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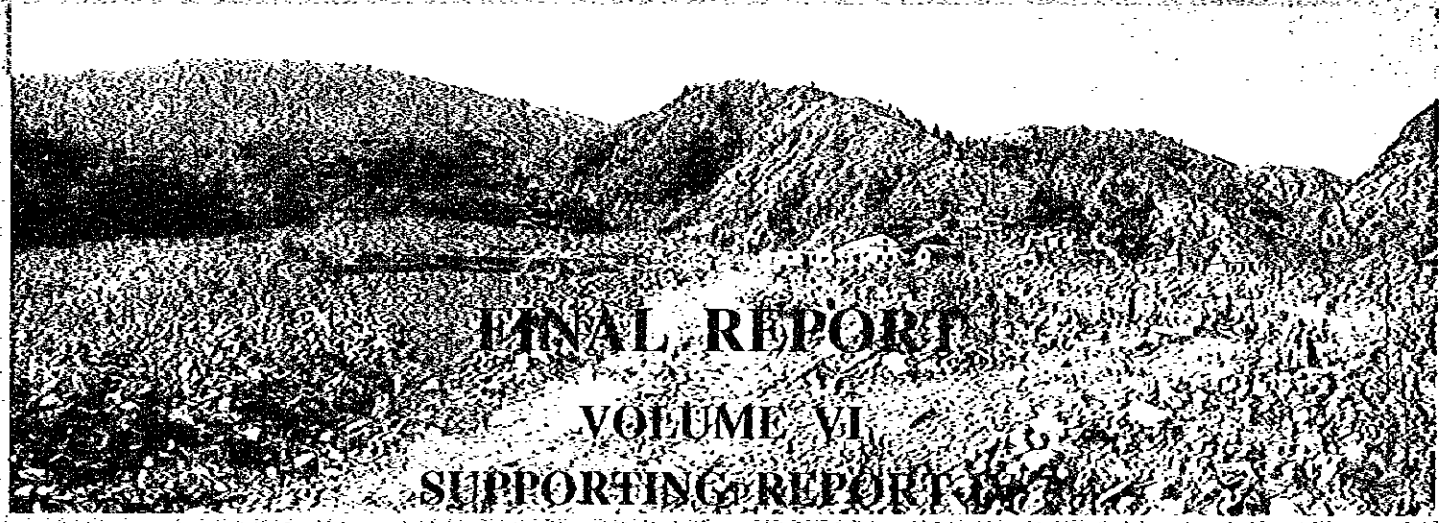
DEPARTMENT OF SOIL CONSERVATION
MINISTRY OF FOREST AND SOIL CONSERVATION
HIS MAJESTY'S GOVERNMENT OF NEPAL

THE STUDY ON THE DISASTER PREVENTION PLAN FOR SEVERELY AFFECTED AREAS BY 1993 DISASTER IN THE CENTRAL DEVELOPMENT REGION OF NEPAL



FINAL REPORT

VOLUME VI
SUPPORTING REPORT (B)

ANNEX-8 : COMMUNITY FORESTRY
ANNEX-9 : PRELIMINARY DESIGN FOR COMMUNITY INFRASTRUCTURES
ANNEX-10: ENVIRONMENTAL STUDIES

MARCH 1997

NIPPON KOEI CO., LTD., TOKYO, JAPAN
INA CORPORATION, TOKYO, JAPAN

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The Study on The Disaster Prevention Plan for Severely Affected Areas by 1993 Disaster in The Central Development Region of Nepal

Composition of Reports

Volume I : Executive Summary

Volume II : Main Report

Volume III : Supporting Report - I
- Annex-1 : Disaster Analysis
- Annex-2 : Disaster Prevention Plan
- Annex-3 : Hydrology

Volume IV : Supporting Report - II
- Annex-4 : Preliminary Design for Disaster Prevention Measures
- Annex-5 : Community Disaster Evacuation System

Volume V : Supporting Report - III
- Annex-6 : Participatory Community Development Plan
- Annex-7 : Agriculture

Volume VI : Supporting Report - IV
- Annex-8 : Community Forestry
- Annex-9 : Preliminary Design for Community Infrastructures
- Annex-10 : Environmental Studies

Volume VII : Data Book - I
1. Questionnaires and answers for Households Sampling
2. Minutes for Discussion with People
3. Report on Geological Investigation of Kulekhani Reservoir
4. Collected Meteo-hydrological Data
5. Material for Seminar
6. Manual for Mulberry Tree Plantation (Nepalese Version)

Volume VIII : Data Book-II
1. Topographic Maps Produced by the Study

Exchange Rate

The exchange rates used in this Study are:

NRs.55.75 = US$1.00 = ¥109.1
as of June, 1996

ANNEX - 8

COMMUNITY FORESTRY

The Study
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Annex-8: Community Forestry

1. GENERAL INFORMATION ON FORESTRY SECTOR IN NEPAL

1.1 Present Status of Forestry Sector in Nepal

At present, the forest area of Nepal is estimated at 5.5 million ha which is 37.4 percent of the total land of the country. The loss of forest land during the period of 1965-79 was 0.4 percent per year which is equivalent to the average loss of 38,000 ha per year. Since 1979, this rate has been about 27,000 ha per year.

In the hills and mountains, the loss of forest land is not so pronounced because of its scattered nature. However, the depletion of forest density is quite severe in the mid-hills where the population density is very high. A recent inventory indicates that only 15 percent of the forests has 70 percent crown cover and only one percent has predominately young regeneration.

Demand and supply trend of forest products:

With a growing population, the demand for forest products has been increasing. On the other hand, the production has stagnated due to mismanagement, over-exploitation and poor plantation programmes. The gap between the demand and the supply has been increasing. All mid-hill region districts have been identified as deficit districts on forest products.

Dependence of hill farming systems on forest:

The desired ratios of agricultural and forest land in the context of the mixed farming system in the hills were suggested by a study as being approximately 1:2.8, 1:0.24 to 0.48 and 1:0.32 for fodder, fuelwood and timber, respectively (John Wyatt-Smith, 1982). These findings were based on a study carried out in Pokhara and Tansen. This indicates that for a hectare of agriculture area, about 3 ha of forest area accessible to the farmers is needed to sustain the present mixed hill farming system. When the forest resources are low to meet the demand, over-exploitation is to be the result.

Forestry sector contribution to national GDP:

The Master Plan for the Forestry Sector estimated the forestry sector's contribution to the total agricultural GDP at about one-fourth. A resent study on

the National Accounting Framework carried out by the FINNIDA has indicated that the forestry sector contribution to the national economy is about 14.6 percent (Marko Katila, Case study on National Accounting Framework).

Future prospects:

Forest in the middle mountains (MM) are now in a state of very low productivity due to over utilisation and/or exploitation.

Per capita forest areas in different physiographic zones of Nepal has been estimated as:

Terai	(T)	0.067 ha
Siwaliks	(S)	1.040 ha
Middle Mountain	(MM)	0.219 ha
High Mountain	(HM)	1.270 ha
High Himal	(HH)	5.000 ha

1.2 Master Plan for Forestry Sector

Long-term objectives:

* To meet the people's basic needs for fuelwood, timber, fodder, and other forest products on a sustainable basis, and to contribute to food production through an effective interaction between forestry and farming practices.

* To protect the land against degradation by soil erosion, floods, landslides, desertification, and other effects of ecological imbalance.

* To conserve the ecosystem and genetic resources.

* To contribute to the growth of local and national economies by managing forest resources and forest-based industries and creating opportunities for income generation and employment.

Short-term objectives:

* To promote people's participation in forestry resource development, management and conservation.

* To develop the legal framework needed to enhance the contribution of individuals, communities and institutions to forest resource development, management and conservation.

* To strengthen the organisation framework and develop the institutions of the forestry sector to enable them to carry out their missions.

Programmes: Twelve programmes identified by the master plan are:

* Community and private forestry.
* National and leasehold forestry.
* Wood-based industries.

* Medicinal and aromatic plants and other minor forest products.
* Soil conservation and watershed management.
* Conservation of ecosystem and genetic resources.
* Policy and legal reform.
* Institution reform.
* Human resources.
* Research and extension.
* Resources information and planning assistance.
* Monitoring and evaluation.

This is a 21-year plan started in 1989/90 fiscal year and will continue up to 2010. The total cost of all programmes combined is about 1.74 billions US dollars in terms of the constant late-1988 price.

2. MAJOR ACTIVITIES IN FORESTRY SECTOR

2.1 Major Programme and Target under Eighth Five-Year Plan

The Eighth Five-Year Plan of Nepal has a clear policy guideline for the forestry sector. It has also identified activities and set targets that will be necessary to meet the long-term goal and objectives of the Plan. It has also set guidelines which must be followed while formulating development projects in the forestry sector.

Two important policy guidelines that are most pertinent for this programme are:

* Mobilise people's participation in forest development as well as in protection through the private forestry, leasehold forestry and community forestry programmes.

* Encourage the people participation on the soil conservation programme.

Following these guidelines for the plan period of five years, programme activities and targets given by the Eighth Five-Year Plan are:

	Programme	Target
1.	Community Forestry Programme	
	Users group farmers	5,000
	Community forest handover	252,000 ha
2.	Leasehold Forestry Programme	25,000 families to be involved
3.	National forest Management	
	Forest Management plan preparation	40 districts
	Area under management	628,301 ha
4.	Plantation Developments	
	Central level plantations	21,635 ha
	Districts level plantations	45,484 ha
5.	Plants Distribution	111,242,000

2.2 Involvement of Donor Agencies in Forestry Sector

At the present major donors agencies involved in the forestry sector are:

World Bank (IDA)
Asian Development Bank
FAO/UNDP
FINNIDA
JICA
German Assistance (GTZ)
Swiss Assistance (SDC)
Australian Aid (AIDAB)
USAID
UK Government (ODA)
EEC
DANIDA

In the community forestry development programme, projects, donors and districts where the projects have been implemented are as follows:

	Project	Donor	District
1.	Nepal-UK Community Forestry Project	ODA	Dhankuta, Terathum, Bhojpur, Sankkhuwasava, Magdi, Parbat, Baglung
2.	Dolakha-Ramechap Community forestry Project	SDC	Dolakha, Ramechap
3.	Nepal-Australia Community Forestry Project	AIDAB	Sindhupalanchok, Kabhre
4.	Community Forestry	IDA	Panchthar, Taplejung, Ilam, Solukhumbu, Okhaldhunga, Khotang, Udayapur, Sinduli, Kathmandu, Lalitpur, Bhaktapur, Dhanding, Nuwakot, Makwanpur, Rasuwa, Tanahu, Kaski, Gorkha, Manang, Lamjung, Shangia, Gulmi, Argakhachi, Dolpa, Darchula, Baitadi, Dadeldhura, Bajang, Doti, Bajura, Acham, Humla, Jumla, Mugu, Kalikot, Jajarkot, Surkhet, Dailekh
5.	Daida Community	DANIDA	- ditto -
6.	Churiya Forest Development Project	GTZ	Siraha, Saptari, Udayapur
7.	Rapti Integrated Development Project	USAID	Rapti Zone

2.3 Progress on Community Forestry Programme

Forest users group (FUG) database records under the management information system (MIS) are:

Project	No. of Districts	No. of FUGs	Total area handled by community F.	No. of house-holds involved
CFDP	38	2,489	160,376	254,915
N/UKCPP	7	1,020	66,108	90,104
NACFP	2	185	5,695	20,289
SDC	2	117	10,995	13,651
USAID	5	*813	53,308	*85,576
Other	3	212	7,033	25,198
Total	57	4,836	303,517	489,733

Source: Department of Forest, July 1996

Note:

CFDP : Community Forestry Project under loan by the World Bank (IDA)
N/UKCPP: Nepal/United Kingdom Community Forestry Project (ODA)
NACFP : Nepal Australia Community Forestry Project (AIDAB)
SDC : Dolakha-Ramechap Community Forestry Project (SDC)
USAID : Rapti Integrated Rural Development Project (USAID)
Others : Three districts (Mahotari, Saptari and Palpa) where the donors funded project have been completed are been funded under HMG/Nepal development funds.
* : Estimated figures from Rapti

3. MAJOR FINDINGS IN FOREST CONDITIONS

3.1 Existing Community Forestry Programme in Makwanpur District

Most of the hill dwellers are Tamangs in Makwanpur District. Charcoal making and selling to the Kathmandu valley is found to be very common in some of the villages of the catchment area, e.g., Fakhel and Chitlang. Handing over the nearby forest to the local community would be one of the best ways to cope with such a problem. In most of the area, indigenous management systems exist and there is a high demand for community forestry.

