	744
B	Soft Components			
	Design, Supervision Management	4,200		

	Sub Total	4,200	4,200	538
	Total	10,000	10,000	1,282

Unit Cost of Rill Stabilizing is summarized as follows.

Table 5-41: Unit Cost of Rill Stabilizing

Description		Amount (Emalangeni)	Unit Cost (E/site)	Unit Cost (US$/site)
Per location				
A	Hard Components			
	Transport of sand, stone, rock	800		
	Hand Tools	200		
	Builder	300		
	Machinery	200		
	Sub Total	1,500	1,500	192
B	Soft Components			
	Design, Supervision Management	1,000		
	Sub Total	1,000	1,000	128
	Total	2,500	2,500	320

b. Grazing / Range Management

Unit Cost of Fenced Rotation Grazing is summarized as follows.

Table 5-42: Unit Cost of Rotation Grazing

Description		Amount (Emalangeni)	Unit Cost (E/ha)	Unit Cost (US$/ha)
Total Area = 200 ha				
A	Hard Components			
	Fencing Materials	102,500		
	Fencing Erections	10,000		
	Others	2,500		
	Sub Total	115,000	575	74
B	Soft Components			
	Planning and preparation	6,500		
	Community Development	3,000		
	Supervision and Management	35,500		
	Sub Total	45,000	225	29
	Total	160,000	800	103

Unit Cost of Feedlot is summarized as follows.

Table 5-43: Unit Cost of Feedlot

Description		Amount (Emalangeni)	Unit Cost (E/Unit)	Unit Cost (US$/Unit)
Per location				
A	Hard Components			
	Fencing	15,000		
	Fodder development	30,000		
	Construction of Structure	20,000		
	Sub Total	65,000	65,000	8,300
B	Soft Components			
	Planning and preparation	3,000		
	Supervision and Management	12,000		
	Sub Total	15,000	15,000	1,900
	Total	80,000	80,000	10,200

c. Agro/Community Forestry

Unit Cost of Forest Nursery is summarized as follows.

Table 5-44: Unit Cost of Forest Nursery

Description		Amount (Emalangeni)	Unit Cost (E/Unit)	Unit Cost (US$/Unit)
Per location				
A	Hard Components			
	Land Preparation	55,000		
	Water Intake	6,000		
	Piping	14,000		
	Water Tank	30,000		
	Buildings	160,000		
	Fencing	8,000		
	Tools and Equipment	40,000		
	Sub Total	313,000	313,000	40,128
B	Soft Components			
	Design	121,000		
	Supervision and Management	92,000		
	Sub Total	213,000	213,000	27,308
	Total	526,000	526,000	67,436

Unit Cost of stony surface reforestation and woodlot development is summarized as follows.

Table 5-45: Unit Cost of Stony Surface Reforestation and Woodlot Development

Description		Amount (Emalangeni)	Unit Cost (E/ha)	Unit Cost (US$/ha)
Total Area = 4 ha				
A	Hard Components			
	Fencing	13,000		
	Eucalyptus Establishment	10,000		
	Trasnportation of Seedlings	7,000		
	Sub Total	30,000	7,500	962

B	Soft Components			
	Supervision	10,000		
	Sub Total	10,000	2,500	320
	Total	40,000	10,000	1,282

Unit Cost of wattle tree management is summarized as follows.

Table 5-46: Unit Cost for Wattle Management

Description		Amount (Emalangeni)	Unit Cost (E/ha)	Unit Cost (US$/ha)
Total Area = 4 ha				
A	Hard Components			
	Fencing	13,000		
	Wattle Tree establishment	4,000		
	Sub Total	17,000	4,250	545
B	Soft Components			
	Supervision	3,000		
	Sub Total	3,000	750	96
	Total	20-000	5,000	641

d. Capacity Building

Unit Cost of capacity building is summarized as follows.

Table 5-47: Unit Cost for Capacity Building

	Description	Unit Cost (E/session)	Unit Cost (US$/session)
A	Hard Components		
	Stationeries	150	19.35
	Projector	64	8.26
	Sub Total	214	27.61
B	Soft Components		
	Refreshment	1,500	192.30
	Sub Total	1,500	192.30
	Total	1,714	219.91

Note: Average participants of 30 persons per training session are assumed.

