ANNEX - 7

AGRICULTURE

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

Annex-7: Agriculture

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FINAL REPORT

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Annex-7: Agriculture

1. INTRODUCTION

1.1 Background

The agriculture sector occupies a predominant place in the Nepalese economy accounting for 43 per cent of the GDP (1993/94). The major share of the economically active population (81% ; 1991) depend on agriculture sector. Nepalese farming system has been operating on a self-sufficiency basis . Because of the low growth rate in GDP in comparison with the high growth rate in population, the per capita income is almost stagnant . The pressure on arable land is very intense in the Hills and the Mountains. In light of high dependence on agriculture, sustainable economic growth can not be achieved without the development of this sector. But this sector is still directly affected by vagaries of monsoon.

In July 1993, an unprecedented disaster of floods and landslides occurred and severely affected to the Central Development Region of Nepal. Many districts in the region suffered from damages such as lost and buried farm land etc. Such damaged communities are still dangerous to further disaster. The reduction of the vulnerability of the regions to further disasters and empowerment of the people should be focused. In this sector report, three areas in Makwanpur District -Phedigaon/Phatbazar (Palung VDC), Chisapani (Agra VDC) and Namtar (Namtar VDC) which were severely affected by the 1993 disaster are studied and income generation measures have been recommended as a Community Disaster Prevention Plan(CDPP). In this report,country level macro socio-economic data have been analysed to know the features and position of the study area.

1.2 Population

According to the census of 1991, the population of Nepal is 18.5 million. During 1971 to 1981, net increase of population was about 3.5 million and annual average increase rate during the same period was 2.66%. During the last decade from 1981 to 1991 net increase of population was about 3.5 million and annual average increase rate during the same period was 2.1%. Although the increase rate decreased from 2.66% in previous decade, increased population was almost the same (refer Table 1.2.1).

Out of the three ecological regions, the Hills and the Terai are the most populated regions. The Mountain region extended east to west in the north of the country lying at the altitude

of 4,877 meters to 8,848 meters above the sea level, constitutes about 30% of the total land area of Nepal and the land is populated by 7.8% of the country's total population.

The Hill region lies at an altitude ranging between 610 meters and 4,877 meters above the sea level and occupies 42% of the total land area of Nepal. About 46% of the country's population are settled in this region. The cultivated area lies in the hill tops, hill slope terraces, river basins and small valleys.

The Terai region is the flat land of the southern part of the country and occupies 23% of the total land area of the country. This region lies at an altitude ranging between 60 meters and 610 meters above the sea level. About 47% of the country's total population are settled here.

During the period of 1971 to 1991, the proportionate share of the population in Terai has increased by about 9 points from 37.6% in 1971 to 46.7% in 1991. During the same period, in the Hills the share dropped by about 7 points from 52.5% in 1971 to 45.5 % in 1991. The share of Mountain area dropped from 9.9% in 1971 to 7.8% in 1991.

With respect to the population distribution and the land area the population pressure is heavy in Central Development Region where only 18.6% of the land is available for 33.4% of the country's population . Second heavily populated region is Eastern Development Region followed by Western Development Region and Mid-western Development Region . The most populated zone was Bagmati Zone where the capital city of Kathmandu is located with 12.17% of the country's total population and the lowest was Karnali Zone with 1.41% of the total population (refer Table 1.2.2).

1.3. Trend of Migration

The pressure on arable land is very intense in the Hills and Mountains, which is gradually increasing due to an increase in the total and economically active population depending on it. The exodus of people from the Mountain and Hills to the Terai is attributed to the higher availability of cultivable land and employment opportunities in the latter area. As Table 1.3.1 shows,among the 1.42 million migrants in 1991, 78.36% were found settled in the Terai region, 18.83% in the Hills and 2.81% in the Mountain. In the Hill region, it is only the central hill where Kathmandu valley is located in-migrants out numbered out-migrants (refer Table 1.3.1).

As the result of this population movement, the Terai which constitutes only one-quarter of Nepal's entire land, now supports 47% of the population as mentioned before.

Availability of land is one of the main pull factors of migration in the Terai. The land in Terai is plain, cultivable with less labour investment and fertile. Another pull factors are better hospitals, educational, social and cultural facilities. The Terai district have better marketing and transportation facilities. Economic growth in Nepal has taken place primarily in the Terai and the Hills and Mountains have rarely enjoyed the benefits of development and have been left behind.

1.4 Economically Active Population and Occupation

In Nepal, agriculture is the main source of income and employment. Over 90% of the population is engaged in agriculture and is earning their livelihood from this sector. While the economically active population increased from 6.8 million in 1981 to 7.3

million in 1991, there has been no substantial change in the employment structure as shown in Table 1.4.1. The major share of the economically active population (81.1%) depend on agriculture sector which is mainly traditional subsistence oriented and depended mainly on local resources. The percentage of economically active population in agriculture sector has remained more than 90% from 1950 to 1981. This figure has some declined to 81.1% in 1991. It means in 40 years (1950 - 1991) there has been no substantial change in the employment structure.

Among ecological regions, the percentage of economically active population engaged in agriculture is highest in Mountain (91.7%) followed by the Hills (84.9%) and Terai 74.0% (refer Table 1.4.2). Among development regions Far-western development region has the highest percentage of economically active population engaged in agriculture (89.4%). The Terai region tends to be diversified in occupation more than other regions. In the Hill region only the central development region where Kathmandu, Hetauda, Birganj, and Janakpur are located, are well-diversified in occupation.

In manufacturing sector only 4.23% of the economically active population were engaged. The manufacturing sector is dominated by the manufacture of carpets, garments and handicrafts.

1.5 National Economy

Nepal is predominant agricultural country. In 1993/94, agriculture sector contributed to more than 43 percent of the total GDP (refer Table 1.5.1). Low growth rate in GDP in comparison with the high growth rate in population, the per capita income recorded only a marginal increase. According to the Eight Plan (1992-1997) the average annual growth in GDP, during 1964/65 to 1989/90 was 3.4 percent, whereas the growth in per capita income was a mere 0.8 percent. In a period of 26 years, the increase in per capita income was merely Rs 30 at 1974/75 prices. The high variations in output from one year to another is attributed to the weather-dependent agricultural sector. As Table 1.5.2 shows important non-agricultural sectors include construction (10.54%), financial and real estate (9.72%), manufacturing (9.24%), community and social services (9.13%) etc. As mentioned above growth in agricultural sector has been stagnated recent several years as shown in Table 1.5.1. Non-agricultural sector has grown steadily although slow.

2. CURRENT SITUATION OF AGRICULTURE SECTOR IN NEPAL

2.1 Land Use

Table 2.1.1 shows the land use condition of Nepal. The total area of Nepal is 14.855 million hectare and about 20% (2.968 million ha) is under cultivation. Forest covers 42.4 percent, pastures 11.8 percent and 19.1 percent of the total land area is accounted for by other uses. The estimated forest area also includes the area under shrubs. Increasing demand for food, fuel and fodder has contributed to a rapid rate of deforestation and has been a matter of major ecological concern in recent years.

2.2 Land Tenure and Holding

The distribution of land holding is very skewed in Nepal. Table 2.2.1 shows that in 1991, over 2/3rd of the farm households have still less than one hectare of land and they cultivate about 30 percent of the cultivated land only. Large owners with more than 3 ha which comprise about 5 percent of land owners cultivate about one third of the cultivated land.

Average land holding is bigger in the Terai region with some 1.5 ha, while in the Hills region 0.9 ha and the Mountain region 0.6 ha. The average size of land holding in the country is 1.1 ha.

In Nepal there are about 2.2 million registered land with a holding size of 2.5 million hectares. About 1.4 million hectares are wet land, and the remaining are dry land. Most of the land is cultivated by the owner farmers. It is however, generally considered that the statistics overstate the actual situation as land lords are reluctant to enter into formal tenancy agreements.

Rural landlessness has not yet been systematically studied in Nepal. The official estimates of landless rural households according to the national Sample Census of Agriculture (1981) is 0.4 percent. According to the Central Bureau of Statistics, the percentages of landless rural house holds is in decreasing trend. In 1961 households without land were 1.42 percent of the total households, in 1971 they were 0.95 and in 1981 only 0.40 percent of the households were landless.

2.3 The Characteristics of Hilly Agriculture

Most of the people living in the hills and mountains live in rural areas. As the population is constantly increasing land availability is reducing and what is there is often parcelled to be redistributed to sons. This system of land distribution has caused further fragmentation of land which is already fragmented. Terraced farm land built on the slope of the mountain is subject to small, which makes cultivation practice rather troublesome.

In the hills a individual farm has four components, the farm household, the land for cultivation, the livestock, pasture land or private forestry. Grazing land, forest, crop land provide feed to animals whereas livestock provide manure to forest and grazing land manure and draught power to crop land (Fig 2.3.1).

Agroforestry, growing fodder trees and fruit trees has been traditionally practised in the hills of Nepal. The importance of agroforestry has been noticed by many institutions, GOs and NGOs and have stressed the need of agroforestry development in the hills of

Nepal. The hill farming has been sustained from centuries mainly due to growing trees in combination with growing crops and keeping livestock.