Handing over the forest area to users groups has started since BS 2047. The handover process has been speeded up for the last two years when the community forestry development programme stated in the district. The DFO and the DSCO are playing important roles to bring awareness of the people for protection as well as plantation.

Trend of Community Forestry Handover in Makwanpur District

Fiscal Year	No. of handed over	No. of users H/H	Area handed over (ha)
1990/91	2	465	400
91/92	-	-	-
92/93	-	-	-
93/94	19	2,948	1,569.6
94/95	20	4,365	2,599.51
95/96	35	5,409	4,612.44
Total	76	13,187	9,181.55

Trend of Leasehold Forest Handover to Small Farmers' Group in Makwanpur District

Fiscal Year	No. of groups	No. of members (one member per household)	Female	Male	Area (ha.)
1993/94	15	93	9	84	84
1994/95	26	147	44	103	113
1995/96	27	152	37	115	131
Total	68	392	90	302	328

There are 76 users groups in Makwanpur District as of FY 1995/96, out of which the total 31 FUGs are located in the Kulekhani catchment area (Daman, Palung, Bajrabarahi, Chitlang, Markhu, Kulekhani, Fakhel VDC). There is such a high demand for seedlings for plantation that the DFO and the DSCO are not able to fulfil the demand. Though the demand for community forestry is high, due to low budget allocation, the target for 1996/97 is only 20 UG formations.

3.2 Selected Tree Species in Previous Plantation Activities

Plantation activities in Makwanpur District were carried out under the Terai Community Forestry Development Project. Most of the activities were concentrated in the lower altitude areas of the Dun valley and the major species planted was Dulbergia Sissoo. The plantation activities in the hilly area were mainly concentrated in the Kulekhani catchment

area by the Kulekhani Watershed Management Project. Activities were mostly concentrated in Markhu, Chitlang, and Kulekhani VDCs.

Previously there were also some plantations in Palung VDC including Phedigaon, but the result was very poor mainly due to lack of protection against grazing. The tree species tried in these plantations were:

-Pinus wallichiana
-Pinus roxburghi
-Pinus patula
-Prunus cerasioides
-Alnus nepalensis

There were no plantation activities in Chisapani (ward No. 4 of Agra VDC). Only a few blue pine trees are found which were planted by some farmers on their private land.

3.3 Major Tree Species

As the altitude ranges from 166 m (Rai Gaon) to 2,584 m (Simbhanjyang), the forest types vary from sub-tropical Sal forest to temperate Quarcus forest in Makwanpur District. Tree species found in Phedigaon and Chisapani are mostly Temperate spps. They are :

In Phedigaon:
- Quercus spp.
- Rhododendron spp.
- Alnus nepalensis
- Betula alnoides
- Prunus cerasoides
- Ficus spp.
- Ficus nemoralis

In Chisapani:
- Quarcus spp.
- Rhododendron spp.
- Anus nepalensis
- Prunus cerasoides

3.4 Possible Tree Species for Planting

Based on the demand for and also considering the distribution record of the District Forest Office, the most likely tree species are:

Pinus Wallichiana
Prunus cerasioides
Alnus nepalensis
Ficus nemoralis
Saurauia nepalensis
Castanopsis indica
Choerospondia axillaris
Juglans regia
Dendrocalamus spp.

4. PROPOSED FORESTRY PROGRAMMES IN CDPP FORMULATION

In this chapter the proposed forestry programmes are described. Two major forestry programmes are explained in Sections 4.1 and 4.2. Then other forestry programmes that would be applicable and appropriate in the future are briefly given in Section 4.3.

4.1 Community Forestry Programme

4.1.1 Current Situations of Forest and Forestry

4.1.1.1 Phedigaon Area

The Phedigaon area is situated in the upper reaches of the Kulekhani basin. The forest remaining in this area is natural forest, occupying headwaters of Dhungakatte Khola, Ghatte Khola, and Bottekhoria Khola of Palung River of the Kulekhani basin. In the altitude of around 2,000 m Alnus nepalensis and Pinus spp. are generally dominant, and in the higher altitude of around 2,700 m. Onerous spp., Castanopsis spp. and Micheria are dominant. The forest is deteriorated poorly because of tree-felling, pasturing, getting firewood and humus layer. Deteriorated forest exerts a bad effect on land conservation. The fact of occasional disastrous events has clearly a strong connection to the deterioration of forest and devastation of forest land, although geomorphology and geology in the area are originally worst in the nature.

4.1.1.2 Chisapani Area

The Chisapani area is situated in the upper reaches of Agra Khola, a tributary of Trisuli River. The altitude is higher than 2,500 m on the whole, and Quercuss spp. and Castanopris spp. dominate like seen in the Phedigaon area. The artificial cause of forest deterioration is also the same as in Phedigaon mentioned above. Besides, most of the area is located on a great mass of landslides with remarkable dip slopes in geology. Under these circumstances in the Chisapani area, it is obvious that the forest land has been gradually lost since a long time ago. A conspicuous fact is that the landslides are actively creeping at places and hereby even the surface soil is subject to incessant erosion.

4.1.2 Analysis of Questionnaire (I)

It is really significant for us to identify the way of thinking of the inhabitants about forest in advance, because the activities of community forest establishment cannot start without their understanding and self-consciousness.

In the Questionnaire (I), there are several questions with regard to forest and forest activities in the three CDPP priority areas. The summary of the results are tabulated in Tables 4.1.1, 4.1.2 and 4.1.3. Based on the analysis of these tables, it is found that:

- more than one-half of them are thinking that the heavy rainfall caused the landslides and debris flows,
- most of them notice that the forest considerably decreases as compared with the situation of 25 years ago,
- disastrous events such as landslides and debris flows are thought as the main reason of forest decrease,

- more than one-half of them consider that the decrease of forest is harmful to their livelihood, and

- those people who recognise the favourable effects of forest in the use of firewood, timber, fodder and timber amount to 80%, while those who evaluate the effects of water/soil conservation, prevention of landslide and environmental aspects amount merely to 30 %.

From this quick analysis it has become evident that

(1) There are a considerable number of people who diversely understand the reason of forest decrease.

(2) Beneficial components of the forest are necessarily understood by most people, but conservation components of the forest area are less noticed.

Out of the two conclusions above, the former is much more serious than the latter. It shows that they are almost completely unconscious of the terrible effect being involved in the unrestricted use of forest such as gathering firewood and fodder.

It seems that they cannot afford to pay attention to the matter of forest conservation. It may be safe to say that they have not any kind of idea, for the present, to take practical measures of the forest management which include elementary factors for the disaster prevention in the hills.

4.1.3 Essentials of Community Forests in Phedigaon and Chisapani

The functions of the forest, in general, can broadly be divided into four categories, that is, 1) to produce such forestry products as timber/lumber, legs, and firewood, 2) to maintain the origin of water resources, 3) to protect the hills from erosive agents which generate various disastrous events, and 4) to conserve a better environment in the nature. Although all the functions are usually to be evaluated in a form of integration, the actual manner of forest management necessarily varies to a large extent depending upon the circumstances.

For instance, the management manner to conserve a wood-production forest differs utterly from the way of management to restore a forest from further deterioration. The point of forest management is, thus, to identify first the most important function among those integrated functions, taking natural and socio-economic circumstances into consideration. Namely, without firm confirmation of the first aim of forest management, it is impossible to materialise the way fostering the forest as well as making a proper use of forest products.

From such a rudimentary point of view, the forest in the areas of Phedigaon and Chisapani cannot be, to the appearance, other than the forest whose function is to be expected in the aspect of disaster prevention, even allowing for inevitable socio-economic conditions. Upon establishing the framework of community forest in these areas, this essential point should be kept in mind. The forest here should first be treated so that the forest could play a role of retrieving the function of mitigating the erosion and the cause of disastrous event.

4.1.4 Proposed Sites for Establishment of Community Forest

The following sites are proposed for the establishment of Community Forest in line with the request from the inhabitants as well as based upon their agreement. An approximate size of each area is shown below:

S.N.	Name	Area
1.	Thulo Pokhari Forest	25 ha
2.	Thulo Chour Forest	35 ha
3.	Tham Danda Forest	60 ha
4.	Chuche Dhunga Forest	-- ha
5.	Loche Paka Forest	15 ha
6.	Chuli Bhan Forest	60 ha
	Total	195 ha

The locations of the sites can be shown in Figure 4.1.1. Out of the above-mentioned six sites, the first three sites, namely 1) Thulo Pokhari Forest, 2) Thulo Chour Forest, and 3)Tham Danda Forest, are covered with forest trees of which crowns are rather well developed. Dominant spp. of trees are Quercus spp., Castanopsis spp. and Micheria spp. The last three sites, 4) Chuche Dhunga Forest, 5) Loche Paka Forest and 6) Chuli Bhan Forest, are not well covered with good forest trees; namely, the stand density is poor since these forests are located near the villages. Dominant spp. are Pinus spp. and Alnus spp. Particularly, Chuli Bhan Forest located in the Chisapani area is badly influenced by human activities, having a low grade of stand density, being unexpectable to function well.

The total area of 4) Chuche Dhunga Forest is not given in the above table. This is because severe landslides are observed and it is not possible to start any community forest programme at this moment. After a programme in 3) Tham Danda Forest has been implemented and getting on the right track, some kind of community forestry programme will be necessary.

4.1.5 Approaches to Community Forestry Establishment

Community forestry can be defined to be an integrated management of forest by local people by themselves, apart from a centralised administration of the government. In this sense, due establishment of user's group should come first, together with their better understanding and consistent agreement. Before the establishment of user's group there should be some prerequisites involved in the contents of activities.

The items to be examined deliberately and the approach to the establishment of user's group can be described in the flow as shown in Figure 4.1.2.

For the implementation of community forestry, there must be lots of problems encountered on applying the principle of management. However, it may be too early to touch on practical matters because some elementary conditions are still left to be harmoniously solved. Among a number of basic conditions, the following will include intractable problems:

i) to restrict or prohibit to gather firewood, fodder, humus in a designated extent of forest land,

ii) to provide some fences so as to protect forest land from free pasturing of cattle and goats, and

iii) to strictly prohibit the felling of standing trees in almost all forest land.

Such regulations area assumed to bring about serious situations to the inhabitants who have been relying on customary utilisation of forests and sustaining the livelihood of subsistence agriculture on the hilly land. Nevertheless, judging from all the aspects of forest land, it is a high time for people to embark on a better management of forest in such a conservative way of management as making the best of erosion control function of the forest. Not only the approach but the implementation of community forestry will not be an easy task to deal with. All kinds of devices are to be called for in the implementation practice.

Available species of trees, fodder trees and grasses are tabulated in Tables 4.1.4, 4.1.5 and 4.1.6.

4.1.6 Notes for Implementation

It is easy to assume that throughout the preparation steps toward the implementation quite a few problems will have to be dealt with. But it is too early to move on to those complicated matters since non of detail surveys have been carried out. There are some issues on which the Study Team can touch in advance.

