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HIMALAYAN PROJECT
(A DANISH NGO DEALING WITH DEVELOPMENT AID IN NEPAL)
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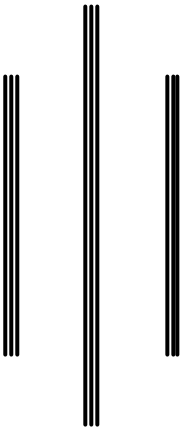

REPORT ON

IDENTIFICATION OF PROBLEMS ASSOCIATED WITH APPLE CULTIVATION AND POSSIBLE MEASURES TO OVERCOMRE THEM IN HIMALAYAN PROJECT AREAS OF SOLUKHUMBU DISTRICT

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LIST OF ABBREVIATIONS

ADB	:	Agricultural Development Bank
ASC	:	Agriculture Service Center
CBO	:	Community Based Organizations
DADO	:	District Agriculture Development Office
DOA	:	Department of Agriculture
FG	:	Farmers Group
ha	:	Hectare
HS	:	Horticulture Station
HMG	:	His Majesty's Government
JT	:	Junior Technician
MOAC	:	Ministry of Agriculture and Cooperatives
Rs	:	Nepali Rupee
VDC	:	Village Development Committee

Table of Contents **Page No.**

ACKNOWLEDGEMENT

The Horticulture Expert is very much delighted to carry out the survey on identification of problems associated with apple cultivation and possible measures to overcome them in Himalayan Project areas of Solukhumbu district of Nepal. The expert has no words to express gratitude to Himalayan Project, a Danish NGO dealing with development aid in Nepal, for entrusting him to undertake this very important survey.

The surveyor firmly believes that the findings and recommendations of the survey will be highly useful to the project while planning and implementing fruit development program in the project area of above district and thereby majority of farmers including the marginal and women farmers and fruit processors would benefit from the project activities.

Papa Kurt Lomborg (very popularly known as 'Papa Kot' in the project area), Chairman of Himalayan Project, deserves whole – hearted appreciation and admiration for his kind support, understanding, fruitful comments and logistic supports. Similarly, the horticulture expert would like to extend many thanks to all those professionals and support staff particularly to Harihar Kafle, Chief DADO, Parsuram Singh, JT, DADO and HS, Phaplu staff.

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Finally, the horticulture expert is owed to a number of farmers of the project area for their positive support and responses and willingness to try out the improved techniques of apple fruit cultivation, storage, marketing and processing.

1. INTRODUCTION

1.1 Background

Nepal, a hilly country, is very much prone to natural hazards such as land slides, floods and soil fertility degradation due to its fragility, physical geography and prevailing climatic situations. At one side Nepal's such physical structure with rugged and rough terrain has made it inaccessible making people's life problematic and difficult, but on the other side its natural scenic beauty, panoramic mountain views, courageous simple friendly people and diverse climatic conditions have been immensely attracting foreign trekkers, mountain climbers and internal as well as external development organizations in assisting poor Nepalese people to develop socially and economically through implementation of health, literacy, income generating and other social sector development programs.

Looking back into the history of introduction of improved apple cultivation in Nepal it was first initiated in 1937 during the Rana regime when improved varieties of apple saplings were imported from Japan and Italy and planted at different places in Kathmandu valley. But these introduced apple varieties did not grow satisfactorily and disappeared without record and documentation. Records on apple developments reveal that the systematic apple development program in the country commenced with the assistance from Government of India in 1960s. Numerous horticulture development centers were established all over the country taking into consideration the climatic potentiality of the area and the natural growing of local wild type of fruit varieties. The fruit development program indicates that apple development program got further impetus during the Third Five-Year Plan period (1965 - 1970) When HMG/Nepal adopted the long term policy of fruit development as a major agricultural activity in hills to better the living level of participating farmers. Area under apple fruit rapidly expanded and many private apple nurseries were established to meet the sapling demand. In 1977, clonal dwarf rootstocks of Melling Merton series, were imported from U.K. along with their growing technologies under Hill Agriculture Development Project, a FAO assisted project. However, experiences on apple cultivation to date indicate that Jumla and Mustang are the most successful districts in Nepal in terms of productivity and quality of apples produced, and other ten districts following them have also been identified for apple growing and Solu is the lone district falling in the list from eastern Nepal. The latest statistics available relating to apple cultivation area and production is presented as below:

Name of fruit	***Total Area*** (Ha.)	***Productive Area*** (Ha.)	***Production*** (M.Ton)	***Productivity*** (M.Ton/Ha)
Apple	7473	3558	34036	9.57

1.2 Government Priority

Nepal is bestowed upon by nature tremendous potentiality for growing multiple fruit types and varieties. In order to exploit this gift of nature, the country has prepared a horticulture master plan in 1991 implementation of which is expected to alter the Nepal's hilly farmer's life positively and the country's economy as well. The master

plan has accorded apple as one pf the priority fruit crops. Similarly, the long term twenty year Agriculture Perspective Plan (APP, 1995-2015) has also ranked apple crop as a prioritized fruit crop for temperate hilly areas of Nepal. In line with the recommendations given in above plans, the Directorate of Fruit Development, Department of Agriculture, has also been endeavoring to develop this fruit putting under long term vision. The Directorate has identified eleven hill districts in Mid and Far Western Nepal as most suitable apple producing potential districts and the pocket package commercial apple production program is being implemented in these districts with priority. Besides above, Special Karnali Zone Development Program is also in operation that provides apple farmers with many subsidized facilities such as subsidized saplings, plant protection equipment and chemicals, packaging materials, horticultural tools and air fruit transportation subsidy.

In case of Solu district, it is unfortunate that it does not fall under the priority districts as identified and approved by Ministry of Agriculture and Cooperatives for apple promotion in Nepal. However, DADO, Salleri has prioritized apple fruit in the district agriculture development plan of Solukhambu district and Gorakhani VDC has been selected to carry out apple pocket development program. Discussion with Harihar Kafle, Chief, DADO, Salleri, revealed that the office had plan to cover the VDC with apple trees in about ten hectare with forty to fifty farmers' participation. Mr. Kafle was found very much impressed with the quality of apples produced in Gorakhani and he himself bought few kilograms of apples at the rate pf Rs. 30.0 per kilo to present as a Desain gift from Solu to his family and close relations living in Kathmandu. He spoke very positively and indicated his interest in fully cooperating with the Himalayan Project for apple development in the district. The DADO under the apple pocket development program at Gorakhani VDC provides the farmers with fifty per cent subsidy on the cost of fruit saplings, pruning secateurs and saws and 100 meter length half inch diameter polythene pipe for irrigation purpose. The DADO also organizes skill development training programs for the apple growers on government cost.

1.3 The Project

It is a much known fact that Nepal is one of the least developed countries in the world. Rapid population growth, unemployment, geographical barriers and poverty are some of the main constraints for development, especially in the hilly rural areas. The government alone with limited resources can do small to eradicate the above barriers and accelerate the pace of development all over the country. Hence, numerous national and international non-governmental organizations are helping this country in its endeavor to attain sustainable development and better the living level of poor Nepalese people. Himalayan Project (the project) is one of them that is implementing various community developmental activities in Solukhumbu district of Nepal for the last ten years. The project, a Danish organization, with a team of dedicated and devoted members and more particularly its chairperson, Papa Kurt Lomburg, has initiated a number of socio-economic activities in three Village Development Committees (VDCs) in upper Solu.

The project has very closely been associated with Himalayan Community Development Organization (HCDO), a grassroots non-government, non- profit local organization

established in 2003 with formal registration with Kathmandu District Administration Office and the Social Welfare Council, Nepal. HCDO is composed of social workers, tourism entrepreneurs, management professionals and students. The organization has its office in Kathmandu which has eased the functioning of the project also in terms of calling meetings, maintaining coordination, supporting the projects work in Kathmandu and Solu and getting permanent communication between the project and HCDO and the project working area. The project is presently working in three VDCs of Solu, namely Bhakanje, Beni and Taksindu, but wishes to replicate its successful events in projects surrounding vicinity and other VDCs.

1.3.1 Objectives

The project has long-term vision to empower and strengthen local people's capacity so that they can themselves take up necessary initiatives for their social, economic and leadership development in a sustainable way using and maintaining local natural resources and also the external resources. The immediate objectives to be achieved by the project are:

- ?? To provide all sorts of possible help to people so as to improve their living standard.
- ?? To facilitate and support rural people for their social and economic development in a sustainable way.
- ?? To assist rural community in achieving self-reliance.

To design and support development projects for rural people living in Himalayan region with affiliation with other donor agencies to carry out similar community development activities.