Under the prevailing land classification system the land is generally classified into two types, ie. Bari or Pakho (Dry/upland) and Khet (wet/low land). Bari land refers to the dry uplands which can not be used for wet rice cultivation and maize and millet are the dominate crops for Bari land. Khet refers to the land where water can remain for certain time making it suitable for paddy cultivation.

Numerous cropping pattern exist in the hills and the crop combination varies with altitude, climate, soil etc. Main cereal crops produced in the hill area are paddy, maize, millet, whet and barley. But in Northern higher hills potato is the main crop.

Terraces are made up to the top of the mountain create a beautiful landscape. Terraced farming is also environmentally sound when considering sloping agriculture. Terraces can prevent soil erosion from heavy rain to certain extent. Water can be restored and could augment recharge ground water.

In Hilly areas, accessibility from one place to another is rather difficult in the area due to lack of transportation system. Closeness, low external dependency, poor mobility, high transportation cost are the main obstacles for agriculture development. Further more, the land in the hills is vulnerable. It is prone to disaster, land slides and soil erosion. Failure of terraces, landslides and gullies are common phenomena in the hills. Farming is a dawn-to-dusk, hand-to-mouth existence and yields depend on the size of land holding rather than on the quality of farming techniques. Farmers use traditional hand tools and oxen for farming.

2.4 Cereal Crops Production

2.4.1 Cropped Area

Cereal crops like paddy, wheat, maize, millet and barley occupy about 90 percent of the cultivated area of Nepal and are the staple food for most of the population. Geographical variations makes different climates which allow to grow variety of crops in Nepal. Their productivity levels vary across different agro-climatic zones. Paddy is grown in about 50% of the cultivated area followed by maize wheat, millet and other cereals (refer Table 2.4.1). The cropped area of paddy has increased by about 15% between 1978/79 and 1993/94. The increment is very high in the Mountain (74%) and in the hills (70%) where the increment of production is about 65% and 51% respectively .

Maize occupies second position as a food crop after paddy. Cropped area of maize has increased by about 65% between 1978/79 and 1993/94. From the production point of view, wheat stood third in cereal crops after paddy and maize. Area cultivated to other food grains like millet and barley also have been increasing (refer Table 2.4.1). Reflecting climatic adaptability of crops, important crops in terms of area differs among geographical regions. In the Terai paddy is by far dominant crop followed by wheat and maize. While in the Hills and mountain regions maize, wheat and millet are of more importance.

2.4.2 Production

The cereal production in 1993/94 is about 5.9 million tons, about 60% of which or 3.5 million tons are harvested in the Terai. Paddy is the most commonly used staple food in

the country, accounting for 3.5 million tons or 59% of total cereal production followed by maize (1.2 million tons or 20%) wheat (873 thousand tons or about 15%) etc. About 77% of total paddy production comes from the Terai. In the Hill area maize production is the largest among the crops with the amount of 812 thousand tons or 67% of the national total production. From the production point of view, wheat stood in third production in cereal grains production after paddy and maize and about 61% of total production comes from the Terai. Millet and barley are mostly produced in the Hills and the Mountains. (refer table 2.4.1 to 2.4.6). Between 1978/79 and 1993/94 the total production of cereal crops increased by about 60% which is mainly attributed to the yield increase of paddy in the Terai region and the significant expansion of maize area in the Hills.

2.4.3 Yields

Agricultural productivity in Nepal has been stagnant, with yields of the main crops increasing little or not at all. As explained before, past increase in production of major crops have come mainly through the expansion of arable land in the Terai and cultivation of marginal land in the hills and mountains. According to the agricultural statistics for the year 1993/94, yields of major cereal crops are : 2.40 ton/ha for paddy, 1.61 ton/ha for maize, 1.41 ton/ha for wheat, 1.1 ton/ha for millet and 0.95 ton/ha for barley, respectively (refer Table 2.4.2 to 2.4.6). Paddy shows increasing trend from the late of 1980's and other cereal crops are in either declining trend or stagnant. Yield of major crops is generally higher in the Terai than other regions. (refer Table 2.4.2 to 2.4.6).

Per ha increasing trend of paddy yield is attributed to the improvement attained in the Terai region. The hills and mountain regions are in declining trend or stagnant in paddy as well as other cereal crops. (refer Table 2.4.2 to 2.4.6).

Table 2.4.7 shows that, in comparison with some South Asian countries and Japan, the yield of paddy is much lower than that of Sri Lanka (2.94 ton/ha) and Japan (4.9 ton/ha). Per hectare yields of wheat in Japan and other neighbouring countries are from 3.4 ton/ha to 1.7 ton/ha. However, the yield of maize and millet are comparatively higher than those of other South Asian countries. The yield of barley is much lower than that of India (1.6 ton/ha) and Japan (3.2 ton/ha).

2.5 Food Balance

As described before, in 1993/94 agriculture contributed to more than 40 percent of the total GDP and agriculture has been a source of livelihood for almost 90 percent of the population. His Majesty's Government of Nepal has laid major emphasis on the development of agriculture sector. However, production has not been able to keep pace with the population growth. The population growth rate per annum between 1981 and 1991 is 2.1 percent as described before and food crops alone occupy about 90 percent of the cropped area, the food balance sheet shows chronicle food deficit as shown in Table 2.5.1.

It will be difficult to increase food production in line with the population growth under the present falling production trends. If the present encroachment upon marginal land continues, there is a great danger of a further decline in fertility and the threat of soil erosion. Since most of the agricultural products relay almost exclusively on rain water, in years of unfavourable weather food shortage is more severe. Even when supply and demand are well balanced on the national level, there are considerable disparities between the Terai and the hilly regions. There are generally surplus in the Terai, there are always shortages in the Hills and the Mountains.

In 1970's Nepal produced surplus food grains, specially rice are exported to India. In 1974, seven rice exporting companies were established . However, as exportable surplus declined, those companies were dissolved in 1980. Presently, Nepal Food Corporation (NFC) established in 1974, is mandated to procure, store and transport food grains from surplus to deficit areas. NFC operates its food grain distribution activities through co-operatives, some private individual and its field offices. Food grains is acquired from domestic sources. NFC manages buffer stock too.

2.6. Cash Crops Production

The main cash crops produced in Nepal are potato, sugarcane, oil seeds, jute and tobacco. Potato is cultivated throughout the country; the other cash crops are cultivated mainly in the Terai. The cropped area of sugarcane and potato increased by about 83% and 76% respectively between 1978/79 and 1993/94. During the same period, the production of sugarcane increased by more than 280% and the potato by more than 170% (refer Table 2.6.1). The per hectare yield of sugarcane, and potato is in increasing trend. The cropped area of oilseed has been increasing but the production and the yield are declining or stagnant. The cropped area of tobacco is in a declining trend. However, the per hectare yield is increasing (refer Table 2.6.2 t o 2.6.5).

Concerning vegetable production, in 1989/90 cauliflower, cabbage, tomato etc. were cultivated in about 140.5 thousand hectares and the total production was 970.2 thousand tons. (refer Table 2.6.6). The share of cabbage and cauliflower in total vegetable production was about 16% each followed by tomato 11.3%. Vegetable production is becoming commercialised in areas linked to road and near the markets. Among fresh vegetables, cauliflower is considered as delicious as well as prestigious. The current level of production is unable to meet the domestic demand and vegetables are imported from India. The total annual need of the whole country is estimated about 1.8 million tons (The Daily Gorkhapatra, June 12, 1996) and the production is far behind. The main factors affecting the development of vegetable production are the lack of irrigation and transportation facilities. Some districts in Tarai, Palung area in Makwanpur which have access to India are exporting vegetables to India.

2.7 Distribution of Agricultural Inputs

2.7.1 Chemical Fertilisers

Table 2.7.1 shows the statistics of fertiliser consumption indicating an increasing trend over the period of 1984/85 to 1993/94. In 1993/94 the consumption of chemical fertiliser was 73,810 ton, which is about 25 kg per hectare of cultivated land. Chemical fertiliser which is one of the prime factor affecting the growth of agricultural production is confined in accessible areas. Increases in chemical fertiliser consumption has been slow because of inadequate transport facility, inefficient distribution network, uncertainties in supply etc.

2.7.2 Improved Seeds

Regarding to improved seeds, it is significant that wheat farmers tended to use much higher proportions of improved seeds. During the year of 1993/94, the consumption of improved seeds of paddy, wheat and maize were 242 ton, 3,229 ton and 105 ton respectively as shown in Table 2.7.2. Improved seeds have to be accompanied by chemical fertiliser and irrigation to obtain the maximum yield. Although Nepal is

relatively well endowed with water resources, only a fraction of total potentials has been utilised and the situation of present irrigation system is very poor. There has been an increase in the use of plant protection materials also during the period. Agricultural mechanisation is very slow. Most cultivation is done by labour and bullock power. In general the agricultural sector has been slow to adopt improved practices.

2.7.3 Agricultural Credit

Although farmers in Nepal utilise both institutional and non-institutional credit, the Agricultural Development Bank (ADBN), a government owned institution established in 1968, is the main source of formal credit in the rural areas, with loans outstanding at mid July 1992 of Rs about 4.5 billion of which 63 percent for the Hills, 42 percent for the Terai and 5 percent for the Mountains. Livestock, cereal, crops, cash crops and agricultural marketing are the major areas of lending (refer Table 2.7.3).