The three sites out of six proposed sites for the implementation of community forestry; that is, 2) Thulo Chour Forest, 4) Chuche Dhunga Forest and 6) Chuli Bhan Forest should be treated by engineering ways to mitigate erosion and landslides along with community forestry implementation.

i) In the area of Thulo Chour Forest, a fierce erosion prevails on the lower hill slopes because of excessive cultivation and pasturing. It is feared that the erosion agent will expand to the upper slopes where the community forestry is envisaged. Properly designed countermeasures by way of engineering technique will be prerequisite.

ii) In the area of Chuche Dhunga Forest, landslides have occasionally occurred and symptoms of landslides are still seen now. Although the inhabitants consider the tendency of landslide as currently not prominent, the establishment of community forestry should call for further examination. Careful attention should be paid to the drainage of rain water.

iii) Chuli Bhan Forest in Chisapani is situated on actively moving landslides with a big mass. The establishment of community forest should be examined. Erosion and landslide control works are a prerequisite for the implementation of community forest. In short, it may be impossible to materialise the community forest without introducing erosion/landslide control technologies to the work items of community forest management.

4.2 Agroforestry Programme

4.2.1 Agroforestry Conditions

4.2.1.1 Agroforestry Conditions in Phedigaon/Phatbazar

(1) Fodder

The major fodder trees found on the farmers' private land in Phedigaon/Phatbazar are Dudhilo (Ficus nemoralis), Nimaro (Ficus roxburghii), Khanyu (Ficus semicordata), Gogan (Saurauia napalensis), etc. Fodder trees are generally lopped every year during the time when ground forage is scarce.

Although the farmers in Phedigaon/Phatbazar realise that trees cause some loss in crop production, they keep some trees to support their farming system. Cattle, buffaloes and goats are the secondary source of livelihood in the area. According to the field survey, the average number of animals kept per sample household is five.

In the study area the dependency on forest for fodder is high. The limited amount of grazing land cannot provide enough feed even in the monsoon season. Private fodder trees as described above and crop residue provide some feed, but they are not enough because the land holding size per household is too small. Farmers are more dependent on trees for fodder during the dry season than in other seasons. Farmers usually buy paddy straw from the Kulekhani area and the Kathmandu valley.

Improved fodder grasses have not been introduced yet in the area. Farmers collect traditional grasses from the forest which has been degraded because of the massive human encroachment and natural disasters such as landslides and erosion. Grasses from the private land is extremely limited.

(2) Fruits

Traditionally, the people in the study area used to get wild fruits like Kaphal (Myrica esculenta) and Lapsi (Spondias axillaris) from the forest. With the depletion of the forest, those fruits have been scarce these days. The major fruit trees planted on the private land in Phedigaon/Phatbazar are, pear, peach, plum and lemon. They are mostly planted for self consumption. Since there are no farmers selling fruits in big quantity, the villagers are hesitant to use their land for fruit growing.

(3) Medicinal Herbs

Although there are no farmers who cultivate medicinal herbs in their private land, various species are wildly found in the Phedigaon/Phatbazar area. Those herbs have been used as a source of drug since a long time ago. The main medicinal herbs found in the forest mountain around the area are, Chiraito (Swertia chirayita), Jatamansi (Nardostachys jatamansi), Sugandhawal (Valeriana wallichii), Paakhanved (Bergenia ciliata) , Indrayani (Bitter apple), etc.

According to the farmers in Phedigaon/Phatbazar, many brokers from Kathmandu and other parts of the country and sometimes from India visit here to

collect these kinds of medicinal herbs. Statistics of such collections is not available.

4.2.1.2 Agroforestry Condition in Chisapani

(1) Fodder

The main fodder trees found in Chisapani are Dudhilo (Ficus memoralis) Nimaro (Ficus roxburghii), Khanyu (Ficus semicordata), Gogan (Sauria napalensis), etc. Since the terraces are made on the very steep slopes of the hill and are very narrow, the farmers are hesitant to grow fodder trees, because the shade of trees will reduce their vegetable production.

In Chisapani, most of the farmers are rearing goats, buffaloes and cattle. Livestock is not the independent sector, rather it serves as the secondary source of the livelihood. According to the sample survey, the average number of animals kept per sample household is 7.5.

Apart from natural disasters, the felling of trees for fuel and fodder and the expanded cultivation on hill slopes have made the fodder collection more difficult. In the Chisapani area, a dependency on forest for fodder is high. Although the farmers have some fodder trees on their private land, they are not enough because the land holding size per household is too small.

Generally the farmers of Chisapani buy paddy straw from the Agra Khola area and they keep the leaves of cauliflower for the season when fodder and grass become scarce.

(2) Fruits

There are a few fruit trees found in the Chisapani area. Some farmers have pear, peach and plum trees planted on their private land for their own consumption. According to the farmers, the lack of market and the long lag-time for returns are the barrier to start up fruit tree production.

(3) Medicinal Herbs

Local medicinal herbs have been used by 'Baidhyas' (indigenous herb practitioners) as a source of drugs for treating human ailments traditionally. Chiraito (Swertia chirayita), Jatamansi (Nardostachys jatamansi), Sugandhawal (Valeriana wallichii), Pakhanved (Bergenia ciliate), Indrayani (Bitter apple), etc., are found in the Chisapani area. These medicinal herbs are found in the Phedigaon area as well.

4.2.1.3 Agroforestry Conditions in Namtar/Tilar

(1) Fodder

According to the sample survey, more than 70 percent of the households own livestock for ploughing and other field preparation works, milk, fertiliser and meat. Goats are the largest in number, followed by cattle and buffaloes. The average number of animals per sample household is 4.3. In the Namtar area, a dependency on forest for fodder is very high. There has not been any significant plantation of fodder trees in the private land. Most of the fodder trees planted in

the private land are more than ten years old. The major fodder trees planted in the private land are, Khanyu (Ficus semicordata), Nimaro (Ficus roxburghii), Gogan (Saurauia napalansis), Tanki (Bauhinia purpurea), Kutmiro (Litsea monopetala) and Dudhilo (Ficus nemoralis).

In Namtar, private fodder trees and crop residue provide some feed, but they are not enough because the land holding size per household is small.

(2) Fruits

Planting fruit trees on pakho land (upland) is an increasing trend in Namtar. Major fruit trees planted in private land are, pear, plum, lime and lemon. Pear, lime and lemon are in an increasing trend in the Bhadaure area (Ward No. 4). And orange is in an increasing trend in Tumure (Ward No. 7). Some farmers are growing litchi, mangoes, and pineapple. According to the farmers of Namtar, about 300 tons of pears were exported mainly to Hetauda in July/August, 1995. Although the farmers are convinced to increase commercial production of fruits the problem is an access to the market. The road from Namtar to Chuniya at the Tribhuvan Highway is disconnected during the monsoon season. Porters are the sole means of transportation from Namtar to Chuniya. The fruit marketing system in Namtar is characterised by small farmers who produce small quantities and market them themselves. There is no formal or informal farmers' group for marketing in the area.

4.2.2 Agroforestry Programme in Three CDPP Priority Areas

4.2.2.1 Agroforestry Programme for Phedigaon/Phatbazar

(1) Promotion of Fodder Trees Plantation

Farmers are reluctant to plant trees on their crop land because they suspect that trees will have a negative impact on vegetable production. But after the 1993 disaster, the awareness of planting trees in and around the farmland has been developed. Considering the profitability of vegetable cultivation in the area, fodder trees can be promoted in marginal land such as abandoned terraces, degraded or eroded and often single-cropped areas. Usually the marginal land are far from their residential areas and the control over grazing animals often leads to a serious problem.

Before promoting the fodder tree plantation, marginal land or eroded land should be identified, and locally available and suitable plant species should be identified. For the plantation on agricultural land, less branchy and crown density tree species should be chosen.

Growing fodder trees on the private land in Phedigaon/Phatbazar can save time for collecting fodder and fuelwood and will help to maintain the natural vegetation. It will reduce human pressure on natural forest, too.

Declining forest resources around the study area is leading the farmers to become more dependent on private resources for meeting their basic requirement of fodder, fuelwood, etc. In the near future, the access to the natural forest, i.e., Thulichour, Thulopokhari, Mahabir, Thamdanda and Losepakaha, will be restricted because of community forestry programme which the Study Team has

proposed. What is meant by restriction is that an individual household cannot use the forest at his own disposal. Users must follow the regulations set by forest users' group.

Tree based fodder has become scarce as mentioned above causing loss of milk production. It is estimated that, 1 kg of fresh leaf fodder (4 kg of dry leaf fodder equivalent) would increase milk production by one litre (World Bank 1980, cited in Marko Katila, Accounting for Market and non Market Production of Timber, and Fodder in the National Income Accounting Framework, a Case Study, Banko Janakari , MFSC, March 1995).

According to the focus group discussion in Phedigaon, the farmers did not know the best species for fodder which are superior to the existing species and they did not get the seedlings for plantation. Forest nurseries are far from the study area and the transportation of seedlings is very difficult. Suitable fodder tree species will be distributed from the Forest Nursery Development and Plant Distribution Programme which has been proposed. The following fodder tree species are recommended for the Phedigaon/Phatbazar area.

Kimbu (Silkworm mulberry)
Khanyu (Ficus semicordata)
Kabro (Ficus locor)
Koiralo (Bauhinia variegata)
Dudhilo (Ficus nemoralis)

(2) Promotion of Improved Grass Plantation

Introduction of improved grass species on private land will reduce the pressure on the existing forest. The demand for fodder in the area has recently been overwhelming. Most prominent grass species are Napier (Pennisetum purpureum) and Amriso (Thysanolaena maxima) which have strong soil binding qualities and are recognised as good fodder. These grasses can be planted on the edges of terraces and on steep slope areas. Amriso can be sold in the market as broom grass and has a relatively high financial value. Seeds of improved grass species will be distributed from the Forest Nursery Development and Plant Distribution Programme which has been proposed.

(3) Promotion of Horticulture

Although many farmers are more interested in vegetable production than fruits, some farmers have shown some interest in fruit production. According to the field survey some farmers were eager to plant pear and lemon trees on their private land but they did not get the desired seedlings. In Daman, a well developed horticulture farm has been under operation for a long period, but its production is not sufficient to fulfil the demand of the farmers. Because of difficulty in transportation and due to lack of extension programmes, the activity has not picked up. A major constraint to horticulture promotion on farmland in the study area is the inability of farmers to forego the vegetable cultivation while fruits are being established.

According to a rough estimate, cash income expected from one ropani of land five years after planting pear and lemon is Rs 12,600 and Rs 7,500, respectively (refer to Table 4.2.1). In the comparison with cauliflower and potato which are the main cash crops at present, the production of pear and lemon will be more

profitable. The analysis of potato and cauliflower shows that the net profit realised from those two vegetables from one ropani of land is Rs 1,127 and Rs 11,156 respectively (refer to Annex-7: Agriculture). Whatever the reason, the ultimate test of agroforestry's usefulness will be its acceptance by the farmers because they are the managers of land. Progressive farmers often choose their best land for profitable crops production. Since there are no farmers selling fruits in big quantity and they do not know the best species, they want a demonstration farm in order to introduce successful species. Quasi fruits like Kaphal (Myrica esculenta) and Lapsi (Spondias axillaris) can be planted in community forest as users' groups become more confident in their role as forest managers.

(4) Promotion of Medicinal Herbs

Herbal remedies, herbal cosmetic and Ayurvedic drugs are getting popular not only in the developing countries but also in the developed countries. The increasing demand and the development of drug industry in the country have brought medicinal herbs into focus. The medicinal herbs proposed below for cultivation are found wildly around the Phedigaon and Chisapani area. Planting those herbs systematically on marginal land, community forest, ridges of terraces will generate more income.

There are two herbal farms operated by the Department of Medicinal Plants, Ministry of Forest and Soil Conservation near Phedigaon, one in Daman and other in Tistung. The Tistung herbal farm is located at the altitude of 1,800 m, established in 1962, and has experimented various herb species. Many herb species wildly found around Phedigaon and Chisapani have been experimented in the herbal farm and have been successful.

