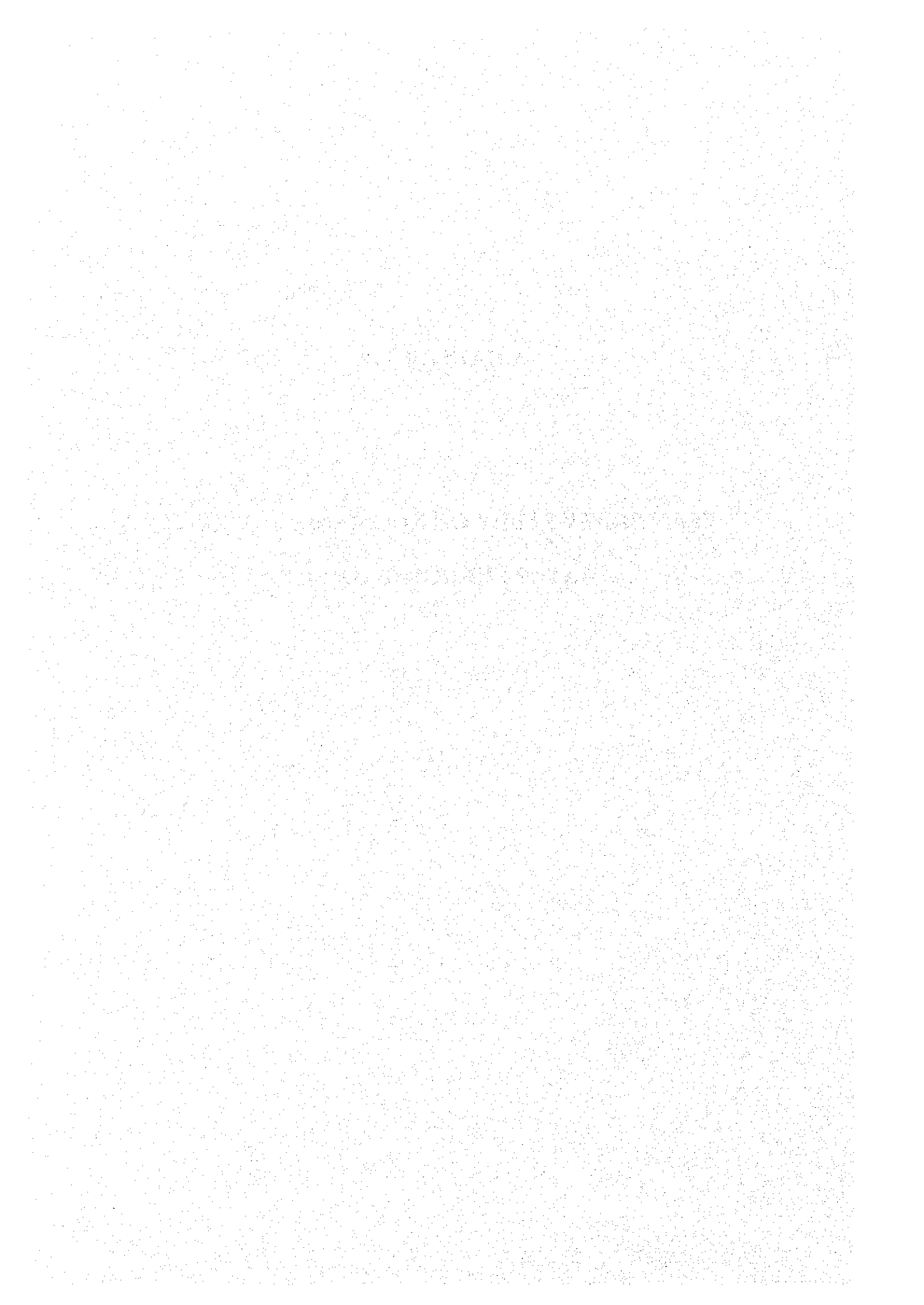


CHAPTER II.

FEASIBILITY STUDY ON NGOMANO/NYANGATI WATER FURROW PROJECT



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CHAPTER II. FEASIBILITY STUDY OF NGOMANO/NYANGATI WATER FURROW PROJECT

2.1 Present Situation of the Area

2.1.1 Introduction

Ngomano/Nyangati Water Furrow Project is Type-C Model Area. This Area is the proposed irrigation schemes, and characterized by a favourable situation with easy accessibility to Area from all weather roads (less than 1.0 km), low construction cost per hectare (less than 13,200 Ksh/ha), and high percentage of horticultural cropping area (more than 70 percent).

2.1.2 Physical Condition

1) Location, Meteorological and Hydrological Conditions

Ngomano/Nyangati Water Furrow Project is in Nyangati location, Mwea division of Kirinyaga district, Central province. It is about 16km southeast of Kerugoya. The scheme extends 4.5 km along the left bank of the Murubara river and up to 1.5 km wide. The gross farm land area of scheme is 381 ha.

The scheme lies in the Upper Midland Agro-Ecological zone, the Maize-Sunflower zone. The Project Area is one of the drier sites with an annual rainfall of about 1,014 mm and evaporation of 2,100 mm. with the long rains from March to May and the short rains from October to November. The temperature is slightly high ranging from a daily minimum of 13.7°C in January to a daily maximum 30.0°C in March. The details of meteorological data observed at Tabere Cotton Research station which is nearest one from the Project Area are shown in Table G.2.2-1, Annex G.2.

The irrigation water source is the Murabara river and its tributary, the Gakuo river. The catchment area located upstream around Kinanga in Gichungu division, upstream from the intake site is only about 25 sq.km. However, as water is transferred via a canal from the Thiba river to the Gakuo river, water is available year round. The location of meteo-hydrological stations near the Project Area and the intake of project is shown in Figure 2.1-1.

2) Topography

The Project is located in a undulating area, on the edge of the Tana river plain, below the south-eastern foothills of Mount Kenya. The elevation of the Project Area is between 1,180 m to 1,250 m. The site is mainly level, with most slopes less than three to five percent. The majority of the potential irrigation area is flat to gently rolling, with a slight fall to the south and south-west.

3) Soil and Land Use

The Nyangati area soils are of two types; moderately deep, friable to firm, reddish brown clay loams (Nitosols) on the upland areas, and deep, imperfectly drained, firm, shrinking and swelling clays,

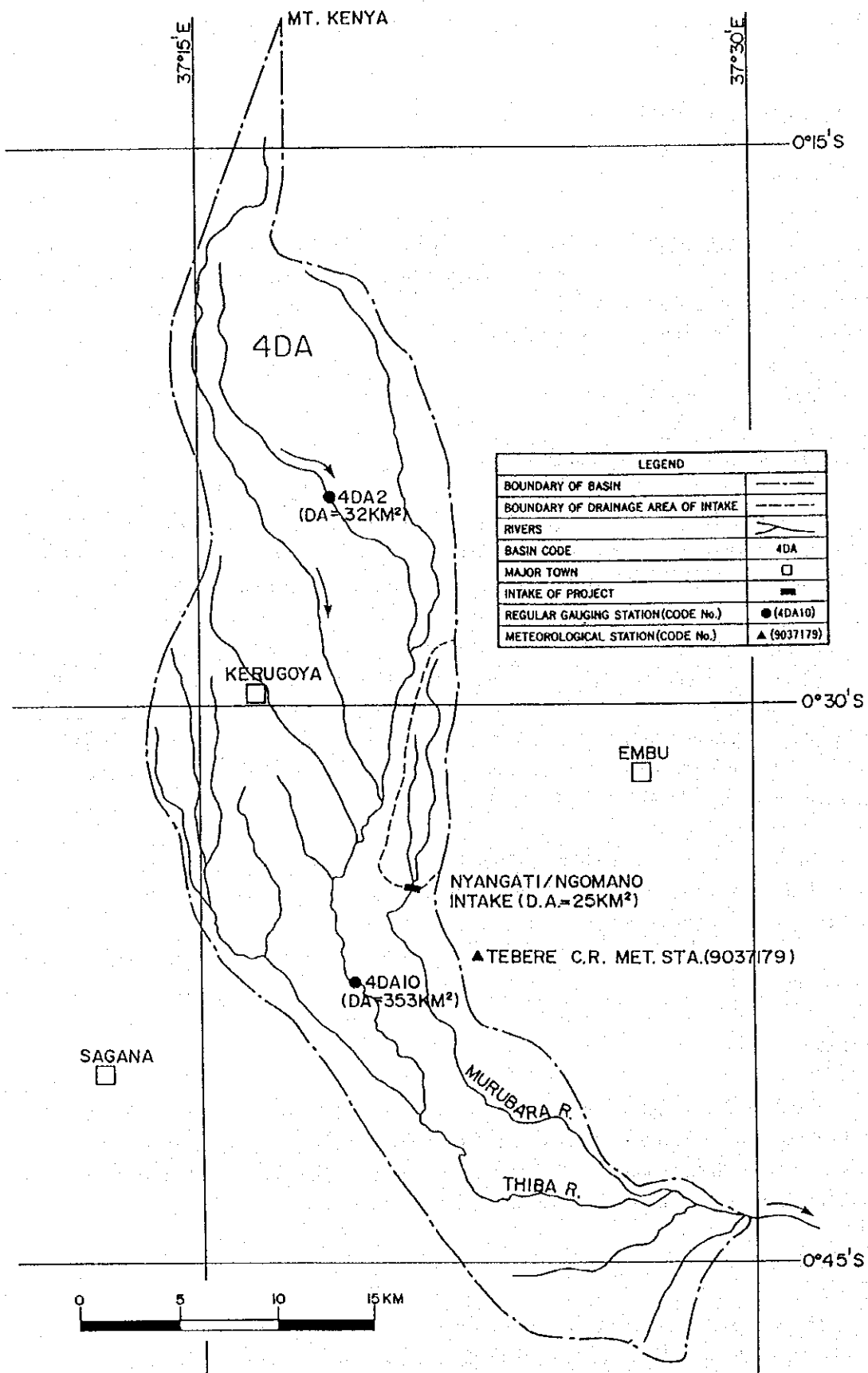


Figure 2.1-1 Location of Meteo-Hydrological Station and Project Intake of Ngomano/Nyangati Water Furrow Project

black cotton soils (Vertisols) in the lower areas. The upland plain area has a mixture of nitosols of variable depth, color and texture, from clay loam through loam to sandy loam. Crop production is extensive on the nitosols, but somewhat precarious because of the lower, less predictable rainfall at this site. A plough pan occurs at 40-70 cm which may be impeding drainage and causing waterlogging. Soil samples were taken and the soil profiles described (see Annex H).

Much of the Project Area is a flat to gently rolling ridge broken up into large open flat fields, with the boundaries, especially around the compounds and along the roads, marked with Lantana and Grevillea. Occasional large mango trees occur in the fields. Currently, 68 families are irrigating about 13 ha.; an expansion to 120 irrigators and 48 irrigated ha. is proposed. Irrigation along the furrow is occurring from the existing functional system. The water is being removed from the canals by a simple temporary diversion, a siphon, or motor driven pumps. The main irrigated cash crops now are French beans, tomato and green maize. Moderately large stands of well tended bananas are common, and the main annual rainfed crops are maize and beans. There are fallow and grazing areas, and both goats and cattle are kept.

2.1.3 Administration, Socio and Farm Economic Conditions

1) Administration and Rural Organization

The administrative context of the Project Area may be specified using the standard Kenyan administrative units as shown below:

Administration of Project Area

Province	District	Division	Location	Sub-Location
Central	Kirinyaga	Mwea	Nyangati	Nyangati

At the district level, community governance including provision of government support services, is structured along the last four administrative units i.e district, division, location and sub-location.

At the district head-quarters, are located the heads of government ministries and departments who include the district commissioner, district agricultural officer, district medical officer of health, district water engineer etc. In turn, most ministries and departments are represented at lower administrative units from the division level down to the location or sub-location level.

The political leadership pattern also generally follows the existing administrative framework. For instance the member of parliament (national legislative organ) represents a constituency whose boundary approximately coincides with that of the division administrative unit. Similarly, the councilor who represents the local community in the district county council (local government) is elected from an area which is almost the same as the location administrative unit.

The district commissioner, who is the head of the "provincial administration," acts as the coordinator of all government supported development activities in the rural areas. He is also the chairman of the District Development Committee, the body responsible for reviewing major development projects whether promoted by government, NGOs or the private sector so long as such projects impact on the public at large. The authority of the provincial administration is projected downwards by the district officer at the divisional level, by the chief at the location level and the sub/assistant chief at the sub-location level.

2) Ethnic Group

Farming people in Ngomano/Nyangati Project Area is the Kikuyu. The Kikuyu which is the largest of 42 ethnic groups in Kenya accounts for about 21 percent, and the same as the Kamba and the Embu in the point of Bantu speaking people. They live mainly in the central part of Kenya and are known as farming ethnic group, and are in the society with the principle of equality that the head of family respected. The head of family of the Kikuyu manages their property such as land, livestock and so on.

3) Population and Farm Household

As there aren't accurate statistics, the population and the number of farm households in Ngomano/Nyangati Project Area were surveyed in parallel with socio-economic data collection by interviewing selected farmers in the prescribed form since June 1998. Population and the number of farms in the Area are estimated by totaling and analyzing the result of the farm economic survey. The total number of farm households in the Area is 200, and population is about 1,300 with average family of 6.6 members. The rate of women forms 48.1 percent. Some 68 farmers out of 200 farm households are the members of irrigation group at present.

4) Farm Economy and Living Conditions

a) Farm Size and Self-Sufficiency of Food

At present, 13 ha has been irrigated in the Project Area. Farm size is 1.5 ha per farm household according to the result of the farm economic survey, which is smaller than 1.86 ha of averaged size in Kirinyaga district. The farms holding title deed account for 42.5 percent which is less than one half of the total households. Agriculture in the area has been diversified compared to other Three Project Areas. Diversified agriculture has been possible due to the good condition for marketing and existence of irrigation facilities. Cooperative society and marketing group have not been established.