Small Farmers' Development Programme (SFDP) which is being operated under the supervision and control of the Agricultural Development Bank, lends for agricultural, horticulture, cottage industry, education, sanitation, irrigation drinking water, afforestation, road etc. By mid July 1992 the outstanding loan stood Rs 684 million. Out of total outstanding loan 47.2 percent was for the Terai, 46.2 percent for the Hills and 6.6 percent for the Mountains (refer Table 2.7.4)

2.8 Livestock Production

Livestock production constitutes more than 30 percent of the total agricultural production (Economic survey 1994/95). Livestock is an integral part of the farming system in the country. The livestock population most of which is locally bred, consists of cattle, buffaloes, sheep, goats, pigs, fowl etc. The limitation of cultivated land and insufficient food grain production have compelled farmers to be more dependent on livestock to supplement their income. Livestock is the major source of their cash income. The population of cattle is the largest followed by sheep/goats and buffaloes. The largest number of livestock population is found in the Hills (refer Table 2.8.1)

Livestock has contributed to the income and employment opportunities for small farmers in the rural areas. In rural areas large number of unproductive animals, scarcity of fodder, inadequate veterinary services, lack of livestock marketing system, have been constraints to livestock development.

According to the MOA Statistics, in 1992/93, 261 thousand ton of cow milk and 616 thousand ton of buffalo milk was produced. The meat production was recorded as much as 150 thousand ton. The total egg production in 1992/93 was 370 million in numbers. The total wool production from sheep was 619 ton from 911 thousand number sheep.

2.9 Fish Production

The fish production in 1992/93 was estimated to be 8,609 thousand Kg and the yield rate was 1,923 Kg/ha. The main sources of fish production in the country are captured fisheries and aqua culture. The per capita consumption of fish in Nepal is just 0.5 Kg, which is very low compared to global per capita consumption of 12.4 kg/year (MOA). In 1992/93 the Terai region produced 8,433 ton or 98% of the total fish production in the country (refer Table 2.9.1)

2.10. Agricultural Research

The modernisation of agricultural sector is possible through the application of modern technologies. Table 2.10.1 briefly presents the history of the agricultural research system in Nepal. Agricultural research in Nepal covering cereal crops, cash crops, horticulture, livestock and fisheries research comprises many commodities. There are all together 29 agricultural farms under the Department of Agriculture Development as shown in Table 2.10.2. Various commodity specific, subject specific and area specific research programs, have led to the development of some improved technologies in major food crops, cash crops, livestock, fishery etc. During the seventh five year plan period. Nepal Agricultural Research Council (NARC) was established as an autonomous body under the chairmanship of the Minister of Agriculture. The research network of Nepal Agricultural Research Council is shown in Table 2.10.3.

Lumle Agricultural Centre (LAC) and Pakhribas Agricultural Centre (PAC) conduct research mainly on hilly agriculture. LAC was established in 1968 and is located at 30 km North-West from Pokhara. The centre was funded by the British Government. The major objectives of the centre is to improve productivity and income of the farmers through generation, verification and dissemination of relevant and sustainable technologies for hilly agriculture. It has encouraged farmers for vegetable seed production and income generating activities. Livestock and fodder improvement programmes have been successful as well.

PAC was established in 1972 by the British Government and is located at 15 km North-West from Dhankuta. The major objective of the centre are similar to LAC.

In 1983, International Centre for Integrated Mountain Development (ICIMOD) was established. The objective of the centre is to promote economically and environmentally sound development in the Hindu-kush Himalayas. ICIMOD is a centre for multi-disciplinary documentation, training, applied research, as well as development activities in mountain regions along with initiating agricultural projects, training, seminars, etc. ICIMOD has been trying out many plant species suitable for fragile mountains.

2.11 Agricultural Extension System

The Department of Agriculture Development under the Ministry of Agriculture has overall responsibility for agriculture related activities. At the district level the District Agriculture Development Office (DADO) is responsible for agricultural extension activities. Each District Agriculture Development Office operates around seven agriculture service centres staffed by Junior Technicians (JT) and Junior Technical Assistants (JTA), which provide all agricultural and livestock extension services to the grass level. There are also about seven sub-service centres and Ikais staffed by JTs. Under the five regional directorates, there are altogether 75 District Agricultural Development Offices (DADOs) and each DADO is headed by an Agricultural Development Officer (ADO).

2.12 Agriculture in The Eighth Five Year Plan (1992-1997)

As noted before, the growth in agricultural production has occurred due to the expansion of cultivated areas, where as the productivity has remained stagnant or has declined in most crops. Population growth has exceeded food production resulting in less availability of food grains. Increasing demand of food, fodder and fuel has led to depletion of natural resources, increasing environmental degradation and unsustainable of mountain

agriculture. The Eighth Five Year Plan (1992-97) is based on the analysis of the present situation. The principal objectives of the plan are:

(i) sustainable economic growth;
(ii) alleviation of poverty; and
(iii) reduction of regional imbalances.

Special priority has been placed on:

(i) agricultural intensification and diversification
(ii) energy development
(iii) development of rural infrastructure
(iv) employment generation and human resources development
(v) reduction of population growth
(vi) industry and tourism development
(vii) export promotion and diversification
(viii) macro-economic stabilisation
(ix) administrative reform
(x) monitoring and evaluation

Agriculture sector which contributed to more than 40% of the total GDP (1993/94) is expected to play a key role to accomplish the above objectives. The basic objectives of the agricultural sector are:

(i) to contribute to the national economy by increasing agricultural production;
(ii) to meet the growing domestic food demand;
(iii) to enhance production and productivity of the raw materials for agro-industries;
(iv) to augment employment opportunities for the majority of small/marginal farmers; and
(v) to maintain a balance between agriculture and environment

In order to achieve the above objectives the following policies have been set up in agriculture sector.

(i) The appropriateness of agro-ecological zones will be accorded priority in development of agricultural production programme
(ii) Agricultural production will be commercialised and diversified on the basis of comparative advantage and export potential;
(iii) The production of industrial crops will be encouraged to meet the requirements of raw materials for agro-based industries;
(iv) Management of agricultural extension services will be brought under a unified structure of efficient and effective delivery of extension services;
(v) Leader farmers of each farmer's group will be trained to assist in extension services at the village level;
(vi) The private sector will be encouraged to be involved in the production, import and distribution of agricultural inputs;
(vii) An autonomous agricultural research system will be under fully operation;
(viii) Disbursement of agricultural credit will be simplified;
(ix) Co-operatives will be revitalised as a vehicle of overall development, especially of rural areas.

To implement the above mentioned policies many targets have been set up for agriculture development. During the Eighth Plan period, production of various crops is targeted to increase by the following percentage over the current production level: food grains 5.4 percent; pulses 8.4 percent; cash crops 9.1 percent. The targeted increase rates per annum for paddy, wheat, maize, millet and barley are 5.5%, 8.4%, 4.7%, 2.1% and 3.4% respectively (refer Table 2.12.1). For off-season vegetable production Makwanpur, Dhading and other four districts are accorded priority for production (refer Table 2.12.2).

Under the horticulture extension programme it is targeted to expand the fruit orchard areas of citrus fruits etc. As Table 2.12.3 shows fruits are assorted priority in areas which are lying within the distance of one day's walk from a high way point. Other potential fruits which are accorded priority are listed in Table 2.12.4. Major research targets have been set up on crop, horticulture, livestock, fishery, environment etc. (refer Table 2.12.5). Regarding the allocation of total agricultural development out lay of Rs 10,947 million, about 46% is allocated for food crops and cash crops followed by livestock 13%, agricultural and research 11% etc. (refer Table 2.12.6).

Priority is given in agricultural intensification and diversification with emphasis on increasing farmer's income through sericulture, apiculture, herbal farming in the Mountains. Diversification of production is not only expected to aid in the development of agriculture, but also to add varieties to the people's diet, improve their nutritional levels and create a healthy work force.

2.13 Fresh Vegetables and Fruit Marketing

The agricultural marketing structure in Nepal is underdeveloped. The hilly areas suffer from the inaccessibility to markets. Even within a district, some areas are isolated. The areas which have access to roads can export vegetables, fruits and other products to Kathmandu and other big cities. The city of Kathmandu is accessible to some hilly and mountainous regions by the Tribhuvan Highway, the Prithivi Highway, the Kodari Highway and the Kathmandu Trisuli road.

In rural Nepal generally four market systems are practised:

(a) Village Market Stalls: It is a small stall in a village where vegetable, fruits and other daily use commodities are sold. Some wholesalers and retailers from the town, contact those stalls for vegetable and other food grains collection.

(b) Hat Bazzar: Hat Bazzar is a periodical market, opened once a week or once in two weeks. Those are popular in eastern hills.

(c) Village, Town Centre Bazzar: Those bazzars are opened in the village and town centers and this type of market is popular in the Terai area.