5.7.2 Calculation of Implementation Cost

a. Phased Quantity

Main Components of the M/P will be implemented in three phases in which phase 1 will be from 2004 to 2009, phase 2 will be from 2010 to 2015 and phase 3 will be from 2016 to 2020. Each quantity in each Target Area will be summarized in the following tables.

Table 5-48: Phased Quantity for Main Components of the M/P

Description	unit	Quantity			
		Phase1	Phase2	Phase3	Total
Soil Conservation					
Contour Terrace	ha	1,869	2,800	4,671	9,340
Gully Training	site	85	75	90	250
Rill Stabilizing	site	31	43	72	146
Grazing Management					
Rotation Grazing	ha	1,375	3,120	2,185	6,680
Feed Lot	nos	4	6	4	14
Grazing Control (Tethering)	ha	490	730	1,240	2,470
Forest Management					
Integrated Nursery	nos	2	0	0	2
Stony Surface Reforestation	ha	20	320	530	1,070
Woodlot Development	ha	95	115	170	380
Wattle Management	ha	110	291	229	630
Capacity Building	session	156	153	160	469

b. Summary of Unit Cost

Unit cost for each component is summarized as follows.

Table 5-49: Summary of Unit Cost

Description	unit	Unit Cost(Emalangeni)		
		Hard Components	Soft Components	Total
Soil Conservation				
Contour Terrace	ha	2,730	1,230	4,000
Gully Training	site	5,800	4,200	10,000
Rill Stabilizing	site	1,500	1,000	2,500
Grazing Management				
Fenced Rotation Grazing	ha	575	225	800
Feedlot	unit	6,500	1,500	8,000
Grazing Control (Tethering)	ha	100	0	100
Forest Management				
Integrated Nursery	unit	313,000	213,000	526,000
Stony Surface Reforestation	ha	7,500	2,500	10,000
Woodlot Development	ha	7,500	2,500	10,000
Wattle Management	ha	4,250	750	5,000
Capacity Building	session	214	1,500	1,714

c. Implementation Cost

Total implementation cost for the M/P will be estimated as follows based on the quantity and unit cost which were presented above. These costs include both hard and soft components to carry out each component of the M/P in a phased manner.

Table 5-50: Total Implementation Cost for the M/P

Description	Implementation Cost (Emalangeni)			
	Phase1 (2004-2009)	Phase2 (2010-2015)	Phase3 (2016-2020)	Total (17years)
Soil Conservation				
Contour Terrace	7,476,000	11,200,000	18,684,000	37,360,000
Gully Training	850,000	750,000	900,000	2,500,000
Rill Stabilizing	77,500	107,500	180,000	365,000
Sub Total	8,403,000	12,057,500	19,764,000	40,225,000
Grazing Management				
Fenced Rotation Grazing	1,100,000	2,496,000	1,748,000	5,344,000
Feedlot	320,000	480,000	320,000	1,120,000
Grazing Control (Tethering)	49,000	73,000	124,000	246,000
Sub Total	1,469,000	3,049,000	2,192,000	6,710,000
Forest Management				
Integrated Nursery	1,052,000	0	0	1,052,000
Stony Surface Reforestation	2,200,000	3,200,000	5,300,000	10,700,000
Woodlot Development	950,000	1,150,000	1,700,000	3,800,000
Wattle Management	550,000	1,455,000	1,145,000	3,150,000
Sub Total	4,752,000	5,805,000	8,145,000	18,702,000
Capacity Building	267,384	262,242	274,240	803,866
Total	14,891,884	21,173,742	30,375,240	66,440,866
(US$)	(1,909,216)	(2,714,582)	(3,894,262)	(8,518,060)

Above implementation cost will be divided by the duration of each phase and annual implementation cost will be calculated as follow.