Some 51.4 percent of the farm households interviewed in the farm economic survey don't produce enough maize for home consumption on their farms and buy it from market to supplement deficit. They answer that the reasons are water shortage and drought.

b) Farm Household Income

Average annual farm household income is estimated at 58,500 Ksh based on the farm economic survey, which is the highest among the four Project Areas. About 70 percent of the total income came from crop income, 3,100 Ksh and 14,600 Ksh are from animal and off-farm incomes. Off-farm income, which is

one of the important income sources, accounts for about 25 percent of the total income. However it seems that the household income in this area is low accounting 80 percent of that of Kirinyaga district. This is further less than 116,350 Ksh/family/year of Kenyan average.

c) Farm Laour Available

Average farm laours per household is 4.2 persons, 2.2 persons of which are full-time farm laours. The rate of female farm laours occupyes 45.8 percent, which is the lowest among four Project Areas.

d) Living Standard compared with Poverty Line

The poverty line in Kenyan rural areas is estimated at 8,440 Ksh /person /year. Averaged household income in the Project Area is 50,800 Ksh, which is corresponding to 7,696 Ksh/person/year, implying that the living standard of the farmers in the Area is lower than the poverty line.

e) Educational Status

The farm economic survey shows that 50 percent of the head of family graduated from elementary school, 32.5 percent graduated junior high school and 15 percent don't have any education. Therefore, the educational level is not so high. This implies that it is necessary to spend more time to educate and train farmers, which are indispensable for the promotion of irrigated agriculture, and to consider such level in the preparation of training materials.

f) Bylaw of the WUA

The bylaw of the irrigation group was drawn up in 1996. The agreement mentions the penalty to illegal irrigation water use and the rules for farmers, for example cassava and sweet potato must not be grown along the canals. However, it doesn't describe the rule on the water distribution though there exists a tacit understanding on rotation irrigation starting irrigation from downstream, then middle and upstream in that order.

5) Condition of Social Capability

a) Present Conditions of Social Capability

People were settled in the Project Area in the 1950s -1960s from the upper-lying areas of Kirinyaga District. Some of the traditions they brought down with them were the practice of mutual-help groups formed along neighborhood, family or clan basis. Presently, the community takes collective action in a number of non-traditional activities such as building churches, schools and poly-techniques.

Perhaps one of the important non-traditional projects collectively installed by the community is the irrigation water furrow. Along the upper section of the furrow, irrigation is being practiced and a wide range of crops are grown including horticulture. Some members of the project community have, as a result, acquired technical skills in horticultural production.

b) Assessment and Consideration of Present Conditions of Social Capability

Irrigation water does not reach about a third of the members located at the tail end. Although technical reasons were cited (insufficient water, canal leakage), it would appear that inadequate social and organization mechanisms also contributes to this problem.

There is also the problem of the old people, who own and control the use of land, preferring to rent out irrigable land to outsiders rather than giving it to their sons or daughters. The reason for their preference is that they get considerable and immediate cash in advance from outsiders while receipt from a son or daughter will be a little at time. Since horticultural production is predominantly a youth enterprise, this inter-generation contention must be resolved as part of project implementation.

2.1.4 Agricultural Conditions

1) Crop Production

Based on the results of the field survey by the JICA Study Team, and the Farm Survey the total gross cropped area per year in Nyangati is estimated at around 435 ha.

Estimate of Present Crop Production

Crop	Area Rainfed	Area Irrigated	Yield Rainfed	Yield Irrigated	(unit : ha)	
					Production Rainfed (ton)	Production Irrigated (ton)
Maize/beans	212	0	1.5	1.75	319	0
Beans/Maize	211	0	0.25	0.3	53	0
Green Maize	0	9	-	3.5	0	30
Beans	69	1	0.5	0.6	35	1
Coffee	11	0	3.0	-	35	0
Banana	6	0	9.0	-	57	0
S. Potato	1	0	6.0	-	4	0
Cabbage	1	0	8.5	-	5	0
Kale	5	0	10	-	27	0
Fr. Beans	56	9	3.5	4.5	197	39
Tomato	26	5	10	11	267	56
Melon	2.6	0	7.5	-	19	0
Rice	0	5	-	2.5	-	12
Sor./Millet	9	0	0.7	-	7	0
Onion	2.2	0.3	6.5	8	14	2
Other Veggies.	3	0	4.5	-	14	0
Total	406	29				

Source: Farm Economic Survey and Phase III field work

The current cropping intensity is about 114 percent of the gross area. The average farm size is around 1.5 ha. Nyangati is one of the hotter, drier sites with the potential evaporation exceeding rainfall by 1,000 mm, making this a sub-humid, medium potential area for rainfed agriculture, especially in the hotter months such as February. The rainfall and soils in this area are only just adequate. Nyangati is one of the two driest of the four Project Areas, with the main restrictions on crop growth being soil fertility,

waterlogging, and occasional drought. The fields in the area are large and comparatively flat. The main food crop, maize, is grown interplanted with beans. Rice is grown on the valley bottoms along the Murabara river. The existing furrow irrigation system is used to grow a range of vegetables. The main cash and vegetable crops now are French bean, with occasional plots of tomato, onion and kale. The fruit trees found here include paw-paw and bananas near the houses and mango in the open fields.

2) Farming Practices and Input Supply

There are two types of land in the proposed irrigation area, open areas of grazing on the poorly drained lower lands and cultivated fields on the upper areas. The area is dominated by gently rolling ridges and valleys, but on the occasional steeper slope the friable soils are susceptible to erosion. The beans are usually intercropped with the maize. Sweet potato is also grown, often under the young banana plantings. Some sugar cane and pigeon pea occur on small areas. Cotton occurs sporadically on rainfed fields in the area. Occasionally sorghum or cassava is found growing on the edges of the maize fields. Pumpkins are sometimes found near the house, near the midden from the stall fed cattle.

Manure for the vegetables are available from the zero grazed cattle. Because of the location on the main tarmac road to Nairobi and because of the proximity to the Mwea rice scheme, seed and other inputs are usually available in the nearby towns. Both fertilizer and pesticides are being used already on the vegetables, particularly the french bean. The buyers of the french beans are providing the seed to be grown. Access to government extension staff and services is comparatively easy.

3) Animal Husbandry

There are extensive areas of both fallow and rough grazing, plus field weeds and residues are commonly used as forage. Both goats and cattle are found. Napier grass for the dairy cows is grown on the waste areas and along the edge of the canals. The zero grazed cattle are also fed with maize stalks and bean stover. Some cattle are tethered on grazing areas, particularly around and on the vertisol areas. Ox ploughing is common in the area, but tractors are also used. Children are responsible for collecting forage for the animals, and removing manure. Women do the milking. The cattle are mainly improved breeds or crosses. Most farms have a few local hens around the house.

2.1.5 Marketing of Agricultural Product

1) Crops for Local and Export Markets

The crops for cash earning are mainly French beans and local consumed vegetables in this Project Area.

French Bean

This produce are sold to middlemen of exporters at Kimbimbi market as collecting points or road side of the Project Area individually, thus the marketing groups are not existing. Demands on French beans

in EU markets are stable, and Kenyan has the top market share at 30.1 percent in 1996, succeeding Egypt at 29.9 percent, Senegal at 7.9 percent, Morocco 7.8 percent and Ethiopia 5.0 percent). The prices of beans FOB in Kenya fluctuated as shown in the following:

Export Volume and Price Fluctuation of French Beans in Kenya in 1997

Crop/Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fine Bean												
Volume(ton)	585.2	708.1	1042.5	1154.6	1040.4	897.8	777.3	892.9	1015.9	986.4	1098.9	1366.4
Price(Ksh/kg)	100	96	71	90	142	141	134	96	142	180	107	92
Extra Fine Bean												
Volume(ton)	62.7	87.7	136.2	114.7	115.9	312.1	90.1	87.4	126.8	175.8	170.1	127.1
Price(Ksh/kg)	115	100	62	98	103	63	136	(301)*	148	139	130	97

Note : There is possibility of calculation mistake in the figure of extra fine bean in August.

Source : Export produce statistics (draft), HCDA, 1998

French beans can be categorized into two sizes in diameter of pod; fine bean not exceeding 9mm and extra fine bean not exceeding 6mm stipulated in KS01-394 of Kenya Bureau of Standards (KBS). The demands of the size of beans, fine or extra fine, are different by country. The prices can change at double scale in both fine bean and extra fine bean. Lower price season occurs in February to March and August, referring to the statistics in the last 3 years (1994-96), and it frequently happened that middlemen don't pay back to farmers. It is quite needed to provide provision to protect farmers from price fluctuation.

Banana, (Ripe)

Ripe banana of Kampala and Israel varieties are widely planted in the farms. Outflow of this crop is mainly Nyandarua and Nyeri Districts through Kutus Market. This crop has been adversely affected by dry spell, therefore, banana planting is very strategic against drought for food security. Beside the mature suckers can be used to feed livestock for zero-grazing of pigs. The unit price are relatively stable in cheaper side at 10Ksh/kg, so transporting means by group using ox drawn wheel barrows not by automobiles to Kutus market is recommendable. The traders at Kutus Market are interested in large lots at exact time, because they should return to their base after unloading inflow produce to that market such as white irish potatoes.

Mango

In this Project Area, local and Ngowe varieties of mangoes are planted and sold to middlemen, and are very important for cash earning. Mango export from Kenya is increasing following avocado especially destined to Saudi Arabia by sea freight.

Export Volume and Price Fluctuation of Mangoes (all varieties) in Kenya in 1997

Crop/Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Volume(ton)	672.4	554.1	378.6	144.5	23.9	29.0	21.7	11.8	14.2	63.4	368.2	243.1
Price(Ksh/kg)	66	65	43	66	197	228	89	158	99	86	133	77

Source: Export produce statistics (draft), HCDA, 1998

Prices of mangoes drop down during harvest and glut seasons in January to April. In export volume, high season is from October or November to February or March. In the other months, mangoes imported from Brazil, Puerto Rico, Cote d'Ivoire and Mexico are occupied. The strong competitor of Kenya is South Africa in EU (Dutch, French and UK markets), but Kenyan produce is much stronger in Middle East markets due to lower seafreight costs. Most of produce in the Project Area can meet the standard of Class I level. In local surrounding markets including Kutus, Kimbimbi, Wanguru and Manutano makets, the demands for this crop are not so high because most of farmers are planting this crop. It may be recommended to be introduced such as Van Dyke, Apple, Kent, Sabine and Sensation varieties or early maturing varieties instead of local variety mango.

Mango Standard (KS 01-286):

<Class I>

- The mangoes shall be whole, sound and mature.
- The fruits shall be firm and have a stalk of up to 10mm in length.
- They must be free from insect damage and disease.
- They shall be free from unhealed injury and traces of latex or dirt.
- They shall be free from foreign smell and taste.
- The fibre content shall be typical of the variety.
- The conditions of the mangoes must allow them to withstand transport and handling to ensure that they arrive in a satisfactory condition at the point of destination. They must also be typical of the variety in shape and colour.
- They must be free from blemish.

<Class II>

- This class consists of mangoes which do not qualify for Class I but may have the following defects.
- Traces of latex on the skin
- Slight bruising.
- The stalk may be damaged or missing.
- They may slightly deviate from the colour and shape typical of the variety.
- Well healed abrasion covering 10 percent of the surface of the fruit.
- Mechanical damage up to 2 cm².
- The flesh may be moderately fibrous.

Pawpaw

This produce can be mainly sold at town inhabitants at Kutus and Wanguru in Kirinyaga District or other big town. The prices are relatively lower at 8.5Ksh/kg. The long and same harvesting season in the areas can not create market niche. Group loading bound to Nakuru markets taking the road through Nyahururu, not to Nairobi, is recommendable.

Chilli and Capsicum

Fresh chilli has stable demand for export market, relatively lower inputs and enough labour force but farmers sell the produce to middlemen at lower prices. On the other hand, capsicum export is decreasing.

The demands of Tobbas variety chilli planting in this Project Area are stable, but middlemen absorb all benefits caused by price escalation. Because farmers don't have means to get prevailing prices.

Export Volume and Price Fluctuation of Chillies in Kenya in 1997

Crop/Item	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Chilli, Tobbas												
Volume(ton)	93.8	62.8	72.7	89.5	127.6	61.6	85.3	39.1	73.2	84.3	97.1	91.3
Price(Ksh/kg)	56	90	43	48	39	85	55	135	82	102	67	85
Chilli, Long												
Volume(ton)	21.7	15.8	24.7	34.8	45.5	15.4	2.8	20.7	5.4	11.2	3.9	3.2
Price(Ksh/kg)	55	55	55	55	55	55	55	55	45	59	112	124
Chilli, Tin												
Volume(ton)	5.2	3.1	3.0	3.6	67.8	45.9	28.2	26.9	23.1	14.5	6.3	4.1
Price(Ksh/kg)	36	55	55	55	3	11	20	12	43	59	144	147
Chilli, Short												
Volume(ton)	11.7	7.5	6.9	10.0	15.5	24.5	9.6	25.2	14.5	25.3	13.1	11.2
Price(Ksh/kg)	132	120	73	97	69	93	84	95	146	199	143	168

Source : Export produce statistics (draft), HCDA, 1998

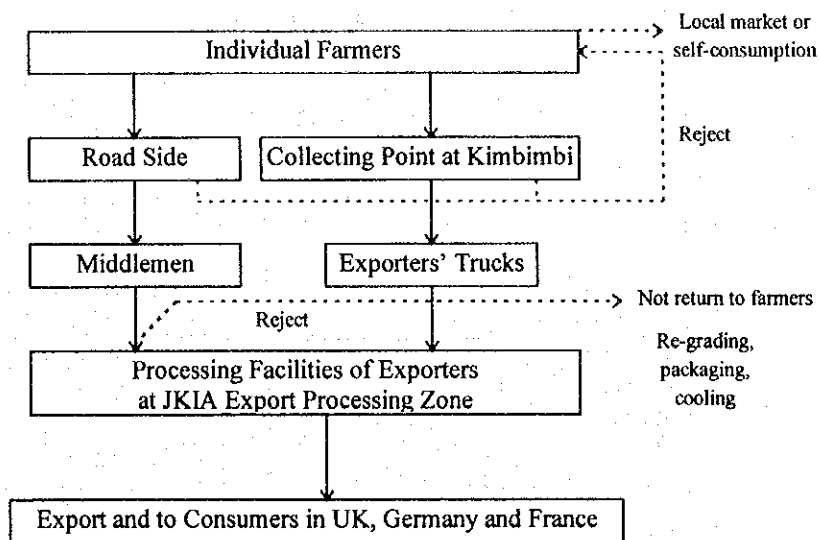
Red Bulb Onion

The price of this produce had been rapidly increasing during heavy rain beginning of 1998. The transport method was missing in main producing area of Nyeri District due to El-Niño phenomenon. Even in Wanguru and Kutus market, this produce become scarce, therefore the produce from Arusha in Tanzania were delivered.