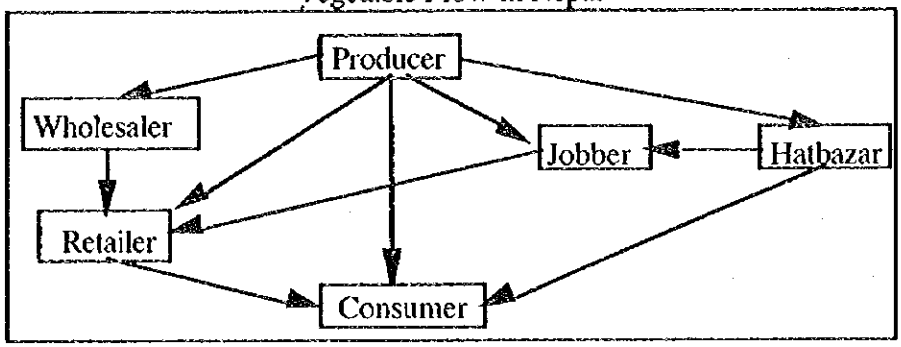
(d) District Headquarters' Premise: Markets are opened in the premises of Chief District Officer (CDO). Vegetables, fruits, milk, etc. are sold here. In the district level CDO is responsible for price control, market maintenance etc. Established markets are shown in Table 2.13.1.

2.13.1 Fresh vegetable Marketing in Kathmandu Valley

In Kathmandu valley local pretty traders are found in almost every locality called tole of the city. The daily buying of fresh vegetables by most consumers in local markets is the

prominent feature of vegetable marketing. The lack of refrigerator in majority of the households is the main reason for daily buying. Previously, the supply was mainly done by the local farmers called Jyapus at public places and by permanent shops. The fast growth of the foot loose vendors from other areas are replacing farmers. The general vegetable flow is shown below.

Vegetable Flow in Nepal



According to the MOA/FAO Survey (1995), in Kathmandu city there were approximately 600 permanent retail shops, 78 street markets with 657 sellers and about 2,000 vendors. In Kathmandu city, Kalimati and Ratnapark were the main markets and got the supply from Dhading, Palung, Lukkanthali etc. In Patan Tarkari bazzar and in Bhaktapur Sukuldhokha were the main markets and their main source of supply were Kalimati wholesale market and surrounding areas (refer Table 2.13.2).

Table 2.13.3 shows the approximate volumes supplied to Kathmandu valley through the main markets. It is estimated that 150 to 400 ton of fresh vegetables are supplied to the market daily. The share of Kalimati wholesale market is big followed by Ratnapark, Ranamukteshwor, Lagankhel etc.

2.13.2 The Kalimati Wholesale Market:

The Kalimati wholesale market was established by His Majesty's Government of Nepal in 1987, and it is the first attempt in Nepal to organise the wholesale market of perishable commodities. This project was started with FAO assistance and is now funded by UNCDF/UNDP. The construction of the market building has not yet started and the traders use small huts which are constructed by the government. The wholesalers pay about Rs 3 to 8 per Sq. foot per month to the government. The total area of the planned market area is about 45 ropani (about 2.3 ha) and at present only 7 ropani is used for the daily transaction of the fresh vegetables and fruits etc. At present there are 235 wholesalers in the Kalimati wholesale market.

The basic planning for the Kalimati wholesale market was developed in 1988. To calculate the market floor space requirements, the population of the Kathmandu valley total consumption and the commercial volumes of the vegetables and fruits was estimated as shown in Table 2.13.4.

In 1993/94, the total transaction of fresh vegetables and fruits in the Kalimati wholesale market was 86,504 ton (refer Table 2.13.6). The volume of transaction is growing rapidly. Fresh vegetables and fruits supplied in the Kalimati whole sale market come from various parts of the country. Makwanpur (Palung area), Dhading, Nuwakot, Gorkha, Tanahun, Kabhre and various Terai districts are the main supplier to the Kalimati

wholesale market. Off-season vegetables and fruits come from India, Bhutan and occasionally from Tibet. The Kathmandu valley participation in the Kalimati transactions was between 3.3% and 16.6% (refer Table 2.13.7). In 1991/92 the area under vegetable cultivation in Kathmandu valley was 2,890 ha (refer Table 2.13.8). However with the expansion of urban area, the production of vegetable is supposed to decline in the Kathmandu valley.

The rules and regulations on transaction of vegetables and fruits have not yet been formulated. Generally the prices are decided by the wholesalers and the margin taken varies from 5% to 10%. The price determination between the producer or collector, wholesaler, retailer, vendor occurs by means of bargaining . Exact marketing margins are difficult to verify statistically. Wholesalers are generally not willing to revel their margins and according to the farmers of the Palung area in many cases the margins exceed this range.

There is a lack of specific and adequate place to sale fruits and vegetables. The whole market becomes more dirty during the rainy season. Drinking water, toilets, wastage removal, electricity, security etc. are pointed out as the main problems (HMG/N, FAO,1995). Because of the lack of communication traders can not contact to their supply sources. The whole market is congested with inconvenient access to the market area to the vehicles. After the construction of wholesale market building those problems are expected to be solved.

In the Kalimati wholesale market grading is not common practice and the packing practices are traditional. Suppliers use doko for highly perishable commodities like cauliflower, and gunny sacs are generally used for less perishables like potato, onion etc.

The prices of vegetables and fruits in the Kalimati wholesale market experience extreme fluctuations over short time periods and wide seasonal variations. Seasons of low supply and price fluctuations in the Kalimati wholesale market are given in section 5 (Phedigaon/Phatbazar) to explain the rationality of producing cash crops in those areas. The development of information system, alternative markets, comparatively longer harvest periods and storage facilities will solve this problem in some extent.

3. AGRICULTURAL ACTIVITIES IN MAKWANPUR DISTRICT

3.1 Geographical Background of the District

The total area of Makwanpur district is 2,426 sq. kms and is located at 27°10' latitude and 84°44' longitude. Elevation ranges from 305 meters to 2,743 meters. The average maximum temperature in Makwanpur district is 30.3℃ and minimum is 16.6. The average annual rainfall is 2,288.9 ml. There are three types of climate i.e. sub-tropical, temperate and cool-temperate. Major rivers are Bagmati, Kulekhani, Rapati and Bhainse etc. Topographically the land is distributed in Mid mountain (94,947 ha), Siwalik (144,124 ha) and Tarai (5 ha). Forest covers about 70% of the total land. Total cultivated land is 40,842 ha (17% of the total land) and about 60% of the cultivated land lies in Siwalik as shown in Table 3.1.1.

3.2 Population

According to the latest population census, the population in Makwanpur District is 314.6 thousand as of 1991. During the two decades from 1971 to 1991 the population nearly doubled (refer Table 3.2.1).

3.3 Cereal Crops Production

Maize, paddy, millet and wheat are the main cereal crops grown in Makwanpur district. Table 3.3.1 shows the area, production and per hectare yield of cereal crops in Makwanpur district. In 1992/93 the cropped area of paddy was 13,510 ha and production was 26,880 metric ton. But in 1993/94 cropped area and production decreased due to the flood and landslide. After the disaster of 1993, many irrigation facilities were destroyed and keht land were converted into bhari land. Accordingly, the cropped area of millet increased more than twice.

3.4 Cash Crops Production

Makwanpur district is famous for vegetable production thanks to its climatic variation. Makwanpur district presents diversified altitudes, from the inner Terai to the highest point of Simbhanjyang (+/- 2,500 meters). Vegetables can be grown in different seasons. Palung, Phedigaon, Daman Tistung are the main production pockets in the hills and Handi khola, Bhimphedi etc. at the lower altitude. The main markets are Kathmandu, Hetauda, Birganj, Pokhara etc. The production of potato for which data is available, has decreased after the disaster of 1993 (refer Table 3.4.1).

3.5 Livestock Production

Livestock is the only source of draft power for ploughing and other field preparation in Nepal. It is also a secondary source of livelihood. Cattle, buffalo are the major source of milk, fertiliser and energy. Goat is the major source of meat for most of the Nepalese people. Pigs are reared by lower caste people for meat. As Table 3.5.1 shows, population of goat is the largest and number of cattle is second followed by buffalo.

4. AGRICULTURAL ACTIVITIES IN SINDHULI DISTRICT

4.1 Geographical Background of the District

The total area of Sindhuli district is 2,491 sq. kms and is located at 26°55' to 27°21' latitude and 85°24' to 86°22' longitude. Elevation ranges from 305 meters to 2,787 meters. The average maximum temperature of Sindhuli district is 28°C and minimum is 5.3°C. The average annual rainfall is 1,419.5 mm. There are three types of climate, tropical, sub-tropical and temperate. Major rivers are Bagmati, Kamala, Arun Thakur, Gwang khola, Bitijor, Baksu khola, Marin khola and Rosi khola. Topographically, the land is distributed among high mountain (70 ha), Mid mountain (95,027 ha) and Siwalik (152,612 ha). Total cultivated land is 39,485 ha, and about 57 percent of the cultivated land lies in Siwalik and 43 percent lies in Mid mountain as referred in Table 4.1.1..

4.2 Population

As shown in Table 4.2.1 the population of Sindhuli District increased from about 147 thousand in 1971 to 224 thousand in 1991.

4.3 Cereal Crops Production

Major crops for the mountain area are potato, maize, millet and wheat. In Siwalik region, paddy, wheat and millet are the major crops and wheat, soybean, mustard, and potato are the minor. The area, production and per hectare yield of paddy increased in 1991/92 in comparison with 1990/91 but decreased in 1992/93. In 1993/94 per hectare yield of paddy has decreased. Cropped area and production of maize and millet increased, but after the flood of 1993, per hectare yield has decreased as shown in Table 4.3.1.