Medicinal herbs have a very good export market. They are in good demand in India and other countries. As Table 4.2.2 shows that in 1994/95 the total amount of export was Rs 31.6 million and the share of India was about 80 per cent. In recent years the amount of medicinal herbs has increased remarkably.

The following species which are found wildly in the Phedigaon and Chisapani areas are proposed to cultivate systematically. As Table 4.2.3 shows, some herbs such as Sugandhawal (Valeriana wallichii) are economically important, which generates more than Rs 4,500 per ropani of land annually.

Chiraito (Swertia chirayita)

This species is found in the temperate zone of Nepal. This herb attains a height of up to 1.5m. Chirayata is the trade name of the drug obtained from this plant. The entire plant is collected in the following stage and dried. It is used at the time of fever, diarrhoea, etc.

Jtamansi (Nardostachys Jatamansi)

This herb becomes a height of up to 60 cm. Jatamansi is the trade name of the drug obtained from this plant. It is used for the treatment of certain types of fits, palpitation of heart and convulsions. It also promotes urination, digestion and menstruation.

Sugandhawal (Valeriana wallichii)

Its roots are used for the treatment of hysterical, epilepsy, neurosis etc. Plants are used for the treatment of nervous unrest and similar emotional states.

As described before this is the most profitable herb and per ropani net income is estimated about Rs 4,550.

Paakhanved (Bergenia ciliata)

Its roots are used for the treatment of fever, diarrhoea, pulmonary, affections, antiscorbutic, etc.

Indrayani (Indreni, Bitter Apple)

Roots of this plant are used for purgative, ascites, jaundice, urinary diseases and rheumatism. Fruits and roots are for antidote to snake poison.

4.2.2.2 Agroforestry Programme for Chisapani

(1) Promotion of Fodder Trees Plantation

The farmers of Chisapani are more dependent on trees for fodder during the dry season than in other seasons. Declining forest resources around the area is leading the farmers to become more dependent on private resources for meeting their basic requirement. Problems faced by the farmers of Chisapani are similar to those of Phedigaon. The villagers do not want many trees in their farmland which will affect on their production of vegetables. But after the 1993 disaster, the awareness of planting trees in their land have developed, but they do not want fodder plants with heavy crown. The following fodder tree species are recommended for Chisapani.

Kimbu (Silkworm mulberry)
Khanyu (Ficus semicordata)
Kabro (Ficus locor)
Dudhilo (Ficus nemoralis)

An agroforestry programme with some trees with light foliage and if possible nitrogen fixing leguminous trees might be good. There are many successful examples in the villages of eastern districts of Nepal where the agroforestry practice with leguminous tree species such as Albizia spp. and Epil epil have been successfully developed. A similar trial will be a good first step to take for agroforestry development.

(2) Promotion of Improved Grass Plantation

Introduction of improved grass species such as Napier (Pennisetum purpureum) and Amriso (Thysanolaena maxima) which have strong binding qualities and are good fodder may help to mitigate soil erosion and fodder scarcity. Those grasses can be planted on the ditches of terraces and community forest areas when the users' groups become more confident in their role as forest managers.

(3) Promotion of Medicinal Herbs

The main medicinal herbs described here are found in Phedigaon as well. Planting those species systematically on marginal land, community forest, ridges of terraces will generate more income. The following species which are found wildly in the Chisapani area are proposed.

Among those herbs the following five species ((from (a) to (e)) are described in Section 4.2.2.1, where Phedigaon/Phatbazar are dealt with.

(a) Chiraito (Swertia chirayita)
(b) Jatamansi (Nardostachys jatamansi)
(c) Sugandhawal (Valeriana wallichii)
(d) Pakhanved (Bergenia ciliate)
(e) Indrayani (Indreni, Bitter apple)

(f) Peppermint (Mentha piperita)

This is a medium sized shrub that reaches to a height of up to 50 cm. Leaf stalks are more or less absent. Peppermint is the trade name of the drug obtained from this plant. It is used for the treatment of flatulence, vomiting, diarrhoea and nausea, etc. The estimated net profit from one ropani of land is about Rs 700.

Concerning fruits production ,although a few farmers in Chisapani want fruit trees on their cropped land, their bearing capacity in the initial stage is very low and the access to the market is very poor. The farmers of Chisapani may adopt fruit crops if the trial in Phedigaon/Phatbazar becomes successful.

4.2.2.3 Agroforestry Programme for Namtar

(1) Promotion of Fodder Trees Plantation

Because of the disaster of 1993 and human encroachment to the forest, a high degree of forest degradation is observed around the area. This has led the farmers to become more dependent on private resources for meeting their basic requirement for fodder, fuel wood and other tree products. Therefore plantation of more fodder trees at farm level without grossly affecting crop production is required.

The Eighth Five-Year Plan (1992-1997) has emphasised the tree plantation along field boundaries and terrace ridges. Fodder tree saplings required for livestock development programme will be supplied in co-operation and co-ordination with forestry management programme (The Eighth Plan).

According to the farmers of Namtar they are interested in planting fodder trees but they cannot get the desired amount of saplings because there is no nursery near Namtar VDC. Forest nursery development and plant distribution programme which have been proposed will play a significant role for the development of agroforestry in the area. For the promotion of fodder trees plantation locally available and suitable plant species should be identified and less branchy and crown density tree species should be chosen for the plantation on agricultural land.

Depending upon the altitude and farmers' interests and requirements, the following fodder tree species are recommended in Namtar.

Khanyu (Ficus semicordata)
Kabro (Ficus lacor)
Dudhilo (Ficus nemoralis)
Nimaro (Ficus roxburghii)
Gogan (Saurauia napalensis) and
Kimbu (Silkworm mulberry)

By planting mulberry trees and rearing silkworms, the farmers can generate more income than cultivating traditional cereal crops (refer to the sector report, Appendix 4: Agriculture). Silkworm mulberry can be used as good fodder as well.

(2) Promotion of Improved Grass Plantation

To reduce the pressure on the existing forest, improved grass species such as Napier (Pennisetum purpureum), Amriso (Thysanolaena maxima) and Vetivar should be introduced.

(3) Promotion of Horticulture

As described before planting fruit trees in pakho (upland) is in an increasing trend in Namtar. Although farmers know that fruit trees cause some loss in crop production, they plant fruit trees because the benefits from fruits are more valuable than loss in cereal crop production. The long lag time for returns is the barrier for small farmers who might want to start fruits production. And without a clear and well-defined market, there is no advantage in promoting fruits production that cannot be otherwise consumed locally. Depending upon climatic conditions and altitudes, the following varieties of fruit species can be recommended.

Pear
Lemon
Lime
Litchi
Orange (in Timure area)

To encourage the farmers for more fruit production, a small-scale processing plant in which jam and juice are produced may be suitable. Such a plant may encourage the farmers to plant more fruit trees on their private land which generate more income and contribute to soil conservation.

4.3 Other Possible Forestry Programmes

In Sections 4.1 and 4.2, two major community-based forestry programmes are described. There exist, however, still several forestry programmes possible to be implemented in the three CDPP priority areas, and those are described in this section. Please note that the programmes described here are not independently carried out, rather they may be planned

and implemented in the course of and/or after the implementation of the community forestry programme and/or the agroforestry programme.

4.3.1 SALT Technology Implementation

In Tistung, the ICIMOD has put up trails to test a suitability of the SALT technology in vegetable farms. The information so far is quite encouraging and the demonstration effort of these trails will be coming soon. If it could be implemented in the Phedigaon and Chisapani areas the Sloping Agriculture Land Developing Technology (SALT) will give long-term benefits to the villagers.

Basically two important aspects of the SALT technology will be of great interest to the project sites, namely:

- conservation of slope agriculture farming and
- maintaining the fertility of slop agriculture farms.

Adaptation of this technology might take some time because at the initial stage farmers have to plant hedges in a row along the contour, which means that they have to give up some part of their farmland. The long-term benefits from conservation of their farmland will be understood by the villagers only if this programme has a strong extension back-up.

4.3.2 Forest Nursery Development and Plant Distribution Programme

In the study areas the villagers have developed a strong aptitude for planting trees, but forest nurseries are very far from their locations and the transportation of seedlings is quite difficult. Thus, a forest nursery with flexibility of developing other plants such as fruit trees, hedge plants and medicinal herbs will be of great interest to the community.

The nursery development and plant production could not be achieved in a short period. But a quick delivery of seedlings could be done by bringing in plants from nearby nurseries and distributing them in situ. In this plant distribution centre a new forest nursery could be developed. Thus, from this centre a combined activity of production, collection and distribution of tree seedlings could be achieved. When the seedling of required species will be produced in this nursery, the centre will become a plant production and distribution centre for this region. As the need of these sites are more than the capacity of a small community forestry nursery, such a nursery will be able to support much larger plantation activities. Afterwards this nursery could be privatised or handed over to community forestry committees. If the nursery foreman of the nursery could run it, that will be the best. But this transfer of responsibility must be done through the community forestry committee so that the development and the production will continue without any interruption.

Table 4.1.1 Peoples Mind for the Forest (from Questionnaire's Results)

Phedigaon

Q1 Why do you think landslides occur in your village/community? (multiple answer)

a	God being angry	7 %
b	Heavy rain	71 %
c	Deforestation	42 %

Q2 How many hours does it take to collect a bhari of firewood and fodder in your village now and 25 years ago?

Average of villagers

Firewood		Fooder	
Now	25 years ago	Now	25 years ago
8.1 hrs	3.4 hrs	9.3 hrs	3.4hrs

Q3 In your village, forest has increased or decreased in comparison with 25 years ago?

a	Increased	0 %
b	Decreased	100 %

What are the reasons? (multiple answers)

a	Growth of population	17 %
b	Disaster	27 %
c	Deforestration	24 %
d	Lack of education	6 %

Q4 What are advangates and disadvangates of forest? (multipul answer)

Advantages			Disadvantages	
a	Fodder available	86 %	a Increase harmful animals	3 %
b	Firewood available	79 %		
c	Water conservation	48 %		
d	Good environment	27 %		
e	Timber available	24 %		
f	Fertiliser available	10 %		
g	Stop landsliding	6 %		
h	Herbs available	6 %		

Q5 What happens if there were no forest? (multiple answer)

a	Men cannot survive	79 %
b	Cannot raise livestock	89 %
c	Nothing happens	7 %

Table 4.1.2 Peoples Mind for the Forest (from Questionnaire's Results)

Chisapani

Q1 Why do you think landslides occur in your village/community? (multiple answer)

a	God being angry	18 %
b	Heavy rain	89 %
c	Deforestation	11 %

Q2 How many hours does it take to collect a bhari of firewood and fodder in your village now and 25 years ago?

Average of villagers

Firewood		Fooder	
Now	25 years ago	Now	25 years ago
5.4 hrs	3.2 hrs	6.0 hrs	3.5 hrs

Q3 In your village, forest has increased or decreased in comparison with 25 years ago?

a	Increased	7 %
b	Decreased	93 %

What are the reasons? (multiple answers)

a	Disaster	79 %
b	Growth of population	14 %
c	Deforestration	7 %

Q4 What are advangates and disadvangates of forest? (multipul answer)

Advantages			Disadvantages
a	Firewood available	96 %	None
b	Fodder available	89 %	
c	Fertiliser available	46 %	
d	Timber available	39 %	
e	Water conservation	11 %	
f	Stop landsliding	7 %	
g	Herbs available	4 %	

Q5 What happens if there were no forest? (multiple answer)

a	Men cannot survive	61 %
b	Cannot raise livestock	93 %
c	Nothing happens	4 %

Table 4.1.3 Peoples Mind for the Forest (from Questionnaire's Results)

Namtar

Q1 Why do you think landslides occur in your village/community? (multiple answer)

a	God being angry	17 %
b	Heavy rain	55 %
c	Deforestation	51 %

Q2 How many hours does it take to collect a bhari of firewood and fodder in your village now and 25 years ago?