2) Post-Harvest Handling and Marketing Alternatives

French Bean

There are two cases of transaction modes for this produce; to exporters and middlemen. To exporters, the collecting points and day/time are decided at Kimbimbi at 2km distance. The payment can be made only after two weeks. To middlemen, the farmers bring the produce beside of main road under trees, but the collecting day and time are not settled. During low demand seasons in July and August, the middlemen don't come to collect. The serious problem is middlemen wouldn't inform the actual price fluctuation at exporters' facility and grading advises. The rejected produce at exporters' facility will not return to the farmers by the abstract reasons of low level grading, low quality and low price. The farmers can normally get low price at 20-30Ksh/kg compared with the FOB prices at 71-180Ksh/kg in 1997.

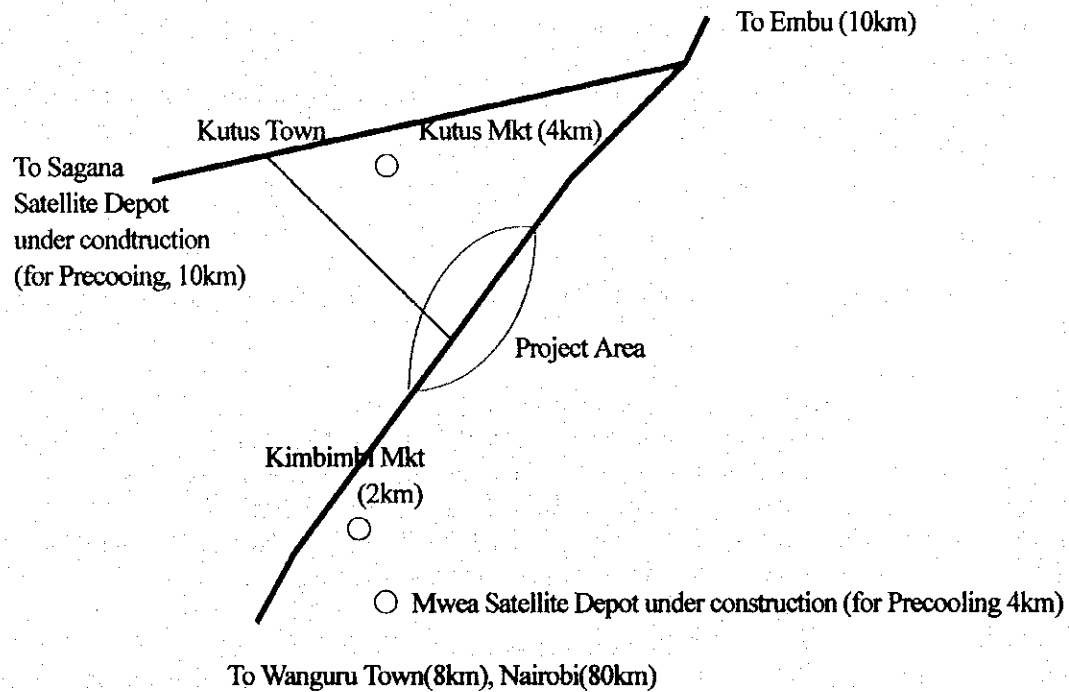


Chilli and Capsicum

The farmers sell these produce to mainly middlemen at roadside. The flow of produce can be referred to the above figure.

Horticultural Crops as Local Consumed Produce

The farmers in Project Area have some marketing alternatives as shown below.



Currently, various transaction modes and place are identified:

Crops	Transaction	Place	Consumer
Ripe Banana (Impala, Israel varieties)	Wholesalers	Kutus Market	mainly to Nyahururu
	Middlemen	at Farm	
Maize, Dolichos bean, Rosecoco bean, Solghum, Pigeon pea, Sweet Potato, Cassava	Retailers	Kutus Market or rarely Kimbimbi Market	Kutus town inhabitants
Sweet melon, Water melon	Wholesalers	Kutus Market	Kutus town inhabitants
	Middlemen	at Farm	Mainly to Nairobi
Mango (Local variety)	Wholesalers or Retailers	Kutus Market	Kutus town inhabitants
Pawpaw	Middlemen	at Farm	Mainly to Nairobi
Chilli for local consumption	Middlemen	at Farm	Mainly to Nairobi
Red bulb onion	Retailers	Kutus Market	Kutus town inhabitants

3) Regional Market Aspects and Produce Trading Status

In Kirinyaga District, markets are widely developed at Kutus, Wanguru, Kagio, Makutano, Baricho, Karaba, Sagana and minor local markets such as Kimbimbi due to relatively improved road network, high population and rich natural resources in productive soils and climate conditions. The facility of Kutus wholesale market is operated and maintained by the Kerugoya Municipal Council and has the largest trading volume in Kirinyaga District which accounted at about 27,200 tonnes per year or 260 tonnes per day, for which figures, there is not any data to state the trading volume, so the Study Team estimated from the Market Gate Fees in the fiscal year 1997/98 collected by the Council.

Estimation of Trading Volume at Kutus Wholesale Market:
 Annual Trading Volume
 = $\Sigma \{ \text{Monthly Collected Fees} (1.19 \text{ million Ksh} \times \text{Collected Ratio} (60\% \text{ from July 1997 to June 1998}) \times \text{Market Fee Rates} (8\text{Ksh}/90\text{kg bag at } 60\% \text{ and } 200\text{Ksh}/5\text{t lorry at } 40\%) = 27,200 \text{ ton/year}$
 Average Daily Trading Volume
 = $27,200 \text{ ton} \div 52 \text{ weeks/year} \div 2 \text{ times/week (on Mondays and Tuesdays)} = 260 \text{ ton/day}$

The price and supply by crop can be summarized as below (the following prices as of in 1997 average):

Arrow Root : High demand. Local produce. 8Ksh/kg.
 Avocado : Local produce and exported. 7Ksh/kg for local consumption.
 Banana, Cooking : Local and inflow produce from western Kenya. 4Ksh/kg.
 Banana, Ripe : High demand. Local produce. Price is increasing. 10Ksh/kg.
 Bean, Canadian Wonder : Local and Inflow produce from Mbeere District and others. 30Ksh/kg.
 Bean, Dolichos : Local produce. High fluctuation and price at 50Ksh/kg.
 Bean, Mwiternania : Same as the above. 25Ksh/kg.
 Bean, Rose Coco : Same as the above. 45Ksh/kg.
 Bean, Soya : Local produce. Low demands now, but the District is promoting this crop due to high nutrition contents. 45Ksh/kg.
 Bean, Wairimu : Local produce. Very high demand. 55Ksh/kg.

Cabbage	: Local produce of Washington navel variety. 10Ksh/kg.
Carrot	: Local produce. During drought four times priced. 15Ksh/kg.
Cowpea	: Local produce and exported a few. During drought double priced. 50percent up from 1996 average. 50Ksh/kg.
French bean	: Local produce and mostly exported. Low demand locally. 20-50Ksh/kg.
Garden Pea	: Local produce. During drought double priced. 35Ksh/kg.
Green gram	: Local produce. During drought triple priced. 75Ksh/kg.
Kale	: Low demand. 7Ksh/kg.
Maize, Dry	: Stable demand. Local and inflow produce even from western Kenya. During drought double priced. 15Ksh/kg.
Maize, Green	: High demand. Local produce. 12Ksh/kg.
Millet, Bulrush	: Low demand. 33Ksh/kg.
Millet, Finger	: Low demand. 30Ksh/kg.
Onion, Red Dry Bulb	: Local and inflow produce from Nyeri District and Arusha, Tanzania. High demand. Irregularly fluctuated at double prices. 28Ksh/kg
Orange	: Inflow produce from Machakos. 15Ksh/kg.
Passion Fruit, Purple	: Local produce for export. 8Ksh/kg.
Passion Fruit, Yellow	: Local produce for local consumption. 4Ksh/kg.
Pawpaw	: Local produce. 9Ksh/kg.
Pigeon Pea	: Low supply seasonally. Inflow produce from Mbeere Distircts. 50Ksh/kg.
Potato, Sweet	: High demand. Local produce. 8Ksh/kg.
Potato, White Irish	: Inflow produce from Nyeri and Nyandarua Districts. Irregularly fluctuated. 10Ksh/kg.
Rice, Pichori	: Local produce. 57Ksh/kg.
Rice, Sindano	: Same as above. 27Ksh/kg.
Sorghum	: Low demand. Inflow produce from Mbeere Distircts. 30Ksh/kg.
Spinach	: Local produce. 8Ksh/kg
Tomato	: Local produce of Cal J. Very fluctuated seasonally at four times. 18Ksh/kg for Grade I, 8Ksh/kg for Grade II and 6Ksh/kg for Grade III.
Tree tomato	: Local produce and for export called Tamarillo. 13Ksh/kg.

4) Farm-to-Market Roads

Accessibility to the Project Area is very attractive for middlemen and exporters. Along the B6 road from the junction of A2 road, Makutano, Wanguru and Kimbimbi markets are located. The Project Area is also connected with Kutus wholesale market by 4km distance unpaved road. The transportation methods used are by ox drawn wheel barrows or *Mataatu*. Since the costs of *Mataatu* are double, group loading by marketing organization is recommendable.

2.1.6 Agricultural Extension Services

1) Institutional Extension Services

a) Ministry of Agriculture (MOA)

Presently the Ministry of Agriculture (MOA) is the main provider of agricultural support services to the Project Area and has deployed technical staff at various administrative levels as illustrated below:

District Level (Kerugoya Town)	Division Level (Wanguru)	Location Level (Kimbimbi)	Sub-location Level (Nyangati)
- 1 x District Agricultural Officer - 12 x Subject matter specialists (extension, irrigation, crops, horticulture, coffee, farm-management, marketing etc)	- 1 x Divisional Agricultural Extension Officer - 8 x Subject matter specialists (horticulture, farm-management, irrigation etc)	- 1 x Location Agricultural Extension Officer	- 1 x Agricultural Extension Assistant

Note: 1) The above staffing situation refers to the Department of Agriculture and does not include personnel belonging to the Departments of Livestock Development and Veterinary Services ;
2) The staffing status can change quite rapidly; e.g at the time of field survey two staff members were transferred from the division level without immediate replacement.

It is at the location and sub-location level where "frontline extension workers" (FEWs) are supposed to make regular contacts with the farming community and transfer improved agricultural technologies. Extension officers located at division and district levels are normally expected to provide back-up support to FEWs in such areas as strategic planning, skills upgrading and performance supervision.

With the completion of the World Bank supported "National Extension Programme (NEP) II", the mobility of extension staff has been severely constrained owing to lack of operational finance and transport facilities. Consequently, individual and group farmer contacts as well as skills upgrading of frontline extension workers has become irregular.

The extension services are, however, currently being drastically re-structured as part of the on-going ASIP (Ref. Proposal on the National Agricultural Livestock Extension Programme, NALEP, "Draft No 3", Ministry of Agriculture April 6, 1998). Among other factors, NALEP will be based on the following:

- Extension to be demand-driven taking due recognition of GOK's policy commitment to liberalization, privatization, and commercialization of the agricultural sector
- Increased involvement of the private sector in providing extension services
- Sharing of extension delivery costs by beneficiary farmers
- Use of participatory approaches in extension (involving main stakeholders in problem diagnosis, planning, appraisal and implementation of agricultural projects)

b) Other Government Agricultural Support Services

Horticultural Crop Development Authority (HCDA)

The Horticultural Development Authority (HCDA) intermittently provides support services to farmers growing horticultural crops in the following areas:

- Horticultural market information
- Grading and quality control demonstrations
- Demonstration on safe use of agricultural chemicals

Some eight and 22 km respectively away from the Project Areas, HCDA is planning to install pre-cooling facilities for export horticultural crops. These facilities are expected to be available to farmers of the Project Area.

Kenya Agricultural Research Institute(KARI)

There is an out-station of Kenya Agricultural Research Institute (KARI), located near Kimbimbi town, some four kilometers from the Project Area, which focuses on cotton research. The Ngomano/Nyangati community however indicated no participation of KARI in provision of support services.

2) Agricultural Extension Services by Private Sector

The Mwea and Kerugoya division, of which the Project Area is a part, is an important horticultural growing area. Hence, a number of private firms, engaged in horticultural export or supply of farm inputs, have been attracted into the area and do provide limited extension services summarized as follows;

Provision of Extension Services by the Private Sector

Category of Private Firm	Type of Extension Services Provided	Examples
Horticultural Export	- Advice on the use of inputs, produce handling, grading and packing	- Homegrown Ltd, Makindu Growers Ltd
Input Distributor	- Field demonstration of input use - Issuing of brochures and leaflets on availability and use of farm in-puts	- Farnchem Ltd
Input stockiest	- Verbal advice on use and handling of farm chemicals	- 30 farm-input stockists located near Project Area at Kimbimbi, Mururi, Wanguru

The private sector is working mainly in the provision of inputs and fertilizer to coffee cooperatives and growers, and the production of French beans. These exporters or their agents supply advice on input use, occasionally provide credit for seed and other inputs, and maintain strict standards of grading and quality control. There are a number of NGOs active in Kirinyaga district, none directly involved in irrigation development at Nyangati however. Various church groups are active in the Project Area, and are potential conduits of extension information.

2.1.7 Agricultural Credit

1) Institutional Credit

The nearest credit facilities is in Kerugoya, 10 km far from the Project Area. However, 80 percent of the farmers interviewed in the farm economic survey does not use institutional credits. The reasons are that agriculture in Ngomano/Nyangati is considerably diversified and any type of cooperative

society which function to intermediate credit service for members, has not been set up and lack of knowledge about credit, anxiety for collateral, no title deed, frail physical condition of banks, high interest and so on.

2) Informal Credit

A few farm households borrow money from private lenders such as relatives and neighbors.