4.4 Cash Crops Production

Potato, oilseed and sugarcane are the main cash crops production in Sindhuli district. Production of potato is in increasing trend. The production of oilseed in 1993/94 has been decreased compared to those in 1991/92 and 1992/93 as referred in Table 4.4.1.

4.5 Livestock Production

Livestock production is a secondary source of the livelihood. It serves as a complimentary sector to the agriculture production. Goat population is the largest and number of cattle is second followed by buffaloes as show in Table 4.5.1. Pigs are reared by the lower caste people for meat.

5 CURRENT SITUATION OF AGRICULTURE IN PHEDIGAON/ PHATBAZAR

5.1 Characteristics of Agriculture in Phedigaon/Phatbazar

Phedigaon/Phatbazar is one of the main vegetable production spots in Makawanpur District. It lies at the altitude about 1,800m above the sea level and off season vegetables, manly cauliflower and cabbage are more of economic value here. Potato is also the main cash crop produced by Phedigaon people. Cereal Crops such as paddy, maize, wheat are also produced for self consumption. Maize is sown on the ditches of potato ridges. After potato is harvested around May/June, Cauliflower is planted on potato ridges. According to the local farmers about 90% of the farmers practice this system

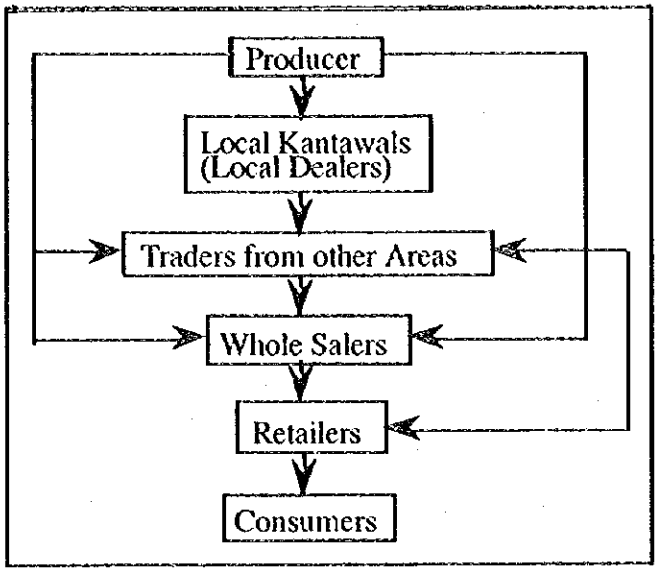
As shown in Figure 5.1.1, potato is the main winter/spring crop harvested from May to July followed by cauliflower and cabbage which is planted in June/July and harvested in August/September to November. According to the local farmers most of the cauliflower is harvested during August to October which is off season in other areas and price is highest in that season. The production of cauliflower has been increasing every year with the fast growing demand of vegetables in Kathmandu Valley and other urban areas such as Hetauda, Pokhara, Birganj etc. The main characteristics of Phedigaon/Phatbazar is that certain varieties of vegetables are produced at a time when it can not be grown in other parts of the country. As Table 5.1.1 indicates, by introducing improved varieties beside cauliflower and cabbage, other vegetables such as radish, beans, onion etc. can be produce in the off season.

Farmers cultivated potato before the construction of Tribhuvan High Way; Radish was introduced later. Then they started cauliflower farming and recently the cultivation of cabbage is getting popular.

As Figure 5.1.2 shows, in Terai markets cauliflower and potato are in low supply during the months from March to September while those commodities are produced during that period in Palung area. Concerning the hill markets like in Kathmandu and Pokhara as Figure 5.1.3 shows cauliflower, cabbage are in low supply from March to August, and those crops can be supplied from the Palung area from August.

5.2 Agricultural Marketing

In Phedigaon/Phatbazar area the marketing system is not organised. Most of the farmers sell their products to Cantawals (Local Dealers) in Phatbazar and Phedigaon. Cantawals then sell the commodities to other dealers from outside the area. According to local dealers about 90% of the potato goes to Birganj or India, and about 80% of the cauliflower and other vegetables are exported to Kathmandu. Other remaining portions are exported to Pokhara, Hetauda and other big municipalities.



Flow of Vegetables from Palung Area

With the assistance of FAO, a vegetable collection centre was constructed in Palung and was operational during the 1992 season when improved packaging/transportation demonstrations were conducted and price information was provided to the farmers. The 1993 floods damaged the compound of the collection centre. Now, the centre is not in operation and local farmers depend on local Cantawals to sell their products. Some retailers from the big cities visit the nearest production spots to get supplies of certain vegetables.

Table 5.2.1 shows the average wholesale price of some vegetable and fruits of Kalimati market of Kathmandu during the year 1994/95. The price of cauliflower raises very high from June/July to Oct/Nov which is off season in other parts of the country. As mentioned earlier, the farmers of Palung area export cauliflower during that off season and take merit of the higher prices.

In Phedigaon area, the traditional packing material for potato is jute bag and for cauliflower and cabbage is overwhelmingly dominated by doko.

5.3 Land Holding Size

In rural Nepal land ownership is the index of wealth. According to VDC's records, the average size of cultivated land holding (excluding landless households) in Palung VDC is about 13 ropani (1.9 ropani of Khet land and 11.1 ropani of Pakho land), which is comparatively higher than other parts of the hill areas. In ward No. 9 the average size of cultivated land holding is about 12.5 ropani. Among 950 households in Palung VDC. 84 households (8.8%) were landless. And in ward No. 9 where Phedigaon is located 22 house holds (8.4%) out of 262 households were landless. (refer Table 5.3.1). According to the survey in ward No. 9 only a friction of their land was rented out and rented in under cash contract.

5.4 Cost of Production and Net Profit

As described earlier, Potato and Cauliflower are the dominant products in Phedigaon and

Phatbazar area. The analysis of these two crops shows that the total cost incurred on producing potato and cauliflower in one ropani of land comes to Rs. 4,623 and 3,044 respectively (refer Table 5.4.1). And the net benefit realised from those two crops in one ropani of land is Rs. 1,127 and Rs 11,156 respectively.

Concerning the cost of production by inputs in potato cultivation, the share of labour is about 34%, seed 31% and fertiliser and pesticide 22%. The cost of production and marketing was Rs. 4.8/Kg based on the total cost of Rs. 4,872 for 1,000 Kg of potato production and marketing.

In the case of cauliflower production the share of labour is 31% followed by fertiliser, pesticide and nutrients 53%. The cost of Production and marketing was Rs. 4.1/Kg based on the total cost of Rs 3,244 for 800 Kg of cauliflower production and marketing. Cauliflower is the most profitable cash crop in Palung area.

Information gathered in course of the field survey were mainly based on the memory of the farmers as they do not maintain any records of the various inputs and outputs of production.

5.5 Livestock Production

Livestock is the secondary source of livelihood in Phedigaon/Phatbazar . Buffaloes are the major source of milk production. Compost which is the major source of nutrition and organic matter, comes form buffaloes and cattle. Goats are the major source of cash income and meat. According to field survey the average number of animals kept per sample household is five.

5.6 Agricultural Problems in Phedigaon/Phatbazar

Farmers in Phedigaon/Phatbazar normally used chemical fertiliser and plant protection in the production of cauliflower, potato and other cash crops. According to the local farmers the supply of chemical fertiliser is irregular and they have to buy in black marketers in high prices.

Both the farmers and the local traders make a deal with small individual volumes facing transportation difficulties from there to Kathmandu and other big municipalities. Because of the lack of proper package system and transportation system the post harvest loss is also considered high.

According to the farmers in Phedigaon/Phatbazar they rarely get technical support from the government. In the Agriculture Sub-Centre in Palung the existing technical personnel like Junior Technical Assistant (JTA) is only 2. It is not physically possible for them to give technical support to farmers door to door.

The other main problem noted by the farmers was irrigation. After the disaster of 1993 most of the canals were washed away and yet have to be rehabilitated. According to the farmers, if the canals be rehabilitated the production of cash crops will be increased.

5.7 Agriculture Development Activities by the Relative Institutions in the Study Area

As described before, at the district level, the Chief District Agriculture Development Officer (CDADO) of the District Agriculture Development Office (DADO) is responsible for agricultural extension services. Each DADO operates around seven Agriculture Service Centres and sub centres and provide agricultural and livestock extension services to the farmers. In the study area, Daman Horticulture Centre is providing extension services and FAO' provided extension services under its "Fresh Vegetable and Vegetable Seed Production Project". Activities of those two institutions are described below.

5.7.1 Activities of Daman Horticulture Centre

Daman Horticulture Centre which is one of the oldest centre established in 1962, introduces new suitable and high yielding varieties of vegetables and fruits, carry out seed improvement works, by selection of locally available materials, distribute improved vegetable seeds and fruit samples to the farmers manly under its command areas. The Centre provides technical assistance to the farmers and supports extension services. Palung VDC, Namtar VDC, Agra VDC, Gogane VDC etc. are under its command. The Centre lies at the altitude of 2,400m above the sea level and experiments many hilly crops.