Table 5-51: Annual Implementation Cost of the M/P

Description	Annual Implementation Cost (Emalangeni)			
	Phase1 (2004-2009)	Phase2 (2010-2015)	Phase3 (2016-2020)	Average (17years)
Soil Conservation	1,401,000	2,010,000	3,953,000	2,366,000
Grazing/Range Management	245,000	508,000	438,000	395,000
Forest Management	792,000	968,000	1,629,000	1,100,000
Capacity Building	44,564	43,707	54,848	47,286
Total	2,481,564	3,528,707	6,074,848	3,908,286
(US$)	(318,000)	(452,000)	(778,000)	(501,000)

5.7.3 Budgetary Arrangement for Implementation of the M/P

It is noted here that no commitments for arranging the budget for implementation of the M/P have been made from any available funding resources including foreign donors. In this connection, it is recommended that MOAC to take earlier actions to find available funding sources necessary for implementation of the M/P.

Table 5-52 summarizes the recurrent expenditure of the Government of Swaziland for fiscal year of 2003.

Table 5-52: Recurrent Expenditure of the Government of Swaziland

(Unit: 1,000 E)

Ministry/Department	Year 2003/2004 (Estimated)	Percentage (%)
Deputy Prime Minister's Office	23,738	0.7
Agriculture and Co-operatives	128,552	3.9
Health and Social Welfare	255,815	7.7
Public Works and Transport	202,083	6.1
Education	703,408	21.2
Other ministries and agencies	1,994,007	60.4
Total Expenditure	**3,307,603**	**100.0**

(Source: Budget Estimates)

Out of which, breakdown of the recurrent expenditure of Ministry of Agriculture and Co-operatives (MOAC) for the fiscal year 2003/2004 is summarized in Table 5-53.

Table 5-53: Recurrent Expenditure of MOAC for the Fiscal Year 2003/2004

(Unit: Emalangeni)

Sections	Year 2003/2004 (Estimated)	Percentage (%)
Minister	917,771	0.7
Administration	8,924,910	6.9
Livestock	50,248,701	39.1
Agriculture Promotion/Extension	39,039,629	30.4
Fisheries	592,592	0.5
Forestry	2,379,409	1.9
Land Development	9,442,180	7.3
Research/Planning	12,173,937	9.5
Home Economics	793,302	0.6
Cooperatives/Marketing	4,038,464	3.1
Total Expenditure	**128,550,895**	**100.0**

The cost for implementation of the proposed M/P is roughly estimated at 65.6 Million Emalangeni (around 8.4 Million US$) for the duration of 17 years. Around 4 million Emalangeni will be necessary to implement the M/P annually, which will be 3 % of the annual expenditure of MOAC in 2003/2004 fiscal year.

5.7.4 Benefit Cost Analysis of Main Projects

a. Basic Assumptions

In order to ascertain the economic and financial viability of the proposed projects, the benefit cost analysis has been made on the main projects such as soil conservation, feedlot fattening, integrated tree nursery, and community garden. The analysis has been undertaken on the basis of the following assumptions.

(1) The exchange rate as of May 2003 has been applied:
US$ 1.00 = 7.81 Emalangeni
(2) Project life has been assumed as 20 years.
(3) Only direct benefits have been quantified for the calculation of the IRR.
(4) Opportunity cost of capital (or discount rate) has been assumed to be 10 %.
(5) Transfer payments such as interest and taxes, and price escalation are not included in the calculation.

b. Summary of the Analysis

The benefit cost calculation of the main projects is summarized in Table 5-54.

Table 5-54: Summary of the Benefit Cost Analysis

Project Component	IRR	B/C	Main Benefits
Community garden	17.9 %	1.13	Sale of the vegetables
Integrated Tree Nursery	4.7 %	0.92	Sale of tree seedlings
Soil Conservation	10.7 %	1.03	i) grazing grass recovery; ii) prevention of dam sediment and gully formation; iii) creating IGA opportunities; iv) improving water conservation
Feedlot Fattening	19.5 %	1.15	Sale of fattened cattle

Note: (1) Refer to Annex G.4 for the detailed calculation sheets.
(2) IRR = Internal Rate of Return; B/C = Benefit cost ratio
(3) Benefit cost analysis has been conducted only for the main projects as it is considerably difficult for other projects (such as water source protection, improved cooking stove, and afforestation) to quantify the benefits.