2.1.8 Farmers' Organizations and Their Activities

1) Cooperative Society

There is Nyangati Coffee Cooperative Society operating two factories near the Project Area, and in which a few coffee-growing farmers within the Project Area are shareholders. The Project Area is, however, not ecologically suited for coffee production (high temperatures and low rain fall) and the annual cherry turn-over of the two factories is low.

Nevertheless, the coffee factories maintain stocks of farm chemicals which are available to members on credit or to non-members on cash basis.

2) Water User's Association

A water users association (WUA) of 68 members is already established and registered with the Ministry of Culture and Social Services in the name of Ngomano/Nyangati Water Furrow Project. The main activities of the Water Users' Association are:

- Mobilization of members for repair/reconstruction of the temporary intake, main as well as secondary canals
- Allocation of irrigation water to members
- Collection of membership fee (there are no annual fees)
- Resolving water disputes or complaints on water distribution

The WUA has delegated the above functions to a management committee consisting of a chairman, vice-chairman, secretary, treasurer and six committee members. One of the committee members acts as a water guard whose main duty is to distribute water along the entire length of the canal.

3) Marketing Groups

Apart from the limited coffee that is processed and marketed by two nearby coffee factories, there are at present no arrangements for group marketing of farm produce. Selling of horticultural and other farm produce is effected on an individual basis.

4) Women's Groups

A total of five women's groups were identified as active within the Project Area during the field workshop (Ref. participation/stakeholder analysis). These women groups are engaged in self-help activities aimed at improving their members welfare. The method used in achieving this objective is the "merry-go-round." This implies each member making an equal monthly money contribution which is then given to one member at a time. The money, so raised, is used in assisting an individual member to buy household utensils, construct water tanks or install roofing iron sheets. In addition, group members assist each other during labour peaks that coincide with weeding or harvesting.

5) Other Community Associations/Organizations

There are other loose associations such as youth clubs as well as those based on family or clan affinities. The clan/family based associations are not formally registered but nevertheless serve a useful purpose by providing mutual assistance in situations that require considerable financial expenditure (wedding, school fees) or in case of emergencies (medical bills, funeral expenses).

6) Non-Government Organizations (NGOs)

There are a range of church organizations that operate within the Project Area. Apart from their primarily religious function, some churches (Anglican Church of Kenya and the Catholic Church) do provide their members with advisory services on such topics as house keeping and family hygiene.

There was no evidence of an NGOs undertaking development activities within the Project Area.

2.1.9 Irrigation Water Sources and Water Permit

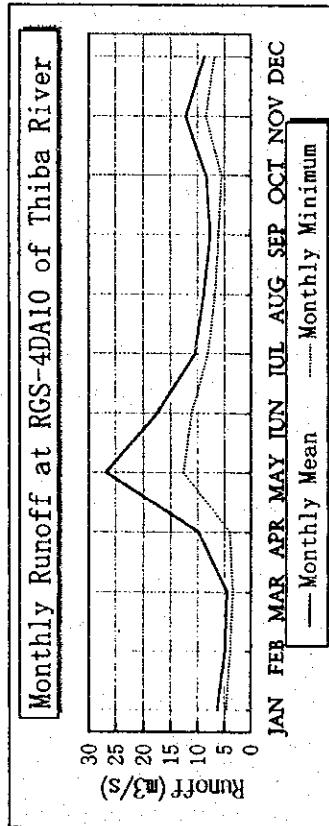
The water source for the Project is the Murabara river and its tributary, the Gakuo river. The temporary intake weir is provided at conjunction point of both rivers. The catchment area at intake site is only 25 sq.km. The river length from the origin to the intake site of scheme is 10 km and the river slope around intake site is 1/70. However, as water is transferred from the Thiba river to the Gakuo river by 0.3 to 0.5 cu.m/sec since 1950's, the water is available year round .

The Thiba river is gauged at RGS-4DA10 with a catchment area of 353 sq.km as shown in Figure 2.1-1. The station has discharge record of 26 years from 1970 to 1996. The high flow occurs two times in May and November and the lowest flow occurs in March over a year. The annual mean flow and low flow are 10.5 and 6.8 cu.m/sec, respectively. The variation of monthly runoff is shown in Table 2.1-1.

The authorization of water permit belongs to MWR. However the scheme has not yet applied the permit. There exist six projects holding water permit in the upper basin of the scheme. The total amount of authorized water is 0.002 cu.m/sec. No water permit exists in the immediately down-stream of the scheme.

Table 2.1-1 Monthly River Runoff at RGS-4DA10 of Thiba River

RGS	YEAR	ITEM	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	ANNUAL
Thiba River (C.A.=353 km ²)															
4DA10	1970-'96	MEAN	6.27	4.90	4.49	9.85	26.85	17.42	10.46	8.84	7.61	8.36	12.23	8.82	10.51
4DA10	1970-'96	MINI	4.74	3.94	3.42	4.02	12.67	11.19	8.15	6.78	6.08	5.54	8.48	6.89	6.82



2.1.10 Irrigation and Drainage

Ngomano/Nyangati Water Furrow Project was initiated by County Council in 1984 with a purpose of irrigation and cattle dip. The irrigation was started in 1985. The scheme adopted an open canal system getting water from the Murubara and Gakuo rivers. When county council abandoned the scheme in 1990, irrigation was suspended until 1995. However, the scheme was reorganized in 1995 due to recognition of profitability of horticulture crops and necessity of job creation to the youth.

The existing temporary weir and gravity intake structure are located on the midstream portion of the Murubara river in a medium sized valley, at the confluence where it joins with the Gakuo river which carries water diverted from the Thiba river. The main distribution canal leading to the irrigation furrows splits at some one kilometer distance after this intake. The project is split into two by the Nairobi-Embu road. One branch of the canal goes in a small culvert under this tarmac road, and the other stays on the west side of the road and runs down to the south as illustrated in Figure 2.1-2.

The scheme extends about 4.5 km long from north to south, however two branch canals exhaust the contained water after running more two kilometer from their diversion point due to heavy seepage from earth canal. Consequently, irrigation water does not reach to the lower part of area.

The gross area of scheme is 381 ha in 115 farm plots. The irrigated area by the existing canal system is estimated at about 40 ha in 50 farm plots. Though the scheme employs one water guard, scheduled irrigation is not planned, and the recognition on necessity of water management is still in low level within the members. More intensive extension service for effective water management shall be provided for farmers.

The reasons of water shortage at the downstream area are as follows;

- Diverted water amount at intake site is not sufficient due to low reliability of existing temporary weir
- Difficulty of water diversion in the canal system due to lack of permanent diversion facility
- Lack of knowledge of the WUA on water management due to weak extension service.

The irrigated crops were tomatoes, French beans, maize, kale etc. and furrow irrigation is adopted with 12 hours operation time per day and six days irrigation interval.

As a part of irrigation area is so flat to develop natural drains, the areas suffered from excess water caused by intensive rainfall during the rainy season. To eliminate of crop damage from inundation, some drainage facilities shall be provided.

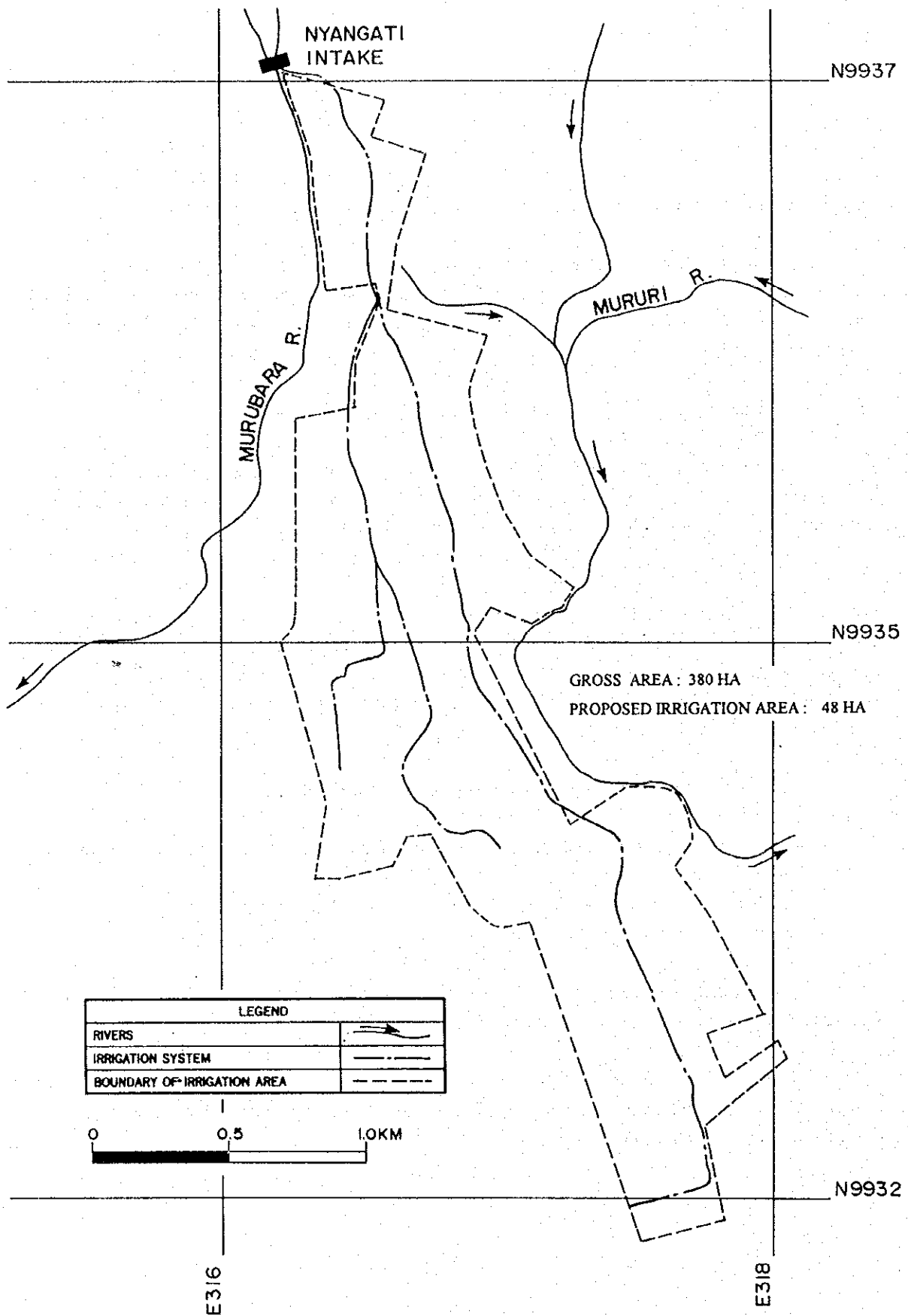


Figure 2.1-2 Irrigation Area of Ngomano/Nyangati Water Furrow Project

2.1.11 Agriculture and Rural Infrastructure Conditions

1) Irrigation and Drainage

Present irrigation water supply system is an open canal system tapping water from Murubara river. The irrigation system was initially built by county council with different intake site, a few km upstream of Murubara river, then after some years operation initial intake site was replaced to the present location due to insufficient water flow at the original intake point and much seepage losses from delivery earth canal. The system is now functioning and fairly operated with 66 member households even though the lower reach of the canal is still suffering from shortage of irrigation water.

Major facilities of the system are a temporary intake weir, earth canal line and pipe culverts. No other structures are observed such as intake box and division structures.

Intake facility is temporary wooden weir crossing steep Murubara river which is washed away by floods two to three times during rainy season every year. There is no intake box, therefore flood water also comes into the canal directly which is the cause of canal erosion and siltation. Riverbed rocks are not observed at intake site.

Irrigation canals with a total length of around eight kilometer are all earth canal. Canals are so long that irrigation water could not reach to the lower reach of the canal. Conflicts occur sometimes regarding water distribution. There are several pipe culverts crossing roads and footpath. In the canal distribution system, division structures which are necessary for effective water distribution operation are not observed at turn-out points. Inlet structures to farm plots are also not seen in whole canal line. Farmers take water to their plots by cutting canal bank together with making temporary weir using grass and soil. Irrigation method at on-farm level is furrow irrigation.

There is a water users association named Ngomano/Nyangati Water Furrow Association with 66 members for operation and maintenance (O&M) of the irrigation system. All members have to pay 20 ksh per month as an O&M fee. Major O&M activities are reconstruction of temporary intake weir when washed away by floods and cleaning of the canal.

2) Domestic Water Supply

There is no piped water system in the Project Area, hence inhabitants take water for domestic use from springs, shallow wells, streams and canals.

There are four springs in the Project Area being used as a major source of domestic water. Quantity of spring water at each spring is not big, but would be sufficient for domestic use by neighboring people. One spring located near the Nyangati primary school is used by the school. They have never dried up according to the inhabitants. Three shallow wells built in 1980 and 1981 exist in the Project Area and they are owned by individual household. Shallow wells are open dug well type with around 5.5 m in depth and 1.0 m in diameter. The top of dug wells is sealed with a concrete frame and steel cover to protect wells from rain water and locked for safety.

Most inhabitants are taking domestic water from springs, however those who are residing far from springs take water from streams or canals occasionally or permanently.

3) Rural Roads

Since B6 tarmac road (national trunk road) is crossing the centre of Project Area, access is very convenient. The B6 road is in good condition with gentle slope tarmac surface maintained by MPWH.

Village/farm roads in the Area are also generally in fair condition as the Area is very gentle sloping topographic condition. Roads are all with earth surface with 4.5 to 6.0 m in road width. Village roads are owned by Kirinyaga County Council which is responsible for O&M. However actual road maintenance has been carried out by community as needed or as arranged by Assistant Chief of Sub-Location.

4) Rural Electrification

There is no electric power supply in the Project Area. Nearest existing power line is located at Kimbimbi, two kilometers, south from the Project Area, which is operated by Kenya Power & Lighting Company.

5) Public Health

Kimbimbi health centre, two kilometers from the Project Area, is the nearest public medical facility where a clinic officer and several nurses are stationed. When further medical treatment is required, inhabitants have to go to Kerugoya district hospital (19 km) or Embu provincial hospital (16 km).