The total area of the centre is about 68 ha of which 12 ha is for fruits, 2 ha for root stock nursery, 3 ha for vegetables and 4 ha for potatoes. Because of the lack of permanent water source, only a portion of land is utilised. Many species of fruits and vegetables are cultivated in a small parcel of land , increasing the risk of disease. According to the farmers of the study area, they cannot get vegetable seeds and fruit samples in time and the quantity is very small .

5.7.2 Activities of the FAO

"Fresh Vegetable and Vegetable Seed Production Project" was initiated in 1981 with the objective to support the efforts of HMG/N to increase income of the farmers and improve nutritional standard of the people. This programme has supported many production pockets in more than 20 districts in the country. In Makwanpur District, FAO supported production pockets are Palung , Daman, Phedigaon, Bajrabarahi/Tistung, Handikhola, Aghor, Shikarkot, Ghartikhola, Okhargaon and Hetauda. This project distributed high yield and early varieties of vegetable seeds of which cauliflower has become one of the most profitable cash crop in the area. The farmers of Chisapani benefited from this programme too.

FAO assisted to construct a vegetable collection centre in Palung VDC and was operational in the season of 1992. Many farmers learned improved packing system, got price information from the centre. But now the centre does not work as a collection centre and is used as a meeting hall for the VDCs . The compound of the collection centre was damaged by the disaster of 1993. According to the farmers of the area, reasons behind the closure of collection centre was not only the flood but also the miss management.

The International Fund for Agriculture Development (IFAD) has signed an agreement with VDC to construct an irrigation system in Phedigaon/Phatbazar in March 1996. This will contribute to the development of cash crops farming.

6 COMMUNITY DISASTER PREVENTION PLAN (CDPP) FOR PHEDIGAON/PHATBAZAR(AGRICULTURE DEVELOPMENT PLAN)

In this chapter four components of agriculture development are proposed. They are listed below.

-Cash crop production

-Silkworm rearing

-Medicinal herbs planting, and

-Formation of farmers' organisation

The details of respective aspects are as follows

6.1 Cash Crops Production

After the completion of Tribhuvan High Way, which was the first high way in Nepal, there have been major changes in agricultural practices in the Palung area.

By increasing vegetable demand in Kathmandu, Hetauda, Birganj, Pokhara and other parts of the country the farmers of this area have been encouraged to grow more and more vegetables. Farmers of this area have been practising various cash crops according to the market demands and are taking advantages of high altitude by producing off season vegetables. The exact data of vegetable export from Palung area is not available but according to the rough information given by Palung and Daman VDC states that during 1995 season the volumes of main vegetable exported were potato (1,200 truck load, 8,000 ton), cauliflower (1,450 truck load, 6,250 ton), cabbage (2,300 truck, load 13,100 ton), radish (1,550 truck load, 8,500 ton) etc. The area being utilised for cereal crop production is gradually being replaced by cash crop production. For the last few years Palung area has been growing as centre of vegetable production especially during the off season. The FAO through fresh vegetable and vegetable seed production project has supported these activities in Phedigaon, Shikharkot, Ghartikhola, Anghree, Okhargaon etc. Vegetable brokers from Kathmandu and other areas visit this area occasionally and recommend the farmers to produce vegetables which are in high demand. It seems that farmers have selecting the best species and the best cropping patterns.

Migration in this area is not in higher degree as other parts of the country as described in Chapter 1. The reason of lesser migration is because of vegetable production. Vegetable production has attracted to many small and large farmers . According to the farmers of this area, villagers who migrated from this area before and after the disaster are trying to come back again to engage in the Vegetable cultivation.

Cauliflower

As described before, among different crops, the net income received by the farmers was highest in cauliflower despite its low yield. The estimated yield of cauliflower per ropani was 800 Kg while, according to VDD, potential yield is 1,500 Kg (HMG/FAO Fresh vegetable and vegetable seed production Project. GCP/NEP/043/SWI, Nepal, cost of Production, Market Margins and Transportation of vegetables in Palung/Daman area,

1992 P IV). Adequate and timely supply of chemical fertilisers technical support and irrigation may increase the yield more than 70% from the present state. Early varieties should be introduced so that, the farmers can sell in high prices. Cauliflower production is in increasing trend among different vegetable crops and there is a great potentiality to increase the area as well as productivity. A net profit of cauliflower produced in Phedigaon is estimated at Rs 11,156 per ropani as shown in Table 5.4.1.

Potato

Although the production of potato is in decreasing trend in Palung VDC, still it is one of the main cash crops in Phedigaon/Phatbazar. The farmers sell potato by about Rs. 6 per Kg, in the harvesting season and buy seeds by about Rs. 10 per kg. since there is no any proper cold storage facility in the area, the farmers are not able to preserve seeds for the next season. So they keep it in cold storage in Kathmandu, Hetauda, or elsewhere. It is estimated that about 1,200 ton capacity of cold storage is needed. According to the farmers, regular supply of chemical fertiliser other inputs and technical support may generate more production and income. A net profit of potato production in Phedigaon is estimated at Rs. 1,127 per ropani as shown in Table 5.4.1.

Carrot

The cultivation of carrot is getting popular among the farmers in Palung. But only few farmers in Phedigaon/Phatbazar are cultivating it. The whole sales price of carrot in Kalimati Wholesale Market is highest in October/November (Rs. 32.37/Kg) and is lowest in April/May (Rs. 13.49/Kg) as shown in Table 5.2.1) According to the farmers in Phedigaon/Phatbazar, they will produce carrot all the year if the irrigation is available.

Capsicum (Bhende Khursani)

A few farmers have started capsicum cultivation and are getting good prices. The highest price in the Kalimati wholesale market is in the month of March/April with Rs. 52.5/Kg and lowest in the month of Apr/May with Rs. 10.67 (refer Table 5.2.1)

6.2 Silkworm Rearing

Although the sericulture farming may not be a substitute for vegetable farming, it may help to generate supplementary income and generate employment. Mulberry trees can be grown on marginal lands, steep slopes, edges of the terraces, and road sides etc.

It is estimated that 1500 mulberry trees can be planted in two ropani of land and 20,000 silkworms (one box) can be reared at least twice a year by their leaves. About 20 Kg of cocoons can be produced from one box, it means about 40 Kg of cocoon can be produced feeding mulberry leaves planted in two ropani of land. Cocoons of Good quality (A grade) can be sold by Rs 150 per Kg. It means Rs. 3,000 can be generated from one ropani of land. Eggs are supplied by the government of Nepal freely, and plants are available in Rs 0.30 of which Rs 0.15 is subsided by the HMG/N.

6.3 Medicinal herbs Planting

Although there are no farmers who cultivate medicinal herbs in their farms, but medicinal herbs are wildly found in Phedigaon/Chisapani . According to the farmers of Phedigaon,

occasionally, some Indian brokers and some times Nepali brokers visit there to collect such kind of medicinal herbs. The main medicinal herbs described below are found in the forest mountain around the area.

Those plants may generate additional income to the farmers if planted and managed properly. Those plants can be planted in marginal land, community forest areas etc. As Table 6.3.1 shows some herbs such as sugandhawal (Valeriana Wallichii) are economically important which generates more than Rs 4,500 per Ropani annually.

Chiraito (Swertia Chirayita)

This species is found in the temperate zone of Nepal. This herb attains a height of upto 1.5 mt.. Chirayata is the trade name of the drug obtained from this plant. The entire plant is collected in the flowering stage and dried. It is used in fever, diarrhea etc.

Jatamansi (Nardostachys Jatamansi)

This herb attains a height of upto 60 Cms. Jatamansi is the trade name of the drug obtained from this plant. It is used in 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 in 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)

It's roots are used in the treatment of fever, diarrhoea, pulmonary affections, antiscorbutic etc. It is generally found in Mahabharat regions.

Indrayani (Indreni, Bitter Apple)