Average of villagers

Firewood		Fooder	
Now	25 years ago	Now	25 years ago
5.2 hrs	7.2 hrs	5.0 hrs	2.6 hrs

Q3 In your village, forest has increased or decreased in comparison with 25 years ago?

a	Increased	0 %
b	Decreased	100 %

What are the reasons? (multiple answers)

a	Deforestration	46 %
b	Growth of population	30 %
c	Disaster	26 %

Q4 What are advangates and disadvangates of forest? (multipul answer)

	Advantages		Disadvantages
a	Fodder available	93 %	None
b	Firewood available	80 %	
c	Timber available	73 %	
d	Good environment	33 %	
e	Stop landsliding	27 %	
f	Water conservation	17 %	
g	Herbs available	3 %	

Q5 What happens if there were no forest? (multiple answer)

a	Men cannot survive	34 %
b	Cannot raise livestock	53 %
c	Nothing happens	3 %

Table 4.1.4 Available Plants

English/Local mane (Botanical name)	Remarks	Use
Nepali Alder / Utis (Alnus nepalensis)	deciduous, tall; shallow root-system, rapid growth soil-improving tree, fittable devastated land	firewood timber
Blue pine / Gobre salla (Pinus wallichiana)	evergreen coniperous, tall; deep root-system, dry-proof, fittable devastated land	timber
Plum / Painyun (Prunus cerasoides)	deciduous, tall tree, distributed in India, Himalayas; useful as product	timber
Chilaune (Schima wallichi)	deciduous, tall, distributed in South East Asia rather slow growth, useful forest tree	timber
Wooly Oak / Bajha (Quercus pubsons)	ever-green, tall tree; growing on 2000m EL around suitable for rather humid land	timber
Champac Micheria / Champ (Micheria champaca)	ever-green, tall tree; leaves available for sericulture rather slow growth, useful forest tree for furniture production	timber sericulture
Silky Oak / Kangiyo (Grevillea robusta)	ever-green, tall tree; rather rapid growth,	timber
Katus / Chestnut (Castanopsis hystrix)	ever-green, tall tree; growing in South East Asia, Himalayas, edible fruit, useful as wood-material	edible timber
Musure Katus (Castanopsis tribuloides)	ever-green, tall tree; widely distributed in Middle Highland of Nepal; suitable for thick layer of soil	edible timber
Rhododendron / Lali Gurans (Rhododendron arboreum)	ever-green, tall tree; partly distributed Ceylon to South China, available for wood-craft, useful as firewood	firewood timber
Gale / Kaphal (Myrica esculenta)	ever-green, small to tall, distributed Low Himalayas to South China; edible fruit, a kind of soil-improving tree	edible
Camphor / Kapur (Cinnamomun camphora)	ever-green, tall tree, strong, durable tree, showing rather rapid growth; available as softwood, containing camphor	timber edible
Cinnamon / Tej Patta (Cinnamomun tamala)	ever-green, small to tall; distributed Low Himalayas to South China, leaves for spice, bark for cinnamon-substitute	spice
Lapsi (Choerospondias axilaris)	deciduous, tall tree, available for furniture-making; the fruits for medicine, also edible	timber edible medicine
Himalayan ash / Lankuri (Fraxinus floribunda)	deciduous, tall tree; growing on human land; hard-wood for furniture production	timber

Source: Field Survey by the Study Team, 1996

Table 4.1.5 Fodder Trees

English/Local mane (Botanical name)	Remarks	Use
Silkworm mulberry / Kimbu (Morus alba)	deciduous, small to middle/tall tree, leaves for sericulture and twigs for medical use	fodder sericulture
Rai Khanyu (Ficus semicordata)	deciduous, middle to tall tree, having well-developed root-system, suitable for erosion control; capable for growing on dry cut-slope	fodder
Kabro (Ficus lacor)	unknown	fodder
Dudhilo (Ficus nemoralis)	unknown	fodder
Nimaro (Ficus roxburghii)	unknown	fodder
Gogan (Saurauia nepalensis)	deciduous, small tree, bearing edible fruits	edible fodder

Source: Field Survey by the Study Team, 1996

Table 4.1.6 Grasses

English/Local Name (Botanical name)	Remarks	Use
Napier (Pennisetium purpureum)	perennial grass, available for fodder, growing up rapidly; available to erosion-control purpose; culum can be used for thatching material.	fodder erosion-control, thatch
Amriso / Broom grass (Thysanolaena maxima)	perennial grass, bamboo-like grass species, expectable for the purpose of erosion-control; the ears for broom	fodder, erosion-control, broom
Vetivar (Vetiveria zizanioides)	perennial grass, available to erosion-control purpose; perfume oil can be extracted from the root.	fodder, erosion-control,
Musekharuki (Pogonatherum paniceum)	perennial grass, easy propagation using the splits of roots, available for the purpose of steep-slope covering	fodder, erosion-control
Ketuki (Agave spp.)	fittable to control surface erosion of soil, strongly growing even on dry spot; fibre from the leaves	erosion-control, fibre

Source: Field Survey by the Study Team, 1996

Table 4.2.1 Estimated Per Ropani Production of Pear and Lemon

Name of Fruits	Pear	Lemon
Trees/Ropani	7	20
Production/Ropani	600 kg	500 pieces/tree
Price(Rs)	Rs 3 per kg	0.75 per piece
Total (Rs)	12,600	7,500
Remarks	From fifth year after plantation	From fifth year after plantation

Source: Hearing Survey by the Study Team, 1996

Table 4.2.2 Export of Medicinal Herbs (1974/75-1994/95)

(Rs Million)

Year	India	Other Countries	Total Export
1974/75	2.2	9.9	12.1
1975/76	2.8	6.3	9.1
1976/77	6.3	5.8	12.1
1977/78	6.5	5.5	12.0
1978/79	5.2	4.4	9.6
1989/80	13.5	1.5	15.0
1980/81	16.5	0.9	17.4
1981/82	6.4	0.5	6.9
1982/83	5.9	0.5	6.4
1983/84	8.0	0.6	8.6
1984/85	27.9	0.8	28.7
1985/86	16.6	0.3	16.9
1986/87	8.1	0.1	8.2
1987/88	16.4	0.2	16.6
1988/89	13.7	0.8	14.5
1989/90	4.5	2.6	7.1
1990/91	21.3	1.2	22.5
1991/92	22.4	4.5	26.9
1992/93	24.0	3.5	27.5
1993/94	15.4	2.3	17.7
1994/95	25.3	6.3	31.6

Source: Economic Survey, Ministry of Finance, 1995

Table 4.2.3 Some Medicinal Herbs and their Cost of Production and Net Profit

Medicinal Herbs Particulars	Chiraito (Swertia chirayita)	Jatamansi (Nardostachys Jatamansi)	Sugandhawal (Valeriana wallichii)
Planting Season	Feb/Mar to Apr/May	Mar/Apr	Feb/Mar (can be harvested after two years)
Expenditure per ha (Rs)	21,190 (1,060 per ropani)	14,400 (720 per ropani)	44,000 (2,200 per ropani)
Average Production per ha /kg	1,000 (50 kg per ropani)	750 (38 kg per ropani)	3,000 (150 kg per ropani)
Price per kg (Rs)	50	30	45
Annual Income per ha (Rs)	50,000 (2,500 per ropani)	22,500 (1,125 per ropani)	135,000 (6,750 per ropani)
Net Income per year (Rs)	28,810 (1,440 per ropani)	8,100 (405 per ropani)	91,000 (4,550 per ropani)

Source: Nepal Herb Production and Processing Company Ltd.