6) Education

Nyangati primary school is located in the centre of the Project Area. There are 427 pupils and 16 teachers for standard 1 to 8, and school attendant rate is around 85 percent. There is no secondary school in the Area and around 30 percent children go to vicinity secondary schools either Karoti girls secondary school or Moya boys secondary school or Kutus secondary school. Other than the formal education, Nyangati Youth Polytechnics is also in the Area with 30 students and 6 teachers.

2.1.12 Post-Harvest and Rural -Agro-Industry

1) Post-Harvest

The losses for local consumed produce are 10-30 percent in quantity and 10-20 percent in quality, which are comparatively lower. For export produce, the losses are estimated at 30-60 percent in quantity and quantity due to current unavailability for cooling facility, poor grading techniques, lack of timely price information and seed quality.

2) Rural Agro-Industry

In Mwea division, rice mill factories owned stocks by National Irrigation Board are located. But there is no rice planting in the Project Area because of little higher altitude than Mwea irrigation Project Areas.

2.1.13 Rural Environment and Public Health

1) Natural Conditions

The water source of the Project Area is Murubara River. Farmlands are spread and there is no natural vegetation in the catchment area and in the Project Area. There is no forest around the Project Area and farmers are growing trees for firewood in their farmlands. Damages of crops by wildlife in the Project Area does not occur as there are no nearby game reserves and the Project Area is surrounded by another farmlands.

Generally, river fishery is not important in this area, though some fish species such as *Micropterus salmoides* (black bass), *Oreochromis* spp. (tilapia), *Clarias* spp. (cat fish), and *salmo gairdneri* (rainbow trout) are expected to inhabit in the Murubara River.

The land slope is gentle; less than one percent around the church where the PCM was carried out and about eight percent at the comparatively steep slope area.

2) Health and Sanitary Conditions

As for the drinking water, 35 percent of households use the furrow water at an average distance of 439 m and 22 percent use some springs at an average distance of 222 m. Details are shown below.

Sources of Drinking Water in Ngomano/Nyangati Water Furrow Project

Source of Water	Households (%)		
	July 1998	Dry Season	Rainy Season
Furrow	35	19	16
Spring	22	27	11
River	18	35	19
Shallow Well	13	14	9
Roof Catchment	7	0	40
Borehole	5	5	5

Source: EIA Survey, July 1998

The water quality of Murubara River and three wells in the Project Area are over the standard for drinking water on some parameters as summarized below. Details of the water quality analysis are shown in Table T.2-2, Annex T.

Summary of the Water Quality Analysis

	Standard	Murubara River		D-well	S-well	O-well	Spring
		Intake	7.5km Downstream				
BOD (mg/l)	< 1	2.0	3.0	3.0	2.0	4.0	1.5
NO ₃ ⁻ (mg/l)	<10	6.0	7.3	39	53.2	8.0	8.6
CaCO ₃ (mg/l)	<15	15	20	90	85	25	20
E. Coli. /250 ml	-	+	+	+	+	n.a.	n.a.

D-well : Deep well, S-well: Shallow well, O-well: Open well similar to a spring

n.a. : Not analyzed

Source : EIA Survey, July 1998

As for the construction material of house, all houses have corrugated iron sheet roof although many households rely on mud as the common material for the wall and floors. All households have a pit latrine with depth of about four to five meters.

The cooking stoves being used in the Project Area are mainly three stones. Though the Special Energy Project (1983 - 1994) was implemented by GTZ for the promotion of improved cooking stove (one-pot ceramic liner-stove without a chimney) with the target of whole country, and it was made in 3,898 households in Kirinyaga District by the training of women's groups, it is supposed that this area was not included.

Malaria ranks as the top disease in Nyangati Location and it increased double from 1996 to 1997 as shown below. Diarrhea increased 2.5 times and skin diseases 1.8 times.

Common Diseases in Nyangati Location

(Unit: case)

Diseases	Year			
	1993	1995	1996	1997
Malaria	7,393	6,775	7,349	14,583
Intestinal Worms	5,759	6,826	6,887	6,610
Urinary Tract Infections	390	103	2,356	2,156
Diarrhea	194	96	886	2,229
Eye Infection	221	158	416	472
Skin Diseases	115	100	242	433

Source: Ministry of Health, Kimbimbi, 1998

Medical facilities are underutilized partly due to lack of drugs which are heavily subsidized and hence the Government finds it difficult to sustain the supply. However, all women in the Project Area attend ante-natal clinic and deliver their babies in health facilities; 83 percent in hospital and 17 percent in health centers.

3) Soil and Water Conservation Conditions

This area does not border on river and there are two main furrows with a lot of small furrows crossing in farmlands and some farmers are irrigating many plots of their farmlands (see Figure T.2-4, Annex T).

Generally, the active farmers in agriculture are also active in soil conservation. For example, one farmer has 4 acres of farmland that was not fertile and eroded when he bought it in 1975. He improved the land little by little by maintenance of terrace, contour cultivation, inter cropping (e.g. Pigeon peas, French beans and maize) and rotation cropping with irrigation water from furrows in both sides of his farmland (see Figure T.2-5, Annex T). As the result, the yield is increasing with the years.

However, it is not recommended the consecutive growing of french beans such as what he is planning in two plots for next year, because it may be the cause of the outbreak of disease, the increase of pesticide and the decrease of yield. It is recommended to grow trees along the farm plot for the improvement of soil fertility and for the firewood use as he is not growing any trees for firewood and is using the dead branch of cotton for firewood this year and it is limited.

The farmers' awareness for the soil and water conservation is shown in the next table. Most of farmers practice tree plantation and Napier grass plantation, and *Grevillea robusta* is the common tree to hedge the farmland.

Farmers' Awareness for the Soil and Water Conservation

Soil and Water Conservation Activities	Farmers' Answer (%)	
	I know.	I practice.
Planting trees	100	96
Planting of Napier grass	96	92
Contour cultivation	68	64
Stone wall along contour line	20	4
Others (Planting of sugarcane, bananas & papaya along contours, plant grass along furrows)	8	8

Source: EIA Survey, July 1998

4) Use of Agrochemical

70 percent of farmers use agrochemical mainly for french beans and tomatoes as shown below. All of them are approved for agricultural use in Kenya.

Crop	Agrochemical
French beans	: Dimethoate, Karate, Antracol, Green Copper, Thiodan, Diathane M45, Fastac, Lannet, Thophate, Diazinon, Fenitrothion
Tomatoes	: Diamethoate, Karate, Antracol, Thiodan, Diathane M45, Fastac, Accophate/Redomil
Rice	: Diamethoate, Fenitrothion, Malathion
Kales	: Thiodan
Pepper	: Fastac
Cotton	: Ripcord

According to the EIA Survey, all farmers answered to have the knowledge of agrochemical use, though 52 percent answered that they followed the recommended dilution and 68 percent answered that they followed the recommended application interval. Actually, 75 percent of agrochemicals were used within the recommended dilution including 51 percent less than recommended dilution. However 29 percent of agrochemicals were used shorter than the recommended interval of insecticide and fungicide for French beans and tomatoes. All farmers know that they must use gloves and mask when they use agrochemical, though most of them do not practice as shown below.

Farmers' Awareness for the Agrochemical Use

Questions	Farmers' Answer (%)	
	I know it.	I practice it.
Dilution of Agrochemical	100	52
Frequency of Agrochemical Application	100	68
Use of Gloves and Mask	100	17
Maximum Pesticide Residue Levels	64	0

Source: EIA Survey, July 1998

Actual Agro-chemical Use by Farmers

Agrochemical Use	% of Agro-chemical
Within the Recommended Dilution	75 %
Less than the Recommended Dilutio	(51 %)
Equivalent to the Recommended Dilution	(24 %)
Over the Recommended Dilution	7 %
Unknown	18 %
Recommended Application Interval was followed	62 %
Recommended Application Interval was not followed	29 %
Unknown	9 %

Source: EIA Survey, July 1998

5) Related Projects on Environment and Public Health

The following projects were/are implemented widely in the district including the Project Area.

Name of Project	Donor	Duration	Method	Results
National Agricultural Extension Program	World Bank	1983 - 97	Training of farmers including soil conservation	Success
Soil and Water Conservation Project	SIDA	1984 - Now	Training of farmers	
State Use Project	GIFAP	1992 - Now	Training of farmers and pesticide retailers on safe use of agrochemical	

Source : EIA Survey, July 1998

GIFAP : French Association of Agrochemical Manufacturers

2.1.14 Gender Issues

1) Women's Status in Rural Society

The community within the Project Area consist of immigrants who settled from the upper-lying areas of Kirinyaga district in the late 1950s and early 1960s. During the same period, settlement of immigrants from other parts of Central province, into the nearby Mwea Irrigation Settlement was taking place. These two events have made the community of Ngomano/Nyangati to be somewhat less restrained by tradition (compared to other parts of the district) and have a more liberal attitude towards its women members. The added influence of modern institutions (government agencies, churches, private firms etc) and easy access to Nairobi (major tarmac road cuts across the Project Area) have further loosened the hold of tradition.

These conditions may explain the rather improved status enjoyed by women of the Project Area as illustrated by the slightly higher proportion of girls, compared to boys, being enrolled in Nyangati primary school, the position of the woman vice-chairman of the irrigation project and the highly vocal contribution by women during the field workshops.

2) Women's Roles in Farm Households

In spite of their comparatively improved status, women roles in the household are still much influenced by custom and tradition. However, the ever increasing integration of the community into the national and international monetary economy (travel to Nairobi, export companies etc), has induced new gender roles and modified old ones as shown below;

Task Distribution Between Female and Male Adults

Household task	Female	Male
1. Land Opening		XX
2. Buying inputs	X	XX
3. Planting	XX	X
4. Weeding	XX	X
5. Spraying		XX
6. Harvesting	XX	X
7. Open market selling	XX	
8. Fetching groceries	X	X
9. Livestock grazing		X
10. Stall feeding	X	
11. Milking	XX	X
12. Milk delivery	X	X
13. Irrigation	X	X
14. Firewood collection	XX	
15. Water collection	XX	
16. Cooking	XX	
17. House cleaning	XX	
18. Caring for young children, sick and the old	XX	

Note: X=sometimes; XX = main responsibility

It is clear from the above table that the female members of the household shoulder a disproportionately heavy burden of household work load. Hence in the design of the irrigation system relevant gender issues will have to be considered and incorporated. Such issues are:

- Labour implications of the irrigated production system
- Change income/benefit status for household female members
- Current commitments, preferences, and capabilities of women members of the household

3) Women's Rights to Land Inheritance

Among the communities around Mt Kenya, tradition does not provide for women to own land or inherit it. However, as earlier mentioned, a number of factors (migrant community, proximity to Nairobi, churches, schools) have weakened these traditional attitudes in Ngomano/Nyangati and female members of the household can own land in their own right. For example, the vice-chairman of the management committee, a woman, owns her own land in which she has made permanent improvements (stone house, water tank, fruit trees etc).

4) Women's Rights to Selling of Agricultural Products

Field discussions, indicated that women share with the men the right to market subsistence crops (maize and beans), bananas, sweet potatoes and kales. Young women are also growing horticultural crops which they sell on their own account.

2.1.15 Findings through Workshop Seminars held at Ngomano/Nyangati Water Furrow Project

Workshop seminar at Ngomano/Nyangati Water Furrow Project categorized into Type-C was held at project site during the period from June 30, 1998 to July 2, 1998 with a participation of beneficiary farmers of the scheme, and through the seminar under eager discussion among farmers, the studies on i) members and relevant information, ii) participatory/stakeholder, iii) problem analysis, iv) objective analysis, and v) project design matrix (PDM) were analyzed.

Followings indicate the outlines of problem analysis and PDM, and Figure 2.1-3 and Figure 2.1-4 indicate the problem and objective trees of the Area. The details are referred to Table C.2-4 to Table C.2-6 and Figure C.2-4 to Figure C.2-6, Annex C.

- **Prioritized Present Problems;**

Poor crop yield,

- Inappropriate use of farm inputs (chemical)
- Lack of cultivating machinery
- Poor quality of seeds
- Irrigation water is not enough
- Low soil fertility

Low price of farm products

- Middlemen in pricing of our produce
- Exploitation of farm exporters
- Long distance to the selling point
- Poor access roads
- Poor storage for products

- **Overall Goal** : Increased farm income
- **Project Purposes** : Sufficient irrigation water available
- **Results/Output** : Water distribution guideline established
 - : Permanent good intake
 - : Canal capacity increased
 - : Canal maintained properly
 - : Farm pond