As presented in the above table, most projects indicate the economic and financial viability as IRR exceeds the opportunity cost of capital (10 %).

Only the integrated tree nursery project indicates the lower IRR It is recommended that the said project should be conducted under support from the Forestry Section of MOAC.

5.8 Strategies for Sustainable Implementation of the Proposed M/P

Implementation of the soil conservation projects in 3 target areas under this M/P have been proposed considering the relatively long period of 17 years, i.e., starting from 2004 and ending in the year of 2020. Judging from past experiences, it may be said that it is difficult for the community people to continuously implement the proposed soil conservation plans with tensions and motivation etc. As a result, it is very important to take the following steps together with community people, who are the majority of the stakeholders.

(1) To formulate further implementation plan of the soil conservation plans in collaboration with the staff of MOAC and community people, invite people belonging to NGOs, where necessary, paying full attention to the existing traditional society, elders etc. in order to obtain full cooperation of different sections of the community. In this sense it is recommended to spend much time for establishing an agreed consensus at the initial stage of project planning between the community people and the government staff.

(2) To undertake jointly the process of planning, implementation, evaluation of the project performance among the community people and the government staff. Namely, the government staff and NGOs are requested to guide the community people in a direction, in which community people can feel that the projects they engage themselves belong to themselves and are responsible themselves for the management of the projects.

(3) For sustainable implementation of the soil conservation projects proposed under this M/P, it is necessary to take both approaches, i.e., leadership by the government staff and a participatory approach inclusive of all the stakeholders for implementation.

Chapter 6

Conclusions and Recommendations

6 Conclusions and Recommendations

6.1 Conclusions

JICA study team started the study on Improvement of Rural Environment in Degraded Land in the Kingdom of Swaziland in late December 2000 based on the S/W agreed upon between the Government of Swaziland and JICA on August 23, 2000. During implementation of the study, efforts by the counterpart personnel of MOAC, community people, NGOs, together with JICA study team were made to work out suitable as well as sustainable countermeasures tackling for improvement of the degraded lands in 3 target areas.

As a result of the said study, the Master Plan (M/P) as proposed in this report has been formulated. The M/P consists of the main components of: 1) Soil Conservation; 2) Grazing and Range Management; 3) Agro/Community Forestry; and 4) Capacity Building Plan, together with the supporting components of : 1) Grazing and Range Management (e.g., Establishment of Improved Pasture,); 2) Agro/Community Forestry (e.g., Improved Fallow); and 3) Livelihood Improvement Plan (e.g., Community Garden Projects as income generation, Water Source Protection ,Improved Cooking Stove Projects).

During the study, some of the proposed projects mentioned above were implemented in 3 target areas as the pilot projects, and proved to be effective for attainment of the targeted objectives. Accordingly, it is hereby concluded that the proposed M/P is considered to be the effective tools as countermeasures for improvement of the degraded lands in 3 target areas, and it should be implemented as early as possible, taking the following recommendations into consideration.

6.2 Recommendations

1. Early Implementation of the M/P

Since the contents of the proposed M/P presented in this report have been prepared taking all the working results that were obtained as a result of co-work with community people, counterpart personnel of MOAC and related governmental agencies, and NGOs, it is recommended that MOAC should decide as early as possible to implement the proposed M/P together with its supporting components.

2. Supporting Activities

It is anticipated that implementation of the main components of the M/P seems difficult to put into practice only through the participatory approach of the stakeholders unless harnessed by supporting activities, since no immediate needs to implement the soil conservation plans are felt by the majority of the stakeholders, while they acutely need income generating activities. This is the main reason why JICA study team considers to implement the proposed M/P coupled with its supporting activities that contain income generating components.

3. Strong Leadership

The proposed M/P should be implemented by the Government of Swaziland as one of the most important public works with strong leadership by MOAC in collaboration with other government agencies concerned and participatory activities by the community people concerned.