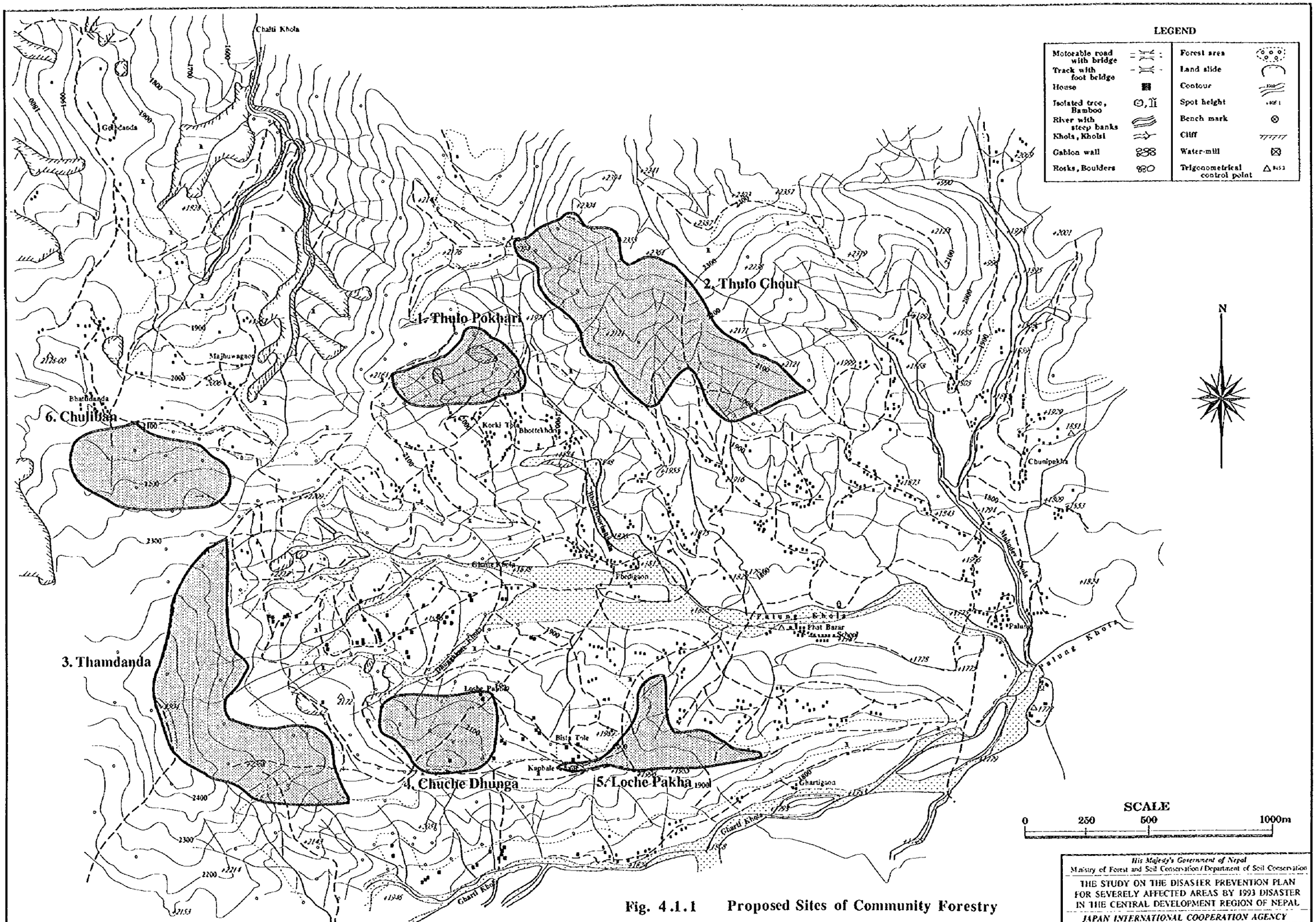

Fig. 4.1.1 Proposed Sites of Community Forestry

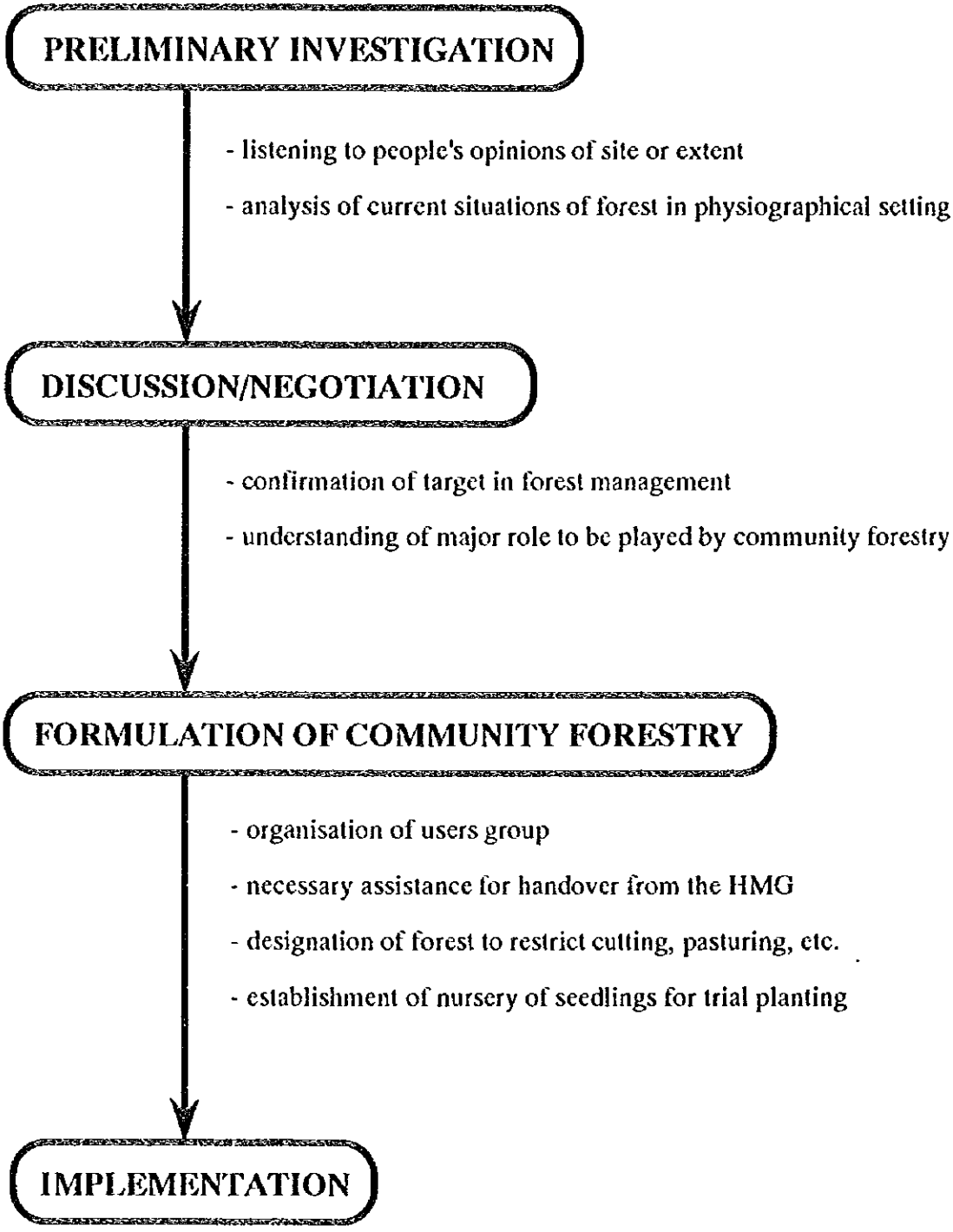

Fig. 4.1.2
Flow of Starting Up Community Forestry Programme

His Majesty's Government of Nepal
Ministry of Forest and Soil Conservation/Department of Soil Conservation
THE STUDY ON THE DISASTER PREVENTION PLAN FOR SEVERELY AFFECTED AREAS BY 1993 DISASTER IN THE CENTRAL DEVELOPMENT REGION OF NEPAL
JAPAN INTERNATIONAL COOPERATION AGENCY

ANNEX - 9

PRELIMINARY DESIGN FOR COMMUNITY INFRASTRUCTURES

The Study
on
The Disaster Prevention Plan
for
Severely Affected Areas by the 1993 Disaster
in
The Central Development Region of Nepal

FINAL REPORT

Supporting Report

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Annex-9: Preliminary Design for Community Infrastructures

1. INTRODUCTION TO RURAL COMMUNITY INFRASTRUCTURE

The natural environment of Nepal shows diverse and fragile features. Its climatic and physiographic zones vary from the semi-arid arctic High Himalaya to the sub-tropical Lowland Terai. Over 90 percent of its population is engaged in agricultural activities in rural areas, both in hill and Terai regions, and in order to enhance the economic growth and improve quality of life in the rural areas, several kinds of infrastructures have been introduced and adopted; a number of irrigation projects, in various sizes, have been carried out; rural road has been constructed for the transportation of agricultural products and other commodities; rural water supply system has been installed for drinking, hygiene and sanitation activities; alternative energy systems, such as water-mill, biogas, micro hydropower plant, for milling, cooking, lighting, and forest conservation.

However, abundance in water resource, rain and snow, brings not only fertility, but also hazard, as was observed in the 1993 disaster; rivers and streams flowing through these zones are extremely erosive because of the geological instability and seismic condition of the mountains and the monsoon nature of the rainfall. In many cases, poorly designed, constructed and inadequately maintained infrastructure with no regard for environmental protection and systematic people's participation, as well as due to lack of knowledge with insufficient funding has, led to a wastage of resources such as water and resulted in vulnerability to natural hazard; destruction of structures and increased land degradation through landslides, gully erosion, waterlogging, siltation etc. Ultimately, economic activities in particularly farming have been interrupted directly and indirectly by burdens of recovery from damaged infrastructure, and often followed by poor land-use practices and a reduced production per capita of population.

Therefore, it is important that both rural dwellers and Government should be aware of and responsible for self-protection and conservation issues against disasters, in order to reduce damages on infrastructure by water induced disaster and expenditure for its recovery as well as to improve quality of rural life in Nepal.

Chapter 1 consists of the following Contents:

Sections 1.1 through 1.3 cover improvement works for the most essential infrastructures; Rural Water Supply, Rural Road, and Farmers' Managed Irrigation Systems. Here, the

present status of these infrastructures, particularly in hill area, have been assessed, both in field and literature, and their advantages as well as common problems are analysed.

Section 1.4 introduces and explains four types of appropriate technologies for the future development of sustainable infrastructure in rural societies. Development and adaptation of alternative energies are highly important for rural life in Nepal in order to conserve forest and vegetation, which contributes to protect slopes as well as prevent landslides in hilly regions. Technologies covered in 1.4 are: Micro-hydropower scheme, Biogas plant, Ropeline/ Ropeway, and Natural power pump.

For Nepal to meet the basic needs of his people and improve the quality of life for future generations it is essential that infrastructure development are well designed and ably managed, i.e., appropriate and sustainable. It is therefore critical that environmental protection and people's participation with technical assistance of the government and local engineers are incorporated into their development process in such a way as to first enhance and then to sustain, in a form of learning to be self-trained as labour, Nepal's inherent productive capacity.

1.1 Rural Water Supply Development

1.1.1 Present Feature of Rural Water Supply Development in Nepal

Nepal is prominently a mountainous country with a population of about 18.5 million. The population concentration is largely concentrating in rural areas with 91 percent of the national people and only about 9 percent of the people living in urban areas of the country. Agriculture is the major economic sector and contributes to 60 percent of the Gross Domestic Product .His Majesty's Government of Nepal in this light has put a high emphasis on the rural development for raise of the living conditions of the Nepalese people. Rural water supply and sanitation is one of the priority sector for development of His Majesty's Government of Nepal and about 5.5 percent of the national budget is allocated for the development of this subsector.

Nepal is administratively divided into five administrative regions namely the eastern, the central, the western, the midwestern and the far western regions. Region wise population distribution in terms of total national population is as shown in table below.

Region wise Population Distribution in Nepal

Region	Percentage of Total Population
Eastern Development Region	24.1
Central Development Region	33.4
Western Development Region	20.3
Mid-Western Development Region	13.0
Far-Western Development Region	9.1

Although extensive internal resources have been mobilised to implement rural water supply and sanitation projects, the coverage so far has been only about 50 percent in water supply through piped water and hand-pump systems. A recent study has estimated that the infant mortality in Nepal is 98 per thousand and child mortality and under five

mortality rates are 51 and 144 per thousand respectively. The same study also establishes that source of drinking water used by the household and type of sanitary facility have an effect in the level of infant and child mortality and lower mortality rates have been observed for families using piped water supply and flush and pan latrines than for families without access to safe water collection and safe excreta disposal.

Collection of water is a daily domestic chore in many rural areas of Nepal, especially for woman and children, that requires long distances to be travelled and substantial amount of time is spent for the purpose. A relevant recent study has established that about 3.4 kilo calories of energy is saved per litre of water fetched in a mountainous region household after implementation of an effective water supply system.

1.1.2 Rural Water Supply Systems in Nepal and Community Involvement

By the end of F.Y. 1993/94 approximately 9,964,000 people, which is about 50 percent of the national rural population, were estimated to be benefiting from water supply systems constructed by DWSS. Some extra coverage has also been achieved from systems constructed by local and international organisations and the number of people benefiting from such systems is estimated to be over 170,000 which is about 0.5 percent of the total rural population in the country. International grants and loans are generously being made available to support HMG-N program in implementing rural water supply and sanitation projects, in the form of bi-literal and multi-lateral aids. Some prominent donors in the sector have been Asian Development Bank, FINNIDA, Helvetas, UNICEF, British ODA, SNV and JICA.

A flow chart given in Fig. 1.1.1 indicates the mode of selection, implementation and operation & maintenance of water supply schemes for rural water supply projects implemented by DWSS with assistance of other co-operative organisations and agencies. In these rural areas in Nepal, it is very common to construct gravity fed piped water supply systems and traditional spring protection works in hilly areas and shallow tubewell installations in Terai areas. An integrated sanitation and training component for Water User Committee members are also generally becoming a part of newer water supply projects. A number of programmes are currently implemented through active participation of the beneficiaries. Community involvement in this subsector project is aimed not only at extracting material and labour contributions from the community but also implemented with strong community involvement where beneficiaries take active part in all phases of project implementation right from project selection to taking over O & M responsibilities of the installed project. It is now quite established that projects planned, implemented and looked after with active community involvement reap larger benefits to the community, are more sustainable and are able to create ownership feelings in the community towards the project. Project selections are weighed against community felt need, degree of community involvement and contribution and commitment to take-over O & M of the project after its construction. With the advent of democracy in Nepal in 1991, peoples' aspirations and desires towards self reliance and self sustained development activities has largely increased. In this situation, even a handful of support from HMG-N would play a catalytic role to nourish these feelings in the people that would eventually lead to rapid development of the country.

Therefore, it is very important to bring about marked increases in health benefits by providing access to safe water supply and sanitation facilities. The project will also result in saving in time and energy, currently being spent for fetching water, that could be used for other economic activities contributing to overall development in living conditions of the people in the mentioned regions.

1.1.3 Future Governmental Support toward Rural Water Supply Development

The eighth development plan of His Majesty's Government of Nepal has set a target to provide safe drinking water to 72% of the national population. Similarly, HMG-N has set a target to provide water facilities to all the Nepalese population by the end of ninth five year plan period (2002 AD). Available data suggest that the coverage so far has been only about 50%. Furthermore, many projects constructed in the past are in need for repair. These indicate a Herculean task lying ahead, for achieving the plan objective, with in the next few years that are remaining;

Resource inputs are available in the eastern region through UNICEF, Asian Development Bank (ADB) and SNV. Similarly the midwestern and far western regions are being covered by assistance from ADB.