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

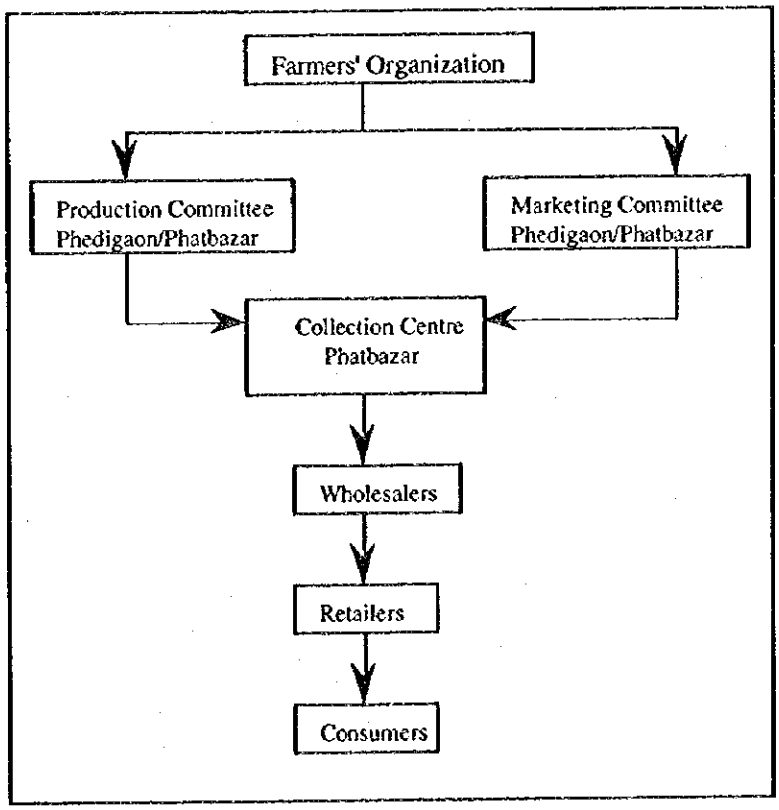
6.4 Formation of Farmer's Organisation

Presently, in the whole study area, individual farmers and individual traders are making deals with small volumes and it makes very difficult to introduce important changes in production and marketing systems. Working in group will enhance their confidence in production and marketing. Two committees a production committee and a marketing committee are proposed. In ward No. 9 where Phedigaon is located, there are 262 households and among those households 22 households are landless. Farmers should form committees comprising about 50% households in each committee. Producers committee will collect the member's needs of fertilisers, seeds, pesticides etc. and will inform to the marketing committee marketing committee to carry their needs to the related organisations. Related organisations will manage inputs beforehand. Likewise the

marketing committee will collect the market information feed back to the farmers and recommend profitable crops for the next season. Marketing committee will also prepare a crop calendar.

A building in Phatbazar should be rented and used as collection centre. Harvesting day and per house hold's commodity and quantity should be identified beforehand and be collected at the collection centre. Marketing groups arrange a truck and mange to transport it to the market.

In the second step those committees will develop into co-operative societies. Those co-operatives will market the vegetables and procure various inputs like chemical fertilisers, seeds and pesticides to the farmers. Co-operatives will develop a crop calendar for different farmers groups, detailing the crop varieties to be grown, dates for plantation etc.



Farmer's Organisation

7 CURRENT SITUATION OF AGRICULTURE IN NAMTAR

7.1 Characteristic of Agriculture in Namtar

The main characteristics of agriculture is the cultivation of varieties of crops but in small volumes. Paddy, maize, wheat, millet, barley, soybean, cauliflower, cabbage, potato, ginger, onion garlic, tomato, mustard etc. are generally produced. The production of cauliflower, cabbage, ginger and garlic is getting popular among the farmers. As sown in Figure 7.1.1 on irrigated land, three crops, rice, wheat and maize are grown. Paddy is grown from June/July to October/November Wheat is grown after paddy is harvested. Usually wheat is sown in October/November and harvested in March/April. Maize is mainly grown from April/May to August/September. According to the farmers, in irrigated land cauliflower can be grown twice. The cultivation of comparatively less perishable cash crops like ginger and garlic are in increasing trend. After the disaster of 1993 which washed away irrigation canals, the farmers cultivated ginger in their non irrigated land. Ginger is planted in March/April and is harvested November to January.

Fruit trees growing is also increasing. Pear, lime, lemon, is in increasing trend in Bhadaure area (Ward No. 4) near Khade Khola. Orange is in increasing trend in Timure (Ward No. 7). Litchi, mangoes, pineapple, also are grown in Namtar .

7.2 Agricultural Marketing

Although in the past many farmers were aware of the advantages of vegetable and fruit production but the problem was access to the market. Now a motorable road is constructed, and trucks, jeeps can reach the village except for the rainy season. But the problem of marketing has not been solved. The farmers produce varieties of cash crops but in small quantity which makes it difficult for marketing. The farmers transport vegetables and fruits from their farm to Chuniya in Tribhuvan High Way on their backs in doko (bamboo baskets). Sometimes they can sell their goods in Chuniya to the local brokers and sometimes they have to go to Hetauda for sales. Presently there is a general trend among farmers to increase area under ginger and garlic production which are comparatively less perishable. The farmers can leave ginger in the farm without harvesting for a few months, and when prices rise in the markets they harvest and sale it. The high price for ginger is from March to July (refer Table 5.2.1). And as Table 7.2.1 shows that in the comparison with Rs 10.14/Kg in 1984/85 it has increased almost 3 times in 1994/95. Encouraged with the rise in market price, farmers are producing ginger more and more.

7.3 Land Holding Size

According to the records in Namtar VDC as shown in Table 7.3.1 the average size of cultivated land holding (excluding landless households) in Ward No. 2 is about 11 ropani (4.5 ropani Khet land and 6.4 ropani of pakho land). In the whole VDC the average land holding size is the same but the proportion of pakho land is more higher.

7.4 Cost of Production and Net Profit

The analysis of main crops produced in Namtar shows that the total cost incurred for producing cereal crops indicates negative returns. This was mainly due to the large input of human labour because of least opportunities in non-farm employment. Although

marketing costs also are included here, most of the farmers are producing cereal crops for their self consumption, irrespective of net return measured by economic yardstick.

Ginger, garlic, cauliflower are the most profitable cash crops followed by potato. In the case of ginger production the cost of seed purchase forms about 45% followed by labour inputs about 20%. The cost of production and marketing is Rs 4.5/Kg based on the total cost of Rs 4,478 for 1,000 Kg of ginger production (refer Table 7.4.1).

In the case of garlic production the cost of labour takes nearly 40% of the total cost followed by seed purchase about 18%. Garlic is more labour intensive commodity. The cost of production and marketing is Rs 5.5 per Kg. Similarly the cost of production and marketing of cauliflower is Rs 2.3 per Kg (refer Table 7.4.1).

As mentioned earlier the information is mainly based on the memory of the farmers as they do not maintain any records of the various inputs and outputs of production.

7.5 Livestock Production

According to field survey, more than 70% of the households in Namtar own livestock for ploughing and other field preparation work, milk, fertiliser and meat. Goat is the largest in number, followed by cattle and buffalo. Live stock is the another income source for the people.

7.6 Agricultural Problems in Namtar

According to field survey the first and second development priorities of the farmers are road and irrigation respectively. The seasonal road from Chuniya in Tribhuvan High Way closed when the monsoon begins. The farmers carry their products in dokos on their back to Chuniya and take public transportation to Hetauda. It is very expensive. As explained earlier many farmers produce varieties of vegetables and fruits in small quantity which is not enough to hire a truck and export them to the market. Because of small quantity vegetable and fruit brokers rarely visit the area.

After the disaster of 1993 many farmers have converted their khet land into bhari land due to the lack of irrigation.

According to Department of Agriculture (Report on cost of production for major crops in Nepal, 1993/94) the average per ropani yield of potato in irrigated land with improved variety in Makwanpur district is 975 Kg. In Namtar it is 600 Kg per ropani. If the irrigation is provided the yield of potato will increase by more than 60%.

The other problem is lack of technical support. According to the farmers no technicians visited their field during any stage of the crop cycle. They generally use chemical fertiliser in the production of cash crops and according to the farmers the supply of chemical fertiliser is irregular.

Every year the insect called Khumre (White Grub) harm the maize . The insects live inside the soil and eat the roots and the plant die. According o the farmers they tried many kinds of insecticides but the insect did not disappear.

8 COMMUNITY DISASTER PREVENTION PLAN (CDPP) FOR NAMTAR (AGRICULTURE DEVELOPMENT PLAN)

The Study Team proposes some cash crops promotion in this sub section, but, without clear, well-defined markets there is no advantage promoting cash crops that cannot otherwise consumed locally. Timely supply of fertiliser is critical for cash crop farming, and cauliflower, potatoes, ginger and other horticultural crops also require considerable amount of fertiliser.

8.1 Concentration on Profitable Varieties in Large Quantity

According to the records in Namtar VDC, the total agricultural land in the VDC is about 13,254 ropani (663 ha) of which 3,604 ropani (180 ha) is khet land and 9,650 ropani (483 ha) is pakho land. The major portion of the paddy land is rainfed. In ward No. 2 there is 594 ropani (30 ha) khet land and 848 ropani (42 ha) of pakho land. In this ward the major portion of khet land is rainfed. As explained before farmers cultivate many varieties but in small quantity of cash crops which makes it difficult to introduce important changes in the marketing .

The following Cash crops are proposed to cultivate intensively.

Garlic Production

Garlic, which is less perishable is getting popular among the farmers in Namtar. The monthly average price of dry garlic in Kalimati Whole Sale Market is found Rs 54.73 in January/February and was lowest Rs 20.19 in May/June refer Table 5.2.1). Garlic is planted in November/December in khet land and is harvested in March/April. It can be dried in the sun light and can be sold when the price rises in the market. As explained earlier it will generate remarkable net income in terms of per ropani of land.

Ginger Production

Among different crops the net income received by farmers is highest in ginger. It is cultivated in pakho land and it takes about one year from plantation to harvest. The highest price is given in April/May (Rs 29.16/Kg) in the Kalimati Whole Sale Market refer Table 5.2.1). It is comparatively more labour intensive and may generate more farm employment.

In Nepal Ginger is one of the important exportable crop and is mostly exported to India either fresh or dried. The eighth five year plan has emphasised ginger production putting it under the species development programme, and Agricultural inputs, agricultural credit and technical support will be provided by the concerned agencies.