4. Assistance and Orientation by the Government

The reasons why soil conservation measures should be taken include the necessity of inheriting productive land to coming generations, the requirement on sustainable land use for

livelihood of current generation. Although MOAC shall play a key role of promoting and supporting soil conservation, it is local population that should take initiative for its implementation as major actors. All the public works ought to be started by the request of the stakeholders, through assistance, cooperation and subsidies by the Government. MOAC and the related government agencies are responsible for education, training, awareness promotion enlightenment, sensitization of organizing the working groups, providing local population with substantial and technical assistance etc., however, it is essential to orient them to the direction until they are disposed of doing soil conservation works for themselves as well as for their descendants.

5. Continuous Capacity Building

Through working together with community people during the study, it has been observed that community people do not concern much the soil conservation in the communities to which they belong. However, it has been observed that change in community people with respect to need of soil conservation has been gradually growing among the community people. This change implies that education and training can foster the stakeholders to acquire more scientific and environmental knowledge and experiences required for better understanding on soil conservation.

6. Controlled Grazing Systems

Though it has been identified through the study that overgrazing continues a major cause of soil erosion, keeping as much cattle herd as possible still remains as traditional behaviour, and very few agree with any reduction of herd size. However, the study to date has revealed that actual carrying capacity on grazing land has steadily been dwindling as herd pressure on grazing land continues to deteriorate grass cover, and this tendency will lead in the future to catastrophic situation after heavy loss of topsoil and subsoil, or grave natural feed crisis for cattle. This means that cattle herds are decreasing regardless of stakeholders' intention. Then, local population cannot but abandon primitive grazing and have to rely on feedlot or other artificial feeding systems. Accordingly, it is recommended that the Government of Swaziland should take action for guiding the community people to the direction of adopting proper range management, for example, rotational fenced grazing as proposed in the M/P.

7. Importance of Transparency and Fairness

The importance of avoiding jealousy is crucial for promoting any community development project in the target areas, since this is the issue which is apt to happen in rural society and causes disputes among them. It could possibly happen both among chiefdoms, and within chiefdom.

For avoiding occurrence of jealousy among chiefdoms, it is essential to hold sufficient explanation by the government on the phase-wise implementation method of the Master Plan, and more discussions on definite planning at Inkhundla level will be inevitable in order to reach consensus. At the same time, the follow-up by Intra-Inkhundla monitoring tour inviting other chiefdoms will be effective to have mutual understanding on the process and effects of the activities which will be started in their communities with widening information network.

At each chiefdom level, keeping transparency and fairness of organisation and activities are inevitable. Frequent regular meetings, discussion for reaching consensus, keeping records of participants and meetings, equal allocation of work and equal distribution of the benefits may assist to keep transparency to support the fairness.

8. Quick Action for Environment Conservation

Current status of land degradation still remains treatable with relevant measures, although whether local population really try to take measures or not is uncertain. Yet, feeble concern on environmental problems prevails throughout African Continent and this is not at all

specific matter in Swaziland. In order to radically rectify this grave situation, a long term tactic will be required including school education, adult sensitization, community training, provision of incentives etc. Recently, a host of legislative efforts have been made in developed world and some developing countries to facilitate environmental care or rehabilitate damaged nature, for fear of emerging untreatable catastrophic state before stakeholders take initiatives. Under these circumstances, it is recommended that the Government of to take a powerful administrative action to further extend what has been achieved in the pilot projects implemented during this study.

9. Recruit of Manpower

Smooth implementation of the proposed M/P needs manpower and further strengthened implementation organizations. During the study, PPMU was established. And PPMU paid very important role not only in implementation of the pilot projects but also in performing the training programs and workshops together with community people in collaboration with other staff of MOAC.

However, since implementation of the proposed M/P will take a long time of 17 years (from the year 2004 through the year 2020), it is necessary to further strengthen the manpower both at MOAC and at the offices of RDA. Based on the experiences obtained through implementation of the pilot projects, it is proposed that at least one administrative officer and two technical officers, in total three offices should be additionally recruited to presently existing PPMU, with this arrangement and providing other additional functions, PPMU will be strengthened into PMU (Project Management Unit), which is the proposed core-organization for implementation of the proposed M/P.