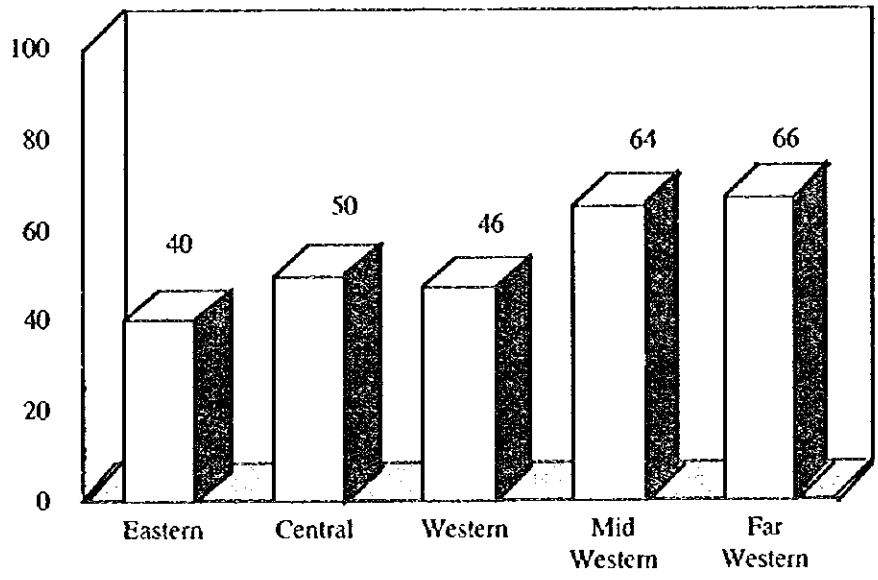
The population coverage made by water supply projects implemented in the central and western development regions so far (up to the end of FY 1933/94) has been only slightly over 50 percent in the central development region and 46 percent in the western development region. the chart below indicates the population coverage achieved in the five development regions. More population is required to be covered in a rapid pace to meet the HMGN objectives of providing safe drinking water to all by the end of 2002 AD.

The major benefits of the rural water supply development project include:

> Supply of safe drinking water in adequate quantities and improvement of sanitary living conditions of communities of Nepal leading to lower infant and child mortality rates, lower cases of water borne epidemics, improvement of general living conditions in the area and saving in time and energy that could be utilised for subsidiary income generating activities and education.

The project will in general benefit all sex and age groups but rural women and children will be the focus beneficiaries as water fetching activity in rural areas is more of a responsibility of women and children and as water related diseases are more common in children. The project is also expected to build management capacities of communities to undertake similar development works.

Population coverage in water supply subsector by DWSS schemes to the end of FY 1993/ 94
(percent of population in the region)



1.1.4 Components of Rural Water Supply System

(1) Intake

An intake collects water from a source and feeds it to the transmission main. An intake should allow continuous abstraction of the design flow from the source. The functioning of a water supply scheme largely depends on the intake. Its location and construction hence, require great care. The type of intake required in a water scheme depends on the type of the water source (spring or stream). As each source is unique, intake design is site specific and needs appropriate consideration. Its construction needs special supervision to ensure that flow from the source is not disturbed and the chances of contamination is minimised.

The site for an intake should be

- free from contamination.
- on stable soil . The site should not be erodible and free from landslides to avoid entry of sediments and contaminants into the transmission main.
- easily accessible for regular inspection and cleaning during operation and maintenance.

Intakes can be generally categorised into following two types depending upon the type of source as; spring intake and stream intake.

(1-a) Spring intake:
It is provided to abstract water from a spring source. It also prevents outside water and other sources of pollutants from entering into the transmission main. The intake thus protects the water from entering into the transmission main. The water outlet points of the spring should be properly identified before intake construction is initiated. Very low yield spring source (< 0.05 lps) should not be tapped for gravity flow schemes. Proper

drainage should be provided around the spring source to divert the run-off water and prevent it from damaging the intake. Special care should be taken to insure that the source is not affected and there is no leakage.

(1-b) Stream intake:
It is built when a stream is selected as the water source. The characteristics of a stream intake depends on the type of stream, its morphology and the expected maximum and minimum flows. The intake in a stream should be located to take advantage of its morphology. Since each river has its own unique characteristics, only a general guideline can be provided for its design and construction. Configuration and other requirement for its design should be constructed with a stream intake.

(2) Pipeline
The pipeline transfers water from the source to the service area. Pipelines require high investment outlay, and hence careful consideration is necessary for its design. Choosing its alignment, size and material, therefore, calls for utmost caution. Proper selection of pipe alignment route is essential to ensure that the pipeline is laid through stable terrain to minimise disruptions later on. The operation and maintenance tasks then become more easy.

Pipes are manufactured from various materials which come in different sizes and pressure ratings. The choice of pipe for a particular situation is governed by its availability, resistance to corrosion and mechanical damages, and pressure limits. The ease with which pipes can be transported and joined also influences the selection.

Locally manufactured High Density Polyethylene (HDP) pipes are mostly used in community water supply schemes in Nepal. In rocky terrain, and when the static water pressure is likely to be very high, HDP pipes are not suitable. Galvanised Iron (GI) pipes and in special cases high pressure steel pipes may be used whenever static head is exceptionally high. GI bends should be used instead on unavoidable acute bends, anchor or thrust blocks should be provided. After the pipeline is laid, protection works need to be carried out against backfill material getting washed away.

Pipeline in a water supply scheme consist of transmission main and distribution pipelines.

(2-a) Transmission Main:
A pipeline that feeds a storage tank continuously for 24 hours from a source (intake - Storage Tank) is called a Transmission Main. It is designed without considering any peak factor. The transmission main may be designed with the concept of open flow. For easy operation and maintenance, washouts are provided in the transmission main. In order to prevent the static pressure in the transmission main the valves are provided only at the outlet of the interruption chamber. When the valve is closed for maintenance the section immediately upstream continues to flow as open system and static water pressure never builds up. When the transmission main is designed under open flow condition the number of interruption chambers required would be reduced. However, for easy operation and maintenance washouts should be provided at every 1.5 km interval. A transmission main should closely follow the profile of the ground surface along the selected alignment. A reconnaissance survey should be carried out and the alternative routes evaluated. Some points to be taken into consideration in the choice of pipe alignment are as follows:

- free from contamination.
- the available head
- the distance from source to the service area
- nature of soil and its stability with regard to land side

- nature of the terrain: steep slopes, rocky areas, forest, agricultural land etc.
- nature and type of river crossings
- whether the alignment can be along existing paths, trails to facilitate easy maintenance as accessibility would be easy.

The hydraulic grade line should be always 10 m above the ground level. Due the nature of the ground profile, some-times, it may fall below the ground at critical points. In such case negative pressure would develop in the pipeline, which must be avoided. For this purpose, chambers should be provided at suitably located points in the pipe profile called interruption chambers, these are also used to break the dynamic head if it is too high.

The selection of the pipe route should consider the following points :
- the ease of construction,
- transportation of pipes to site,
- trench excavation,
- laying and jointing,
- refilling of trench and
- shortest technically possible route.

Many times even if the chosen pipe alignment is short and hydraulically satisfactory, it may be unsuitable for laying the pipeline due to one or more reasons stated above. Pipe routes along rocky terrain should be avoided, if possible. If such alignment can not be avoided, the pipeline should be laid on the rock face with suitable pre-cover or anchors. Once the alignments has been chosen, the next step is to undertake detailed survey along the selected route.

(2-b) Distribution Pipelines

Distribution pipelines are used to supply water to the various consumers. pipes of different diameters and lengths constitute a distribution network. Distribution pipe sizes are determined by the tap flow rate when the water is supplied through the standpost. The distribution system should supply water at adequate residual head and should be accordingly sized. While selecting the alignment of distribution line following points should be considered:

- avoid geologically unstable sections such as landslides, gullies, streams etc. If stream crossings cannot be avoided then crossing such as suspended cable should be used.

- alignment along the side of an existing footpath is acceptable even if it would increase the pipe length. People using the path observe any leakage and most likely will inform the Village Maintenance task easier. If it is not possible to follow an existing path, it is advisable to create one for which co-operation of the users should be sought.

- sudden changes of the pipeline alignment in the horizontal or vertical directions should be avoided. The pipeline gradient should be uniform for as long stretch as possible. Frequent changes in gradient will result in several high points and should be avoided. For practical reasons, not every high point need to be provided with an air valve. in distribution systems also high points may affect flow because of entrapped air.

- stretches parallel to the Hydraulic Grade line (HGL) should be avoided, as unstable flow condition may result. This prevents the entrapped air from moving

in either direction. In the distribution pipe of a closed system, HGL changes whenever faucets are closed and opened.

- alignment should be selected to avoid excessive pressure. Deep valley and ravines should be avoided by re-aligning the pipeline if an alternative exists. However, this might result in a longer alignment which may prove to be costlier than using pipe that withstand higher static pressure. The cost of alternatives should be compared in such cases.

Having fixed the distribution pipe alignment including the location of the storage tank, the next step is to undertake detailed survey of the proposed service area. The surveyor should collect the feasibility survey report and the sketch plan of the service area from the District Office. If such a plan is available, the surveyor should work with the plan as the base map and fill in additional information. If it is not available, a layout map of the service area showing the location of the different villages/ wards, trails, important public institutions and buildings should be prepared. On same layout plan the surveyor should also mark the population and number of houses that each standpost (tapstand) will serve.

To minimised operation and maintenance requirements, the number of varying diameter pipes should be reduced in the distribution lines as practicable as possible.

Other Components

Other structural components that may be provided in a water scheme are as follows:

(3) Sedimentation Tank

Water from streams or rivers may contain suspended matters like leaves, branches, and sediment particles which come with the flow. These materials may cause of the following operational problems:

- reduction of pipelines capacity which in extreme situation can block the pipe completely,
- reduction of capacity of storage tank due to sediment deposit,
- increase of wear and tear of system appurtenances e.g. valves can not be closed and air valves constantly leak.
- scouring of internal pipe surfaces when the water flow velocity is high.

In order to overcome above problems, a sedimentation tank is necessary before the storage tank and close to the intake structure or collection chamber. The amount of sediment likely to enter the water system depends on the types & volume of sediment brought by a stream. This quantity depends on type of the river's watershed, its natural environment and the volume of sediment generated, its land use, the characteristic of the river such as discharge, velocity and slope. The sediment transport characteristics of a river may be to form an idea about the nature of sediment carried by the stream if detailed data is not available, which generally is the case in Nepal.

The size of sedimentation tank required depends on the size of sedimentation particles entering the transmission mains. Sedimentation tanks should be provided as close as possible to the collection chamber or intake. The following detention periods are recommended for community based rural water supply schemes:

- 1 to 2 hours for rivers which carry relatively coarse material only, and for pipe systems where the computed flow velocities in the main pipes is above 1 m/s.

- 4 to a maximum 6 hours for rivers which carry fine material and where the computed flow velocities in the main pipes is below 1 m/s.

The volume of sediment removed depends on the type of sedimentation unit used. The standardised plain sedimentation recommended has a detention time of 1 hour and generally removes particle size up to the mean diameter of 0.05 mm.

(4) Storage Tank

Storage tank are necessary to balance the variation of demand in a day. For economical reasons, it is important to place the storage tank(s), as close as possible to supply area so that the cost of a scheme is reduced. It should be carefully cited keeping the following points in mind:

- the storage tank should be located at suitable place above the highest located standpost of the service area so that a residual head of 5 m to 10 m can be maintained at the stand post.
- the storage tank site should be located towards the lower edge of a terrace to avoid long pipelines carrying peak flows in flat terrain.
- storage tanks must be accessible at all times and not located in rice fields to reduce risk of contamination and failure from uplift pressure.
- instead of one storage tank or tanks served in sequence, several small storage tanks which are served by independent supply lines should be provided.

For a rural water scheme, storage tanks are usually constructed either of stone masonry or ferrocement. Stone masonry tanks are more costly compared to ferrocement tanks. Ferrocement tanks are proposed to be used as storage tanks. A trained technician can build a ferrocement tank in a relatively short time. Construction of ferrocement tanks also requires less contribution from the community members.