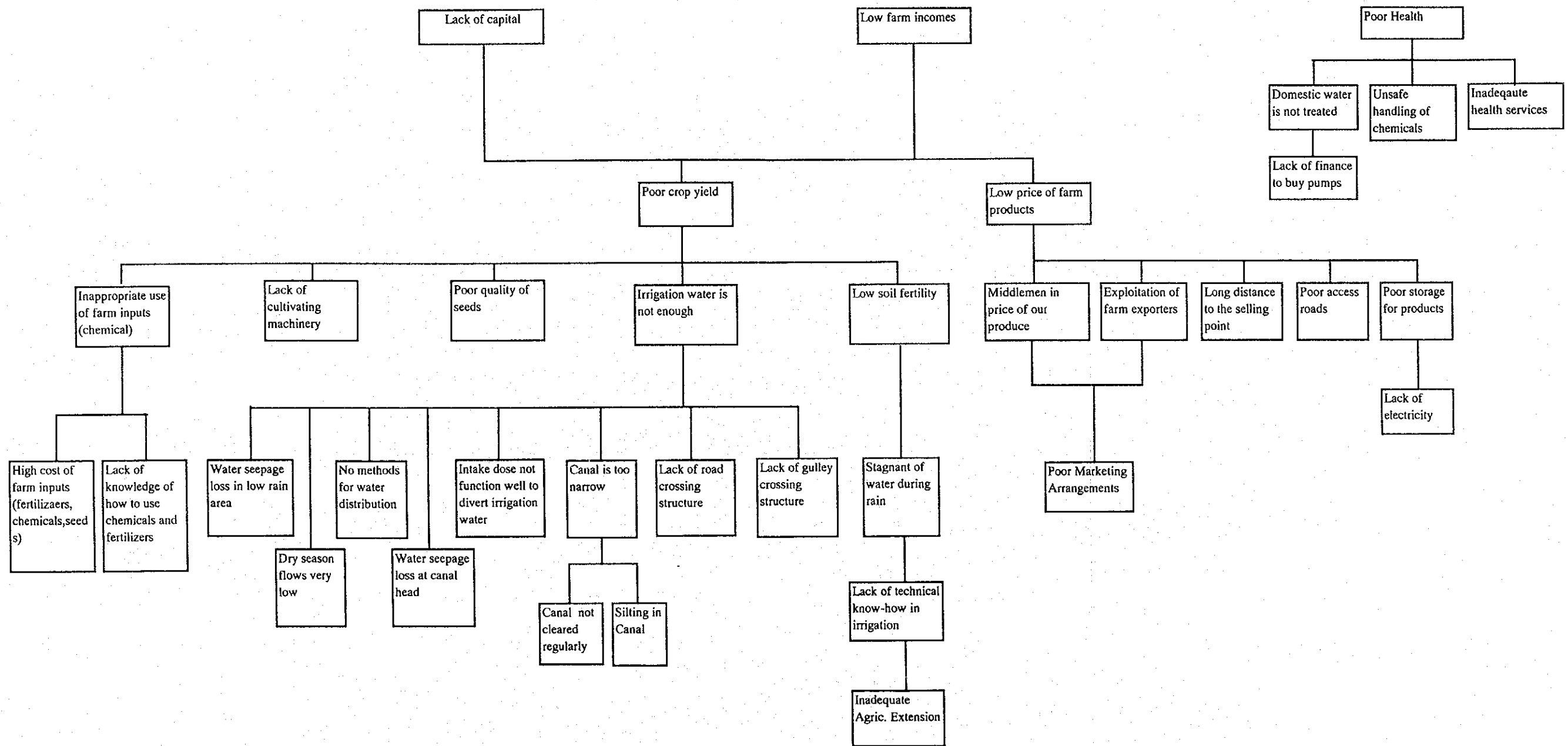
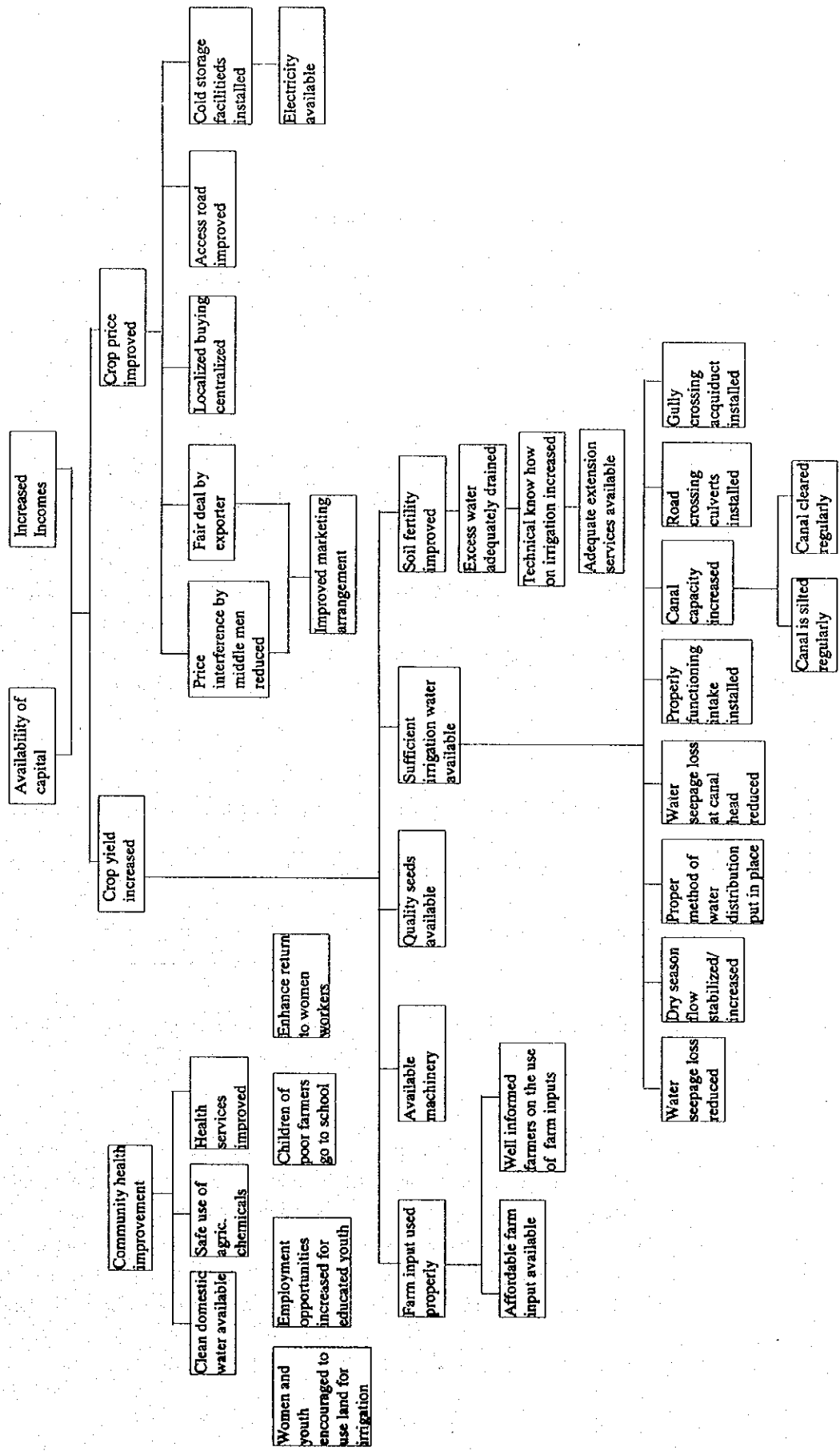


Figure 2.1-3 Problem Tree for Ngomano/Nyangati Water Project

Figure 2.1-4 Objective Tree for Ngomano/Nyangati Water Project



2.1.16 Present Problems, Constraints and Development Potentials

1) Present Problems and Constraints

a) Rural Community

The problem in the Area is to find the good way for the integration of their resources and conditions. They are blessed with good conditions like facing at paved good main road and good access to markets. They have good water resource from springs, and also have many kinds of social groups. The appropriate entry points for vitalization of their good elements would be expected to be found by themselves with good suggestions from outside.

b) Crop Production

There are a number of upstream users on the existing canal, some of them taking large amounts of water for paddy rice production. The vertisol areas in the lower areas are hard to cultivate, cracking in the dry season, and flooding in the wet. They are currently being used either for paddy rice production or are left as rough grazing. The nitosol soils have a particle structure that makes them both permeable and friable, so canals may be liable to collapse, seepage and erosion, especially if the pH or the organic matter levels fall. Without correct use of fertilizers, fertility is likely to become limiting as the cropping intensifies. Some of the upland area currently has drainage problems. Quelea birds are common, particularly in the lower downstream portions of the project, which are adjacent to the Mwea rice scheme.

c) Marketing

As the result of PCM workshop, the following problem tree was suggested in marketing sector:

- Low farm incomes and Low price of farm products
- Middlemen in (lower) prices of our produce and exploitation of farm (by) exporters
- Poor marketing arrangements

More information attaining activities are required by marketing groups for local consumed and export produce. Necessary activities for marketing arrangement are as follows:

- Market prices for local consumed produce:
In Kutus wholesale market, the prices are not collected by the District Agricultural Officers. Therefore, it is necessary to dispatch price enumerator and exchange of price information by the marketing group. In Wanguru Market, where almost the same pricing at Kimbimbi market, the prices and market status by crop such as scare, high demand, low demand, glut, etc., can be collected from Divisional Agricultural Extension Officer in Mwea Division. The market trend can be also known by the analysis of commodity price list on newspaper 'The Daily Nation'.

- Variety selection, grading, MRLs and salinity requirements:

The information for these export produce can be attained by the HCDA Marketing Officer at Karatina, Nyeri District. Now Ammy and Polister varieties are trading at higher price than Monel in case of French bean.

- Strengthening of bargaining power:

The auction consignment with HCDA or farming contract with exporters is recommendable instead of transaction with middlemen. The District Agricultural Office is estimating that 7,000 households have a potential in this contract farming. In Kirinyaga District, the production of French bean become glut by season, i.g. January to March 1997. In order to compete other production areas, the advantage or attractiveness for exporters must be considered by marketing groups in harvest season, group loading, grading, shading after flowering and no violation of a contract.

- Marketing organization:

Currently marketing groups do not exist in this Project Area and it makes farmers negotiation ability weaken. The scale of groups shall be at 20-30 members with formation of chairman, vice-chairman, treasury, auditor and price enumerators. The key point to sustain the marketing group would be clear and transparent accounting system.

- Long distance to the selling points

- Poor access roads (in the area)

Comparing with other Project Areas, Ngamao/Nyangati area is not far from markets and closed to main tarmac road, but transporting means must be improved.

- Poor storage for products

- Lack of electricity

Farmers well understand the importance of longer shelf life of fresh produce and necessity of introduction of cooling facility mentioned in the object tree. HCDA is going to construct pre-cooling facility for auction near Kimbimbi town. By use of this marketing route, the produce can extend shelf life to more than 7-10 days.

d) Agricultural Credit

At present banks require land as collateral when they give loan to farmers and this means that farmers have to hold title deed. However, result of the farm economic survey shows that about 60 percent of farms don't possess it. It is considered that the two main problems are the obstacles in credit use, that is, no existence of cooperative society and title deed. Therefore, Ministry of Land and Settlement is required to survey individual farmlands immediately and publish land title deed for farmers and in addition, educational training for farmers is strongly required to enlighten them on agricultural credit use.

e) Farmers' Organizations

There are three categories of farmers organization that are relatively important within the Rupingazi/Ngerwe Irrigation scheme. These are: Co-operative Society, Water Users' Association and Women Groups. A summary of problems associated with each category is given below;

Summary of Current Problems Facing Farmers' Organizations

Category of Farmer Organization	Main Problems Identified	Potential
Co-operative Society	<ul style="list-style-type: none"> - Low throughput of coffee cherry into the two coffee factories owing to unsuitable ecological conditions - Relatively high cost of running coffee factories 	<ul style="list-style-type: none"> - Promoting saving and issuance of credit - Stocking farm inputs
Water Users' Association	<ul style="list-style-type: none"> - Association as whole weak with members showing an individualistic rather than collective behavior in solving water scarcity problems - Although management gave impression of being active, it was not effective in influencing members (late attendance in workshop meetings, reported water theft by canal head members) - Dominance by local elite (teachers, ex-teachers, ex-bank employees) 	<ul style="list-style-type: none"> - Providing a focal point for promotion of and training on irrigation skills
Women's groups	<ul style="list-style-type: none"> - Loose organizations established for short maturing benefits (eg purchasing utensils) and hence not geared to pursuing goals that take long to realize - Often not permanent and some stated to last for 6 months only - Weak financial management skills 	<ul style="list-style-type: none"> - Offers opportunity for incorporating women angle in irrigation and horticultural production - Basis for production/marketing groups

f) Agricultural Extension Services

Within the Project Area, extension services from the Ministry of Agriculture are theoretically available at the District, division, location and sub-location levels. However, there are considerable problems that currently constraint MOA in providing agricultural extension support to the project community summarized as follows;

Problems and Potential of Providing Extension Services to Project Area

Type of Problem	Assessment of Problem Severity	Potential of Existing System
Ineffective supervision of Frontline Extension Workers (FEW) by divisional and district staff	xx	<ul style="list-style-type: none"> - Provide framework for channeling skills and improved technologies on irrigated horticultural production

Type of Problem	Assessment of Problem Severity	Potential of Existing System
Lack of transport and financial facilities at district and divisional staff	xxx	
Inadequate relevant technical packages for use by the project community	xxx	- Has mechanism for co-ordinating support inputs by other agencies (government, NGOs, Private) to the project community
Insufficient work plans and performance indicators	xxxx	
Lack of farmers confidence in extension staff	xx	- There already exists a pool of technically trained personnel whose capacities can be easily improved to provide necessary support services to the project community
Poor motivation of field extension staff	xxx	

Note: xxxx = Very severe; xxx = Severe; xx = Substantial

g) Water Resources

- Water permit is not yet acquired
- No stream gauging station in the Murabara river

h) Irrigation and Drainage

- Irrigation plan was not properly established
- Existing irrigation system was not properly designed and constructed
- Irrigation water does not reach to the lower area
- No consensus within the scheme members on water management
- Lack of extension service to farmer on irrigated agriculture
- Lack of drain system

i) Agriculture and Rural Infrastructure

- Irrigation water does not reach to the lower reach of the canal due to very long earth canal line and seepage loss.
- Intake weir needs to be a permanent concrete structure.
- Poor drainage at the low land in the Area.
- Village/farm roads need rehabilitation at sections where hollows and gullies are found.
- There is no electric power supply in the Area.

j) Farm Economy

About 70 percent of Farm household income in Ngomano/Nyangati is earned from crops. However as mentioned above, averaged income is lower than that of Kenya and Kirinyaga district. However, the Area is located near the national road and about two hours far to Nairobi metropolitan area by car. The irrigation facilities have already been established to irrigate 13 ha of diversified agricultural lands. Therefore, it can be said that this Area has higher possibility for irrigated horticultural farming among the four Project Areas.

About one half of farm households interviewed expect vegetables cultivation combined with growing maize after the completion of the irrigation facilities. The ranking of agricultural problems in the Project Area according to the result of the farm economy survey is as follow; i) irrigation water shortage, ii) poor bargaining power of farmers, iii) high cost of agricultural materials, iv) low farmgate price, v) low crop yield. The solution of these problems would improve farm economy in Ngomano/Nyangati Area, so both technical improvement in agriculture and improvement in organizational matter must be attained.