At the same time, it is recommended that a series of trainings with respect to soil conservation should also given to the recruited field officers at the offices of RDAs (Central RDA and Luve RDA in TA1, Hluti RDA in TA2, and Ngwempisi RDA in TA3) so that they can work and act as the locally-located officers who will not only to guide and direct the community people but also work with community people during implementation as well as management of the projects proposed under this M/P. It is expected that this arrangement will contribute to deepen the relationship between the central government and the local authorities during implementation of the proposed M/P.

10. Implementation Priority of the Proposed Master Plan in Case of Insufficient Arrangement of the Budget and Manpower

The proposed master plan has been prepared on the assumptions that the budget and manpower required for implementation of the proposed master plan will be properly managed by the Government of Swaziland. At the same time it is important to implement the proposed phase-wise main projects simultaneously. However, if it is found difficult to arrange such amount of budget, or if it is found difficult to arrange the manpower as proposed in the master plan, in such case, JICA study team recommends that MOAC should start with the proposed Capacity Building Project (targeting at community people) or with the Proposed Forestry Management Project in Phase1 (see Table 4-6) in combination with soil conservation projects, based on the following considerations.

a) The proposed capacity building projects targeting at community people may be implemented with relatively low cost. And implementation of the capacity building project will help accelerate the progress of the proposed soil conservation project.

b) The proposed forestry management project in Phase 1 has the following nature and merits.

(1) The proposed forestry management project in phase1 is scheduled to be implemented in the vicinity of TA2, where a tree nursery was constructed at Zikoteni under the pilot projects during the study. Accordingly, it is expected that tree planting

for the areas specified as phase 1 may be carried out at low cost by utilizing the tree nursery and it will contribute to the soil conservation works in the areas specified as phase1.

(2) Tree planting as forestry management project is well recognized and accepted among the community people. This means that tree planting projects have a possibility of spreading over the wide areas. This function is considered very important to promote the whole soil conservation works in the areas specified as phase 1.

(3) In construction of the tree nursery in TA2, the staff of forestry department of MOAC made useful advices at the construction site also the staff had several chances to discuss with community people in TA2 regarding tree planting etc. In addition to this, the staff conducted training at Malkerns on the management of tree nursery for the selected 10 people in the community of TA2, with the purpose of further utilization of the completed tree nursery in TA2. With these backgrounds it is expected that tree planting in the areas specified as phase 1 may be promoted and expanded through these core people.

(4) Implementation of the range management project in the areas specified as phase 1 is of course very important and indispensable from the view point of promotion of soil conservation works. However, judging from the prevailing social conditions in the communities, quick and smooth implementation of range management projects in the areas specified seems to be difficult compared to the implementation of the proposed forestry management plan in phase 1.

11. Necessary Considerations for Treatment of the Seriously Eroded Areas

The soil conservation plans formulated under the proposed M/P have been prepared putting emphasis on the treatment of the moderately eroded areas as well as the areas which are under initial stage of erosion, from the view point of effectiveness and cost-benefit performance of the soil conservation works. Accordingly, most part of the seriously eroded areas in 3 target areas have been omitted from the targets of the Proposed M/P. However, MOAC should take care of the safety of the houses, farming areas and grazing lands located near the seriously eroded areas. Early implementation of the protection works by MOAC will save these assets and minimize the cost required for the works.

12. Necessary Considerations for the Arrangement of the Budgets

In preparation of any budget required for implementation of the proposed M/P, MOAC is requested to pay attention to the combination of the main plans and supporting plans. For example, combination of only soil conservation plan and grazing management plan will not bring any motivation to the community people, because these works are relatively tough to implement by the community people and they don't bring direct benefits that can be seen directly and in a short time. Experiences obtained through implementation of the pilot projects show that well-combined projects, which take care both for increase in income of the community people as well as contribution to the protection of community environment, are welcomed by the community people and they are well implemented in general. Accordingly, it is recommended that MOAC should consider above-mentioned situation whenever MOAC prepares the budgets required for implementation of the proposed M/P.