Ferrocement tanks of capacity 1 m3 to 10 m3 in the interval of 1 m3 and above 10 m3 up to 20 m3 in the interval of 2 m3 are standardised for community water schemes. If the required size is more than 20 m3, combination of two or more tanks or a stone masonry tank may be adopted. for smaller storage tank investigation could be made for use of plastic tanks.

(5) Break Pressure Chamber (BPC)

At any structure/ device where water is permitted to discharge freely into the atmosphere, the hydrostatic pressure is reduced to zero. Such a structure / device will break the hydrostatic pressure. A small tank specifically built to break the hydrostatic pressure in the pipe line is called Break pressure chamber (BPC).Storage tank, sedimentation tank, collection chamber, distribution chamber will also act as Break Pressure besides serving their primary purposes. A float valve is always provided in a Break Pressure chamber. It is used in the distribution system when the pressure head exceeds 60 m of water. the limit is specified because most float valve can satisfactorily withstand up to 60 m head. BPC should not be constructed fully underground and protected by providing barbed wire fencing.

(6) Distribution Chamber (DC)

To split supply network into manageable sub-systems serving lesser number of standpost, a distribution chamber should be provided. It also facilitates division of flow in the distribution sub-systems. To respective flow in each sub-system will be carried by separate pipelines from each decentralised storage tanks. In the proposed Chisapani Scheme, a term "Distribution tank" has been used for this chamber (Section 2.4).

(7) Standpost (Tapstand)

The standpost or a tapstand is a central and the most frequently used component of a water scheme. A standpost will be more than just a physical structure and may become important landmark in the community. Its design should therefore, conform closely to the social and cultural aspirations of the community. The standpost must be appropriately located. It must be aesthetically pleasant and robust. The central pad of the stand post should made of concrete, while stone paving will be desirable on the outside. The drainage from the standpost be taken away from it and safely disposed. When it is not possible to easily drain away waste water, appropriate soakage pit is provided. In the proposed Chisapani scheme, a term "Delivery tank" has been used for a tank that delivers water to household storage tank and also plays a roll of a standpost/ tapstand (Section 2.4 for detail).

The location of a standpost is governed by the population density, and by the settlement pattern. In areas having low population density, a standpost may be needed to serve only a few houses. the provision of the standpost may be determined by the following two factors:

a) maximum desirable walking distance to fetch water, and
b) the number of people who are supplied water conveniently.

The number of people to be served by a standpost is also determined by the tap flow rate. A standpost should serve a maximum 100 users. The following standpost location criteria based on water carrying distance should be used as a reference.

The criteria for locating standposts should be clearly explained to the users who should decide the sites. Often the location of a standpost is influenced by certain groups. It can be avoided by selecting a location which would be acceptable to all the users. To avoid complications, the following guidelines should be followed in locating a standpost:

- accessible to all users all the time.
- not located within a house or court yard.
- if the location is likely to create friction, the villagers should be persuaded to choose an alternate location.
- located where waste water is drained away easily.

In some cases, few houses may exist along the transmission main route. These users may be served by tapping average flow from the transmission main. A storage tank of 1 m3 capacity may be provided along with a standpost to distribute water to these households.

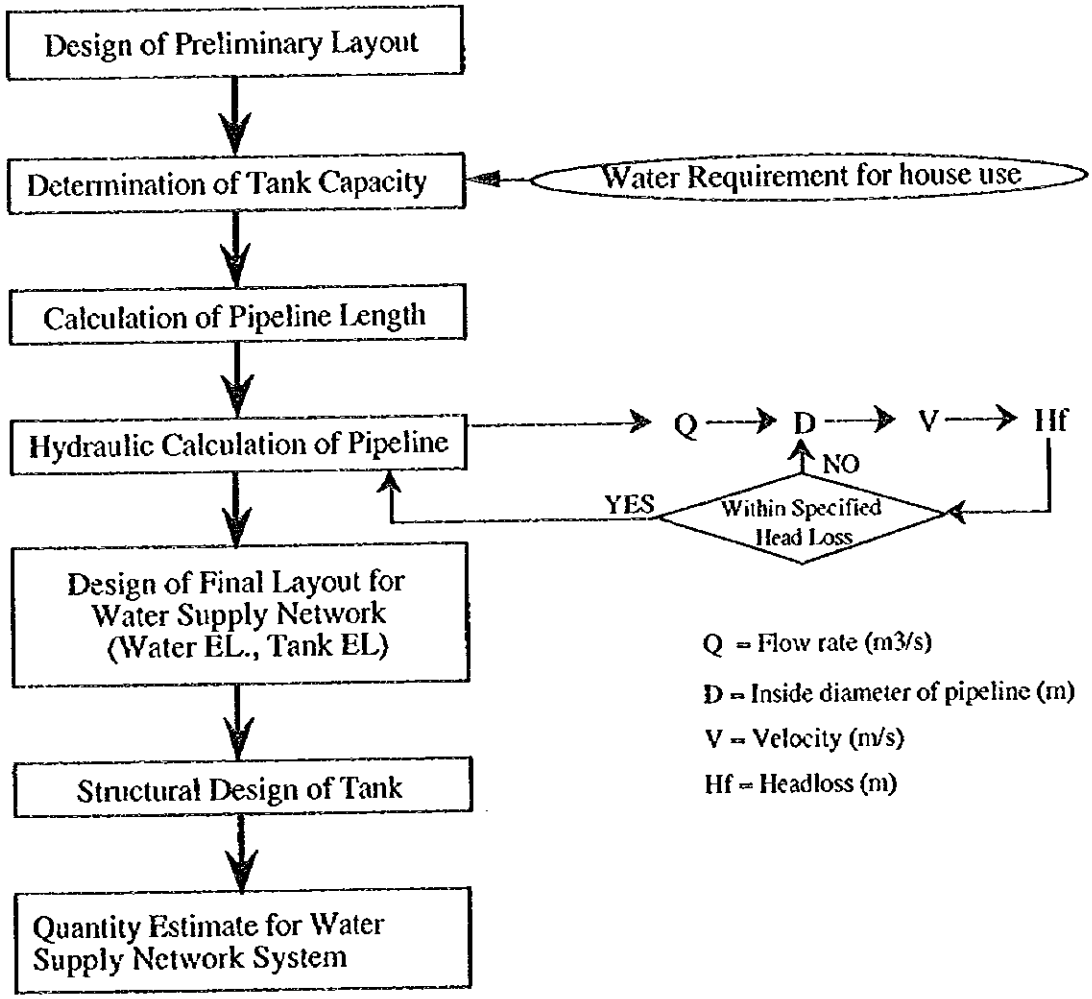
1.1.5 Design for Rural Water Supply Scheme

The design of network system is based on the Design Criteria for the Design Guidelines for Community Based Gravity Flow Rural Water Supply Schemes published by HMG-N/ UNICEF as described in the previous section. Its important factors are given in Table 1.1.1 and a flow chart for design of network system is shown below:

As seen in the case for the rural water supply network system development in Chisapani area, as described in section 2.4, in some case, the water requirement could be integrated with some other purposes as long as the supply of water allows it. The designing stage basically starts from identification of the preliminary layout of the system, then water requirement for the smallest unit, e.g. per capita, or per household, will be assessed. After defining the said requirement, tank capacities will be calculated one by one.

Hydraulic calculation will follow after determination of the inflow rate into basic tanks, and determined in iteration until headloss, hydraulic head as well as flow rates are satisfied within specified range.

Flow Chart for Design of Rural Water Supply Schemes



1.1.6 Implementation Program for Rural Water Supply Schemes

Community based approach

A community is defined as the group of people who socially interact, pursue a common goal to improve their quality of life and come together to attain it. Community participation is the involvement of the beneficiaries in (a) making the decisions about the goal, (b) implementation of the decisions and (c) deriving the benefits from the implementation. Community participation in Implementation of Rural Water Supply Schemes would involve the beneficiaries in the following activities:

(a) Participation in Decision making:

It is the continuous process of discussion, disagreement and collective consent from the initiation of a plan or program. Identifying the need for water scheme, prioritising this need from among other needs of the community and making requests are the other decision to be made.

(b) Participation in the implementation of Action(s) as decided upon above:
It includes actions and involvement of the users in cost sharing through contributing labour, provision of local materials, supervision & management of construction, etc., in collaboration with implementing agency. Participation in implementation pertains to providing resources as well as support for implementation of the scheme. Users share cost by undertaking tasks like trench digging, backfilling, excavation for storage tanks and standposts (tapstands) including collection of stones, sand and other local materials.

(c) Participation in Sharing Benefits to be Derived from the Action and Cost to undertake the Actions:
It is sharing of both the benefits and burden by the users. When the water supply scheme is completed the users share the benefits with the out-put of the participatory action e.g. a safe water. Since they share the benefits the cost of ensuring the delivery of water also lies with the users.

The factors outlined above constitute the three important elements of community participation. A fourth factor; evaluations by beneficiaries should also be included.

Partnership Concept between Implementation Agency and Beneficiaries

Community water supply development is based on partnership concept. Trust between the implementing agency and beneficiaries is therefore, paramount. Community participation is not only the means of organising labour & materials for the implementation but also establishing dialogues with the community and being sensitive to their needs/ constraints. Partnership approach is based on the following concepts.

(i) The long term objectives of water supply and sanitation will be achieved when beneficiaries become equal partners in development.

(ii) A partnership programme works best when the role of each partner is clearly defined and understood from outset.

(iii) Implementing agency performs as a facilitator by providing financial, technical and material support for community efforts.

(iv) If the community is involved in organisation and management for planning and implementation (one or two years for the completion of a gravity supply scheme) it will also be able to organise and manage operation and maintenance of water supply and sanitation system once the project is completed.

(v) A community organisation can manage construction, operation and maintenance of water supply and sanitation system when it is adequately supported by community development, water supply and health field workers.

Sustainable Development through Participatory Approach

A water supply scheme developed by the participatory approach is sustainable as it:

- Satisfies a Felt Need
- Provides a Sense of Ownership
- Integrates Health/ Hygiene Education through Women Involvement
- Insures Upkeep & Maintenance
- Uses Local Skills and Resources
- Selects Right Level of Technology
- Strengthens Local Organisations
- Acts as a Catalyst for Development

In a rural community, water supply schemes could be an entry point for bringing in other development activities. When a water scheme is managed successfully by the community, the chances of success of other development activities are also increased. The villagers would understand partnership concept of development in which they have to meet labour cost in exchange of the technical support provided by the implementing agency.

Key Elements of Successful Community Participation Approach

A community based method should incorporate following elements in the procedure:

Demand Led Development: For the success of a community based approach, request for the water scheme must come from the users. All the beneficiaries should express their willingness in the scheme and support the request. Whether actual users are involved in making the request for the scheme should be checked.

Users Involvement: Another element essential for the success of the community based approach is the involvement of the users in all stages of the schemes development. Pre-feasibility, feasibility, detail survey and design of water scheme should be done in consultation with the users. Women members should be encouraged to participate in locating standposts (tapstands) and other structures. Users should also contribute labour and local materials and will also have the responsibility for supervision, operation and maintenance as well as the overall management of the completed scheme.

Transparency: Transparency is the key to the success of community based water supply schemes. The design and cost estimate of the scheme should be endorsed by the users' committee. The committee should be in position to explain the statement of expenditure to all beneficiaries.

Planning: The life style in rural areas is a routine of several interrelated activities in which the community members are involved. The construction activity for example, will be influenced by rains, plantation and harvesting of crops, festivals and local customs. Community based water supply schemes should be planned when villagers are free from such activities. A general sequence of activities is shown in Fig. 1.1.2.

Finally, responsibilities of beneficiaries/ users' Committee, as well as the responsibilities of implementing agency is described in a form of checklist, as shown in Tables 1.1.2 through 1.1.3, respectively.