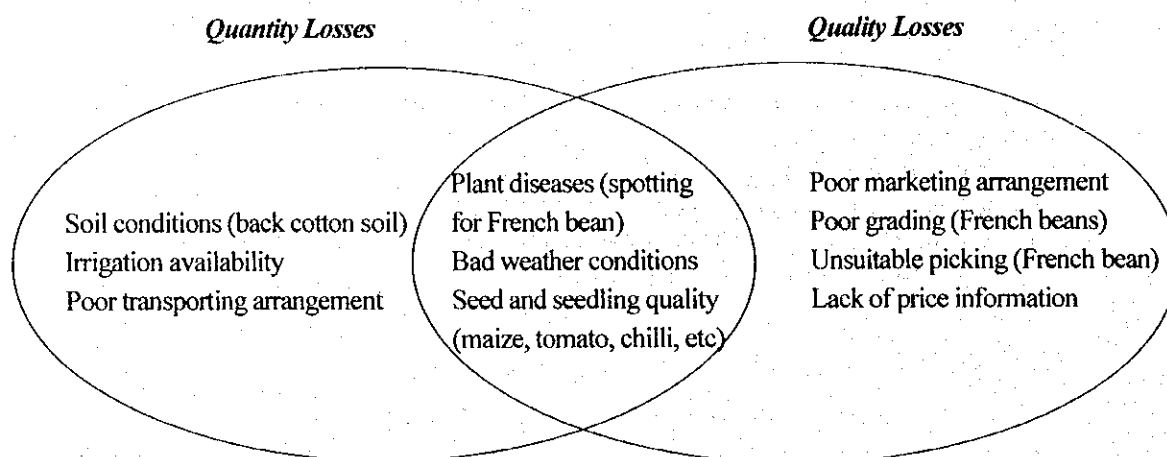
It should be recognized that the construction of irrigation facilities alone can not solve whole problems in farm economy. In addition, irrigation facilities must be maintained and operated by farmer themselves with sustainability. Marketing is also concerned to farm economy, however, the problem on this matter attribute to capability of farmer's organization and their management. The attainment of improvement on this marketing sector will depend on the improvement of people's capability for managing their organizations. Improvement of household economy will eventually be realized by both efforts of beneficial farmers and their organization and the continuous supporting services by government agencies.

k) Animal Husbandry

There are large numbers of cattle in the area, reared for both beef and dairy production. They are currently fed on crop residues, fallow land and/or grazed on the lowland rough pastures. As the horticultural production in the area intensifies, the availability of fallows will decrease, and the distance to grazing will increase. With children at school, laour available to take cattle to and from the pastures, and/or collect forage will be in short supply. Intensification of the existing cattle production would probably compete with the laour demands for horticulture, especially women's laour. Women and young girls are responsible for milking cattle, as well as for picking crops such as French bean and tomato.

l) Post-Harvest and Agro-Industry

The post-harvest losses for horticultural produce are caused by the following issues.



The agro-industry in the Project Area is not existing but there are potential of processing facilities for fermentation of soya beans and bean flouring.

m) Environment and Rural Life

According to the EIA Survey, there will be some negative impacts due to the project implementation including change in river flow regime, water quality deterioration and increase of water-related diseases. However, these impacts would be minor considering the small size of the scheme.

According to the Problem Analysis of PCM, the following problems were shown by farmers.

- Domestic water is not treated
- Inadequate health services
- Lack of knowledge for the use of agrochemical and fertilizers
- Low soil fertility

Children drink the water of furrow directly without boiling as it is easy to get water from the furrow along the road and it is evident that the sanitary education is insufficient.

The cooking stoves being used in the Project Area are mainly three stones and it waste more than 30 percent of firewood compared with the improved cooking stove.

2) Development Potentials

a) Land Use and Crop Production

The flatness of the area, combined with the large field size, the easy access to the major market centres of Kutus and Nairobi, and the warm climate means that with a regular supply of irrigation water the expansion and further development of intensive horticultural production is certainly possible. Currently, there are areas of the project that are subject to waterlogging and reduced yields. The presence of a plough pan at 40-70 cm suggests that simply by deep ploughing with a mole or a chisel plough yields in these areas could increase drastically. The range of potential crops is quite large and the choice of a particular crop should be driven primarily by market considerations rather than by agronomic ones. Improvements in crop husbandry, such as planting time and spacing, pest control, efficient irrigation application and the use of higher levels of inputs on responsive varieties are some of the likely sources of increased yields. After irrigation to increase the maize yields, more cash crop production is the priority here. The climate is conducive to legume production and demand in the adjacent market is high, especially in the off-season. A long term approach to soil fertility management, with particular attention to maintaining N and organic matter levels will pay dividends. Land levelling of farmers fields would increase the efficiency of water use.

b) Marketing

Various marketing alternatives

Currently, the farmers have marketing alternatives to wholesalers/retailers at Kutus wholesale market, retailer at Kimbimbi market, middlemen and exporters compared with other Project Areas. Of

which transaction modes, the trade with middlemen is complained by farmers. For middlemen, this site is very attractive due to close distance to main tarmac road B6 and also near distance to Nairobi.

Geographical advance

Most of exporters' processing facilities are located in Export Processing Zone nearby Jomo Kenyatta International Airport (JKIA), which are 10km south of Nairobi City Centre. Considering from JKIA as the centre circle, the production areas where are possible to grow Asian vegetables (alt. 700-1,200m) are located at Mwea Division of Kirinyaga District, Kajiado or Magadi of Kajiado District and Kibwezi of Makueni District. Kajiado and Magadi have quite limited water resources and Kibwezi is located along trunk road A109 but approximately 250km distance from Nairobi. Since the Project Area is very advantageous in location and water availability, then it is competitive among Asian vegetables production areas such as *turia* (ridged gourd), *tindori* (ivy gourd), *duhdi* (bottle gourd), *tinda* (squash melon or round gourd), *pandola* (snake gourd), *aubergine* (eggplant), *ravaya* (small eggplant), chilli, okra, *valore* (hyacinth bean or *Njahi*), *guwar* (cluster bean), *papadi/papri* (dolichos bean), *tuver* (pigeon pea), *chora* (cowpea), *mooli* (radish), ginger, etc. (The category of Asian vegetables is based on Asian Vegetable Production and Recipe Handbook 1993, Home Economics Branch, Horticultural Div., MOA with assistance of FAO). Furthermore, mask melon, baby corn and curry leaf are also marketable.

Large trading volume at Kutus Wholesale Market

Kutus wholesale market has trading scale estimated at 260 ton/day, which is the largest in Kirinyaga District. Outflows of produce from the District to Embu, Chuka, Nyeri, Karatina, Nyahururu, Nairobi, Mombasa and other minor markets are large, as well inflows from Nyahururu, Karatina and Mombasa are found. This round trip transportation and trade can make less costs than one way transport, which are confirmed trading for ripe bananas and tomatoes to Nyahururu market. It is recommendable to organise marketing group for arrangement of group loading and transport by ox drawn wheel barrows, not by *Matatu*, to Kutus wholesale market using short-cut 4km distance road.

Increase of population of Wanguru town

Wanguru town has been expanding its population rapidly by the success of Mwea Irrigation Project. The multiplication of rice make changes in food habits in the areas, therefore rice with vegetables has been consumed in high rate than other areas in Kenya in place of traditional staple foods of sorghum, millets, cassava, arrow root and even dry maize.

Active women's groups

In the Project Area, many men are working in city or town. The position, education levels and motivation in farming of women seemed higher than in other Project Areas. In the future, it is recommendable to plan cropping pattern in terms of grading as market requirements, group loading arrangement, selection of buyers, transporting arrangement, collection/dissemination of market prices by farmers themselves at Kutus wholesale market and by the contact with Mwea Divisional Agricultural Extension Officer for Wanguru market, and market trend analysis by plotting of commodity prices on the newspaper of The Daily Nation together with giving marketing function to the developing women's groups.

c) Water Resources

- As a water source of irrigation for the scheme, the water resources of the Murabara river is available.

d) Irrigation and Drainage

- Irrigation for the scheme area will be possible by the rehabilitation work of the existing irrigation facilities.
- Effective water management to the irrigation system will be possible by farmers training on irrigated agriculture and water management.

e) Rural Infrastructure

- Irrigation canal system is existing even if intake weir is temporary wooden structure.
- Access roads are in good condition since B6 national trunk road with tarmac surface is crossing the Project Area.

f) Animal Husbandry

This is one of the few areas where oxen are used for ploughing in Kenya, and if kept in peak condition they allow farmers to prepare larger areas of land in a shorter period of time. Weed control using oxen is not common at present, but the extent of the current weed infestation suggests that limited trials of ox cultivation would be productive.

Dairy cattle and goats are kept in the area for the supply of milk for the household. Increasing their stocking level substantially is not realistic. The main increases in yield will come from improved nutrition supplied to breeds with the genetic capability to respond to better feeding. The private sector is providing A.I. services to the Project Area currently. Irrigated forages such as napier can be grown using the irrigation water. Urea supplements can increase the utilization of roughage. The local chicken flocks can be upgraded.

g) Post-harvest and Agro-Industry

Close Distance to Mwea Satellite Depot

The precooling facility shall be constructed near Kimbimbi town under the Horticultural Produce handling facilities Project and implemented and managed by HCDA. The Satellite Depot has functions of initial inspection at site, transport from designated collection points, weighing, palletizing, precooling, transport from the Satellite Depot to Nairobi Horticultural Centre by insulated van trucks and auctioning information dissemination. By the new route of marketing, say marketing alternatives expanding, the farmers in the Project Area can have transacting options to exporters, middlemen and HCDA for export produce. In case of participation in auction, farmers can obtain timely the market prices information, which shall help to the crop planning. The obligations of farmers shall be organising of the marketing group, selection of chairman/vice-chairman/account/auditor, open of bank accounts, grading, weighing, invoicing, recording of all applied chemicals in dates, sprayed crops, names of chemicals and volume.

2.2 Development Plan

2.2.1 Objectives and Components of the Project

1) Objectives of the Project

Current dominant farming type of the Ngomano/Nyangati Water Furrow Project, which was classified as Type-C in Model Area selection, is the diversified commercial basis type of agriculture and consumption-oriented, and beneficial farmers are requesting that such present farming type will be shifted to the commercial-based horticultural farming. This project follows the proposed scheme, which is characterized with easy accessibility to Area from main roads, low construction costs per hectare, high percentage of horticultural cropping.

Under such situation of the Project Area, development objectives of the Project are presented below in terms of short and medium/long-term objectives;

Short-Term Objectives

- To stabilize and raise the rural life of beneficial farmers with introduction of small-scale irrigation system with new construction and rehabilitation of irrigation and drainage facilities for 48 ha, improved management of sustainable horticultural farming for sale a mixture of both export and domestic vegetables such as maize, bananas, French beans, specialty beans, tomatoes, onion, and melons, organization of small-scale farmers of 120 households, and sustainable assistance and support by related government agencies, NGOs, private sectors, etc.
- To raise self-sufficiency of food for farm household in the area by increasing in food production.
- To establish and strengthen farmer's organizations, that is, irrigation groups, marketing groups, women's groups, cooperative societies by providing educational training by related government agencies, NGOs, private sectors, etc.
- To develop productive lands by improving/providing agricultural infrastructural facilities of small-scale irrigation and drainage facilities such as intake facilities and irrigation and drainage canals with related structures, and rural infrastructural facilities of 3.2 km of village/farm roads, and
- To strengthen productive activities by developing agricultural support and institution, such as the provision of necessary post-harvest facilities mainly focusing on three crops and horticultural crops, implementation of training to farmers, strengthening of extension services to farmer's groups, cooperative organization, introduction of farmer's capability building programme, etc.

Medium/Long-Term Objectives

- To alleviate poverty and improve welfare conditions of smallholder beneficiaries by raising living standard and giving them opportunities to increase their income through the introduction of irrigated agriculture focusing mainly on tree and horticultural crops as well as improving and/or providing the necessary agricultural infrastructures and services, and
- To raise farmer's capability to manage rural society by providing continuous educational training.

2) Components of the Project

The project components for the Ngomano/Nyangati Water Furrow Project are generally planned as follows;

- Formulation of irrigated horticultural development plan such as land-use, crop selection, and development of animal husbandry, considering the conditions of relatively flat topography and one of the drier sites in climate,
 - Provision of adequate extension services and trial/demonstration farms,
 - Undertaking of animal husbandry development,
 - Provision of educational training on water management, farm management, agricultural credit, marketing, processing, etc.
- Establishment/strengthening of farmers' organization and promotion of agricultural support services,
 - Establishment and strengthening of farmers' organization (irrigation groups, cooperative societies, women's groups, marketing groups, etc.)
 - Provision of educational training on group management, marketing, O&M of irrigation and drainage facilities,
- Environmental considerations,
 - Establishment of soil conservation measures and training on appropriate utilization of agricultural chemicals including the systems of maximum residue levels (MRLs),
 - Environmental monitoring and evaluation
- Development of agricultural and rural infrastructures,
 - Development of smallholder irrigation systems by means of improvement of intake facilities, irrigation and drainage systems and farm/village roads,
- Development of post-harvest and agro-industry facilities,
 - Provision of agricultural equipment, post-harvest and agro-industry facilities mainly focusing on tree and horticultural crops,
- Social capability building and institutional strengthening programme,
 - Undertaking of village, district agricultural office (DAO) and other local agencies consultations,
 - Formation of technical working committee (TWC),
 - Social preparation for the communities,
 - Strengthening of institutions of IDB and other local agencies,
- Monitoring and Evaluation of the project
 - Irrigation system operation
 - Access and village/farm roads maintenance
 - Agricultural aspect
 - Institutional aspect
 - Marketing aspect
 - Farm economic aspect
 - Control of soil erosion and watershed management

Figure 2.2-1 indicates the development concept to attain overall goals of the Project, which was formulated based on the study results so far made.

2.2.2 Community Capability Building-up and Institutional Development Plan

Irrigated horticultural production in Ngomano/Nyangati Project Area can only be sustained if the project community is effectively involved in all the stages of the irrigation project cycle. Already, as part of the feasibility study, the local community participated in a one week workshop which analyzed problems as well as objectives and defined a preliminary project design for implementing their project. It is now planned to increase the capability of the local community to undertake the following project tasks:

- More detailed planning of the project
- Participating in the technical design of the project
- Planning and mobilizing funds for implementing the project
- Implementing the project
- Operating and maintaining the resulting irrigation system
- Producing food and horticultural produce on a profitable and sustainable basis

For the community to acquire and up-hold the capacity to carry out the above tasks, continued support services will need to be given by the MOA and relevant GOK agencies as well by NGOs and the private sector. Hence, it is planned that the capability of these institutions be built up simultaneously with that of the project community.