Cauliflower Production

Cauliflower production is also profitable in Namtar. Although per ropani yield of cauliflower is comparatively high, regular supply of chemical fertilisers and other nutrients may contribute to increase in its yield.

Potato

Potato cultivation which is generally practised in Namtar is profitable than other cereal crops (refer Table 7.4.1). Potato is grown in khet land and pakho land.

Mushroom Production

Mushroom is in high demand in the urban areas of Nepal. In 1990/91 the production of mushroom was only 56 ton and it has been targeted to increase the production level to 300 ton during the Eighth five year plan period. The production of different varieties of mushrooms will contribute to the enhancement of the income of small farmers. The price of the fresh mushroom such as Agaricus bisporous (gobre chyau) in the market is very high in November to February (Rs 130 per kg) and low in March to May ((Rs 70 per kg (NARC, 1994)). The cost and net profit by producing 200 kg of Agaricus bisporus is estimated about Rs 6,700 and Rs 7,300 respectively (NARC, 1994).

8.2 Promotion of Horticulture and Installation of a Small Scale Processing Plant

Planting fruit trees in pakho land is in increasing trend in the area. According to the farmers of Bhadaure ward No. 4 (Near Khade Khola), about 100 households are growing fruit trees and last year in the month of July/August about 300 metric tons of pear was exported manly to Hetauda. The farmers are convinced to increase commercial production of fruits.

As mentioned before lime and lemon is also produced in big volumes. Due to difficulties in marketing large portion of perishable fruits are wasted.

To encourage the farmers for more fruit production, small scale processing plant in which jam and juice are produced may be suitable. A lime and lemon Juice extracting plant seems necessary so that farmers may be encouraged to plant more fruit trees which generate more income and contribute to soil conservation.

8.3 Promotion of Sericulture

According to the farmers in Namtar 7 households planted mulberry trees and raised silkworm ten years before. They produced good quality of cocoons but they could not found the market to sell it and they stopped silkworm raring. Now, the situation has changed and they can sale it to the government or private entrepreneurs. Good quality of cocoon can be sold in Rs 150 per Kg. Mulberry based sericulture can assist considerably in improving living standard of the farmers. It creates employment opportunities to the rural women. Mulberry trees planted in the marginal land and road side helps in conserving the environment and controlling soil erosion or small scale land slides etc. According to the group discussions many farmers are eager to plant mulberry trees in ridges of their land, marginal land and roadside.

Besides mulberry silkworm, Eri silkworm also can be raised which eats castor leaves. Cassava leaves, papaya leaves, sweet potato leaves etc. The eggs of Eri silkworm are supplied from the government operated farm at Bhandra in Chitwan. Although the price of cocoon produced from Eri Silk worm is lower (Rs 60 per kg) than that by Mulberry silkworm, farmers may take the advantage of their comparatively warm climate by raring Eri silkworm as well.

In 1990/91 the total area covered by mulberry plantation in Nepal was 496 ha and cocoon production was 20 ton. By the final year of the Eighth plan (1996/97), with the involvement and participation of additional farm families, the mulberry plantation has been targeted to increase by additional 533 ha, and the production of cocoon to be raised

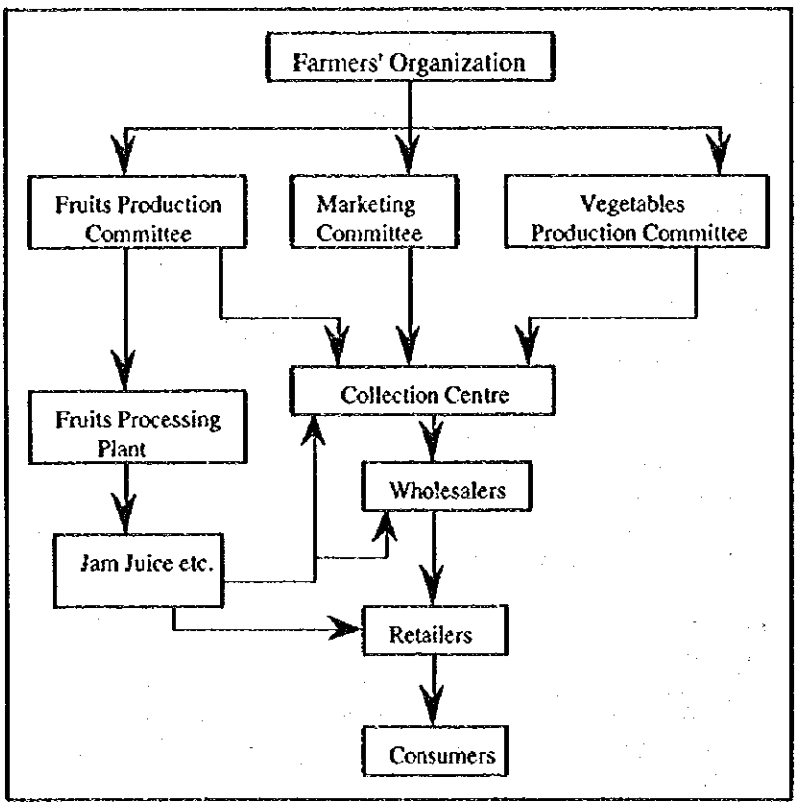
to 300 ton. For castor based sericulture 100 ton of cocoon production has been set as a target involving 500 farmers. The cocoon production of castor based sericulture was 10 ton in 1990/91 (The Eighth Plan).

8.4 Formation of Farmers' Organisation

As described earlier, in Namtar area individual farmers deal with small volumes and it makes them very difficult to export it outside the area. Here, three committees are proposed, a vegetable production committee, fruit production committee and a marketing committee.

The vegetable production committee will estimate the total inputs such as chemical fertiliser, seeds, pesticide etc. for the next crops and will inform to the marketing committee. The marketing committee will inform it to the related organisations and will manage its procurement.

The main activities of the marketing committee is to collect the vegetables and fruits from individual farmers manage a truck and export it to the cities. All member farmers of the organisation are supposed to use the collection centre managed by the marketing committee. A simple hut near VDC office can be used as collection centre. Nominal amount, about Rs 0.10 may be charged as handling cost. This amount will be used for the maintenance of the collection centre



Farmer's Organisation

9 THE CURRENT SITUATION OF AGRICULTURE IN CHISAPANI

9.1 Characteristics of Agriculture in Chisapani

The main products of Chisapani area are potato and cauliflower. Potato is sown in February/March and is harvested in June to August. Cauliflower is planted in May/June and is harvested from August to October which is off season in other parts of the country, (refer Figure 9.1.1). This aspect of vegetable production in Chisapani holds a major potential for development. Some farmers have started carrot cultivation as well. Maize is the main cereal crop here and is sown as early as possible depending on the rainfall in March, April or May. In Chisapani area most of the farm land is non irrigated. The farmers have to rely heavily on rain. The main source of monetary income is potato and cauliflower. Most of the farmers of Chisapani buy food grains from Phedigaon or Phatbazar . There are steep slopes to induce soil erosion naturally in this area and these slopes are cultivated as bari land. Since there is no irrigation and available crops for cultivation are limited.

9.2 Agricultural Marketing

Most of the farmers of Chisapani sale their products (manly potato and cauliflower) in Phedigaon and Phatbazar. There is no any marketing organisation and individual farmers carry their products on their back or hire porters to do so. It takes about two hours to Phedigaon on foot with the load (bari) and it takes whole day to sell few kilos of potatoes.

9.3 Land Holding Size

According to VDC Chairman, in the whole Agra VDC there are only 2 (0.2%) landless households, and more than 80% of the households hold more than 10 ropani of land. In ward No. 4 there were no landless households because those who became landless after the disaster have resettled in Hetauda. The average land holding size in ward No. 4 (where Chisapani is located) is about 12 ropani, and the Whole land is Pakho Land, More than 70% of the households in Ward No. 4 are holding more than 10 ropani of land as shown in Table 9.2.1

9.4 Cost of Production and Net Profit

The cost of production of potato in Chisapani area is estimated Rs 4,660 per Ropani of land. The share of variable cost is 97% . In variable cost the share of seed is 32% followed by labour including bullock and fertiliser is about 30% respectively. The total cost incurred by producing potato in one ropani of land amounts to Rs 4,660 and the net benefit realised is Rs 1,515 deducting the marketing costs as shown in Table 9.4.1.

Concerning the cost of inputs in cauliflower cultivation, the proportion of chemical fertiliser is about 61% followed by human labour including bullock, 24%. The total cost incurred on producing Cauliflower in one ropani of land amounts to Rs 4,558 and the net benefit realised is Rs 11,345 deducting the marketing cost. The cost of production and marketing one kilo of potato and cauliflower is Rs 4.8 and Rs 6.0 respectively. Cauliflower is the most profitable cash crop in Chisapani.

9.5 Livestock Production

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

9.6 Agricultural Problems in Chisapani

According to the farmers of Chisapani, they do not receive regular supply of Chemical fertiliser and improved seeds and rarely get technical support from the government. Because of the lack of proper marketing system individual farmers sale their products to the local brokers mainly in Phedigaon/Phatbazar. As mentioned above the cost of marketing is very high in Chisapani. Other main problem noted by the farmer is irrigation If the irrigation becomes available the cultivation of cauliflower which is the most profitable crop can be grown twice a year.