What follows, then, is an outline of how this capability building will be effected.

1) Community Capability Building Plan

a) General Social Preparation Plan

At the beginning of the project cycle, it is proposed to conduct a one week PRA workshop within the Project Area, where the local community (members, non-members, local private sector) will be facilitated to review their living environment i.e:

- Community's history, key events and trend observations
- Community resources (physical, social, institutional)
- Problems and prioritized needs (using pair-wise scoring matrix)
- Action plans aimed at meeting the community's priority needs

The expected outcome of the social preparation exercise is establishment, within the community, of a sense of group identity, an increased awareness about their strength and potential as well commitment for self-reliance. Thus empowered, they will be in a better position to confront the challenges of the coming irrigation project. They will be transformed from mere spectators into active participants and contributors into the irrigation drama.

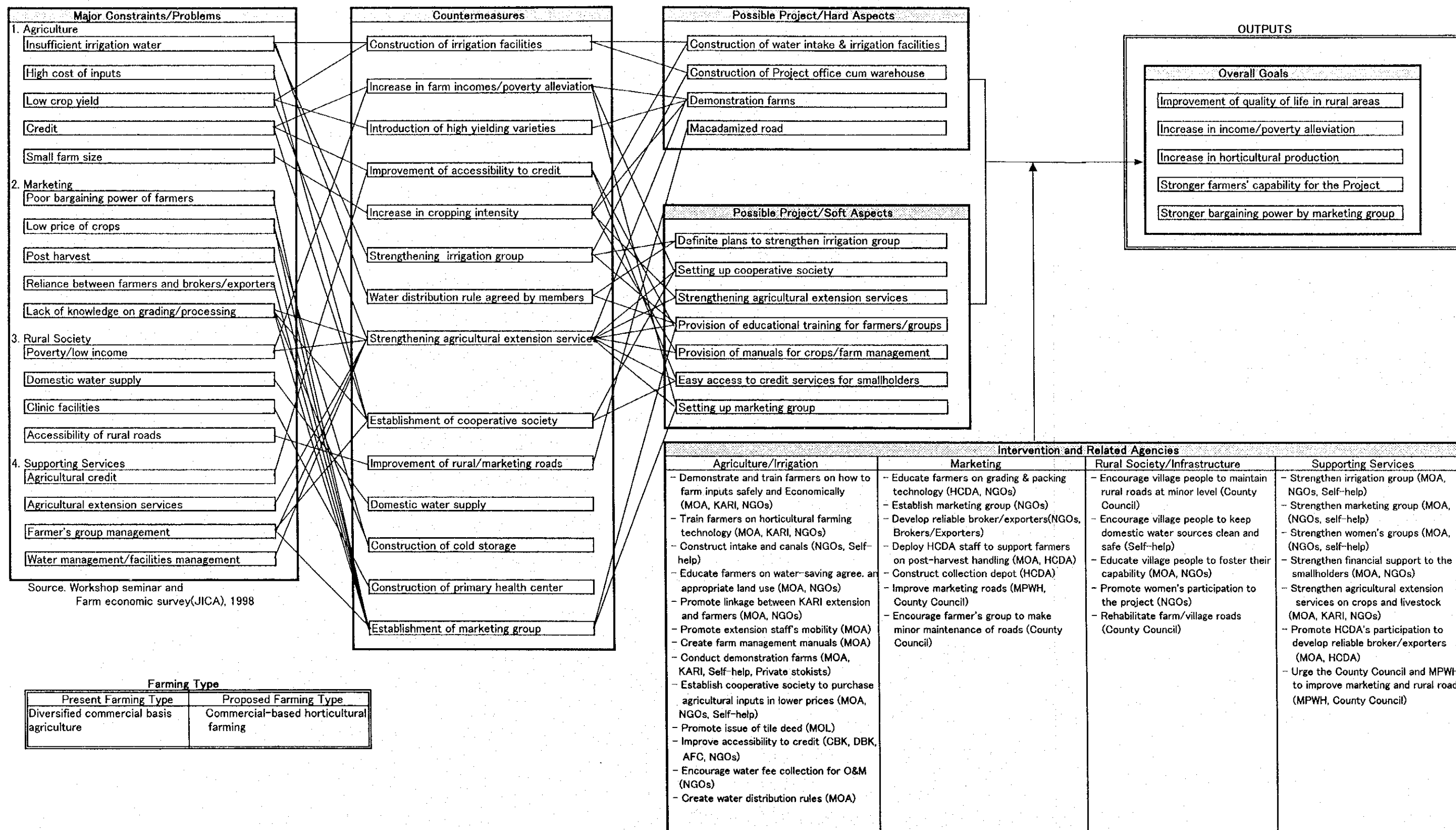


Figure 2.2-1 Relation between Hard and Soft Aspects to attain Overall Goal

In line with the recent policy shift in extension policy, where MOA will increasingly collaborate with the private sector and NGOs, it is planned that the social preparation exercise will be facilitated by the joint effort of MOA staff and a private consulting firm or NGOs experienced in PRA and PDM approaches.

b) Capability Building Plan for Farmers Organization

There are four types of farmers organizations (three existing and one to be promoted) that will make a contribution towards the irrigation project's implementation and sustenance. These farmers' organization will need to be developed and strengthened as summarized as shown below;

Development and Capability Building Plan for Farmers' Organization

Name of Farmer's Organization	Proposed Development Plan
Water Users' Association (WUA)	<ul style="list-style-type: none"> - Educate WUA members on requirements and implications of the intended irrigation system including the need for electing capable leaders to the management committee - Facilitate the community in reviewing and updating the PDM which they have already prepared making modifications as necessary - Train management members on organization, leadership, general and financial management - Indirect strengthening of cooperative society through training of WUA since the two organizations have common membership
Cooperative Society	<ul style="list-style-type: none"> - Promotion of a one day meeting attended by committee members of the Cooperative and WUA to agree on implications of increased irrigated horticultural production (farm-inputs, credit) - Promotion of linkage with WUA and Production /Marketing groups with regard to stocking and provision of farm inputs on cash or credit
Women's Groups	<ul style="list-style-type: none"> - Training on proposed irrigation development including review of PDM - Training in organization, general and financial management - Inviting and involving women groups in reviewing technical irrigation design (engineering and agronomic) particularly from view points of labour and irrigation benefits as well as their perceived role and preferences
Production /Marketing Groups	<ul style="list-style-type: none"> - Promoting establishment of neighborhood production/ marketing groups - Training in organization, general management, agricultural marketing, accounting, and financial management - Training in sourcing and collation of market information - Training in production planning in relation to market opportunities

2) Development and Capability Building of Local NGOs

It is recommended that IDB/DAO explore the possibility of the Catholic and Anglican churches collaborating to provide support services to the project community (i.e. strengthening farmers organizations, intermediating in credit delivery). The two churches have widespread local following and both have experience in rural out-reach programmes elsewhere in the country. However, for these two church NGOs to effectively give the required support services their staff will need remedial training in the following areas:

- Community organization techniques
- PRA approaches
- Leadership and management structures

- Credit administration methods
- Financial management and accounting procedures

3) Tapping Services of Other Agencies in Undertaking Social Preparation

All rural self-help activities are initially promoted and registered by the Ministry of Cultural and Social Services at the district level. However, the Ministry does not usually carry out after-registration follow-up. Yet at the district level, this Ministry has personnel who are professionally qualified to contribute to social preparation of the local community on development matters.

It is therefore planned to encourage a coordinated approach between the DAO/IDB and the Ministry of Culture and Social Services during the initial social preparation workshop as well as in establishing and strengthening existing farmers' organizations.

4) Establishment of Institutional Mechanism for Social Preparation

Since MOA/IDB will be promoting other group-based farmer-managed irrigation schemes elsewhere in the country, it is proposed that it assigns a serving member of its staff to be responsible for social preparation and community mobilization nationwide. In this regard, it is planned that the appointed member will acquire on-the-job skills in PRA and PDM facilitation and later attend the short PRA course offered at Egerton University.

Once deployed, it is expected that this staff member will, in future, facilitate one day annual participatory reviews of irrigation activities at Ngomano/Nyangati Project Area which will be held during the off-season of the agricultural calendar. These annual reviews should include other stake-holders i.e.;

- Community members from within the Project Area
- Personnel from local NGOs, relevant ministries such as MOA, Culture and Social Services, Public Works, Water Development etc
- Private sector produce buyers and local in-put stockists

Using the existing PDM, the review will highlight where things went wrong and pin-point accountability for undertaking follow-up activities. The expected outcome of these annual reviews is to re-inforce the community's commitment and confidence to diagnose and solve their problems while at the same time expecting mutually agreed support services from other stake-holders.

5) Strengthening of IDB Field Offices

The process of promoting smallholder irrigated horticultural production is of necessity multidisciplinary. During the entire project cycle, IDB field offices will be expected to render support services as summarized below:

- Facilitation of social preparation and capacity building for farmers' organizations
- Technical advisory services on irrigation design, tendering, construction, operation and maintenance
- Agricultural extension services on horticultural production and marketing

For them to effectively render the above support services, these field staff will need to have a complement of operational skills (technical, economic, sociological and managerial). Hence it is proposed they be strengthened by exposing them to a training regime that will include:

- Communication and social marketing
- PDM and PRA techniques
- Participatory extension approaches
- Organization and leadership training

This training will be in the form of one week workshops facilitated by IDB headquarters staff in collaboration with a consultant from the private sector or NGOs (for details see Annex J). Together with availing of office and field equipment, this training should enhance the capacity of IDB field staff in providing expected support services.

6) Institutional Strengthening of District Agricultural Offices

a) Consultation with District Agricultural Office (DAO)

Although the farmers community has the main responsibility for implementing the project District Agricultural Office will nevertheless play a crucial role in:

- Facilitating social preparation sessions
- Coordinating in-inputs of other local level agencies (Government, private sector and NGOs)
- Providing technical advisory services to the farming community during various stages of the project cycle (design, construction, operation & maintenance, production and marketing)

In this regard, the Project Coordinator at IDB Nairobi office will make the necessary consultations with the District Agricultural Office at Kerugoya particularly with regard to the project plan and its implication on staff time and technical inputs.

b) Incorporation of Project Support Requirements into DAO's Work Plans

The District Agricultural Office presently accommodates a number of subject matter specialists (SMS) whose skills will be required during implementation, operation and management phases of the project. Such skills include irrigation engineering, horticulture, soil conservation, farm-management, pesticide handling and marketing. Currently, such skills are availed to the project community on an ad hoc or uncoordinated basis.

With a view to institutionalizing contribution of these specialists, it is planned that once a year, the relevant specialists make a joint technical visit to the project, diagnose operational problems and submit a report to the DAO on required intervention measures. The recommended interventions will then form the basis for follow-up support which will be incorporated into an individual specialist's operational work plan.

As part of this strengthening of DAO's office, it is also proposed to:

- Deploy a suitable frontline extension worker (FEW) who will provide services to Ngoma/Nyangati Irrigation scheme on an exclusive basis
- Install a modest field office (semi-permanent) within the Project Area, where farmers can make technical consultations with the extension worker, and whose cost will be shared with the farming community

7) Equipment and Facility Support

To facilitate the work of IDB field staff in providing support services to the project, it is proposed that the following equipment be availed:

- Two computers : one each to the district and divisional levels
- Two sets of soil augurs: one each to district and divisional levels
- PH meter for divisional office
- One tensiometre for divisional office
- Three motor cycles: one for district office and two for divisional office

Availing of the above equipment will address transport and office facilities constraints currently facing extension services

8) Partnership with the Business Community

On the basis of the government commitment to promote increased role of the private sector in agriculture, it is planned to encourage linkages between project level institutions and the business community. The Ministry of Agriculture (IDB, DAO) will take the initiative in this respect by:

- Inviting private sector stakeholders to project level workshops or meetings
- Advising and training farmers and farmers organizations on how to develop beneficial partnerships with different elements of the business community.

The expected linkage pattern between project level institutions and the business community is shown in below;

Planned Partnership Between Various Institutions and the Business Community

Institution	Type of Business Partner	Nature of Partnership
MOA/DAO	Horticultural Exporters	- Common approach in farm chemicals application in order to comply with "minimum residue level" requirements (MRL) - Drawing of production/marketing contracts
	Farm Input Distributors	- Collaboration in staging field demonstrations and field days - Collaboration in holding local agricultural shows
	Local Input Stockists	- Specification of farm chemical types - Farm chemical stocking levels

Institution	Type of Business Partner	Nature of Partnership
Water Users' Association	Banks	- Banking facilities for members contributions
	Credit/Loan Institutions	- Availability of project implementation funds
	Contractor	- Installation of irrigation infrastructure
Cooperative Society	Farm Chemical Distributor	- Procurement of farm inputs in bulk
	Horticultural Exporters	- Market access through production/marketing contracts
Production/Market Gp. & Women Gp.	Banks	- Banking facilities for members contributions and sales proceeds
	Local Input Stockists	- Group acquisition of farm inputs - Probable access to in-put credit or price discount
Individual Farmers	Horticultural Exporters	- Individual market outlet for produce with or without contract
	Banks	- Saving and withdraw facilities
	Local input Stockists	- Supply of farm inputs
	Broker/buyer	- Purchase of farm produce

9) Implementation of Capability Building Training Workshops

As part of a strategy aimed at building up the capability of the farmer community as well as that of supporting institutions, it is planned to implement a series of training workshops over a period of six years. The phasing of the various training events is illustrated as follows;

Implementation Schedule of Capability Building Training Workshops

Training Event	Yr 1	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
1. Social Preparation (Project Community)	■						
2. Internal Organization & Management (WUA Members)	■						
3. Project Planning & Implementation (WUA Members)	■	■	■				
4. Irrigation Operation & Maintenance (WUA Members)			■				
5. Organization & Management (Women Groups Members)		■	■				
6. Initiation, Internal Organization & Management (Production/Marketing Groups)				■	■	■	
7. Farm Inputs & Credit facilities for Irrigation Farmers (Cooperative Committee)			■				
8. Community Organization, Management & Credit Administration (Local NGOs Staff)	■	■	■				
9. Community Organization & Irrigation technology (IDB Field Staff)	■	■	■				
10. Community Organization, Extension Packaging & Delivery (DAO Extension Staff)	■	■	■	■			