1.3.2 Approach

In order to meet the aforementioned development and immediate objectives the approach taken by the project is both participatory and multidisciplinary where the planning, implementation and evaluation processes are integrated from community groupings to village cooperative level. The whole process is facilitated by supporting the need based and demand driven programs through proper and effective management of locally available resources including the natural resources. The project functions on the principle "to help people so that they can help themselves in all aspects of conservation and community development processes." The project envisages empowering local people with appropriate skills, knowledge and technical back up support. The project has large category of clients which also include women, youth, children and students belonging to socially and economically backward communities. The other important approach of the project is to promote effective macro and micro linkages through participation of all stakeholders, from grassroots to national level; integration of social and economic development plans; and information sharing for scaling up the projects successful experiences.

1.3.3 Program Components

Himalayan Project has centered its limited resources collected from the Danish member contributors primarily for three major program components which are described as below. The Nepal loving project members are keen to observe that their contribution is result and output oriented impacting positively and directly on the well being of hilly rural populace who really need the external support for enabling them to come into the mainstream of development.

1.3.3.1 Economic Development

- ?? Management and mobilization group welfare fund for micro credit facility and micro enterprise development.
- ?? Assistance in augmenting farmers' income through increase in agriculture production and productivity.
- ?? Establishment of market linkages and provision of market information system.
- ?? Assistance in institutional development of community based organization of farmers, entrepreneurs and self-help cooperatives and enhancing their capacity to run agro-based industries.

1.3.3.2 Social Development

- ?? Increase in the number of educated citizens through establishment of schools, distribution of scholarships and arrangement of literacy classes.
- ?? Capacity building of local communities to identify plan and implement environment friendly schemes such as health posts, drinking water, treks, drainage and sanitation.

1.3.3.3 Environment Management

- ?? Launching of educational and awareness programs relating to environment conservation, promotion and management.
- ?? Support to CBOs for forest development, its sustainable use and soil and land conservation activities.
- ?? Promotion of bio-diversity conservation and its judicious use.

Land acquisition, construction and operation of Chhimbu Primary School; hostel extension at Junbesi Higher Secondary School; distribution of scholarships to sixty students studying in Solu and Kathmandu; support to Ringmo Higher Secondary School; construction of plastic green houses and production of green quality vegetables at Junbesi, Mapung and Ringmo villages; and development of community forests on abandoned public land at Mapung village are some of the remarkable accomplishments the project has achieved in its working area.

1.4 Scope of the Study

Based on the discussions with the project and agreed upon terms, the survey has focused mainly on the following aspects:

1. Information collection on agro-climatic factors like climate, rainfall, occurrence of hails, temperature, etc; altitude, slopes, aspects, land use pattern, principal cereal and fruit crops, soil type, tillage and soil management practices affecting hill ecology.
2. Presentation of various farming practices in use of fruit cultivation in different project sites.
3. Information collection on economics of apple cultivation and level of use of various production inputs including horticultural tools; sources of fruit saplings; yield of fruits per tree and per hectare and price of fruits and income.
4. Determination of nature, sources, frequency and effectiveness of extension services, and training needs.
5. Assessment of the present methods of storage, transportation, packing, marketing and price spread of apple fruit, and recommendations for future improvement and adoption.
6. Identification of major constraints encountered by farmers to take up apple cultivation as an income generation activity, plant protection problems, unavailability of material resources, credit, etc.
7. Determination of the possibility of forming apple growers groups and cooperatives to undertake apple cultivation, post-harvest handling, processing and marketing jointly.
8. Suggestions for the mechanism to support the apple promotion program with the involvement of various line agencies concerned, and needed follow-up programs.

1.5 Methodology

In view of the objectives of the survey, nature of information sought by the project, the study used both Household survey and Participatory Rural Appraisal (PRA) techniques simultaneously in the selected villages to collect basic information and data required by the project. A survey questionnaire was developed on the basis of the agreed TOR. The questionnaire was filled up by interviewing male and female farmers, and other key informants such as DADO Chief, Junior Technicians, school teachers, leader farmers and local elites in selected villages and at Salleri and Phaplu.The secondary information was compiled from documents at different aspects of the project areas available from different offices and official records of the concerned institutions.

1.6 Limitations of the Study

Accurate information is essential for any report of the socio-economic and feasibility studies. Record keeping system of the rural households is the best source of accurate information. Unfortunately, it is rarely practiced in least developed countries like Nepal. In the absence of such record keeping system, the information collected through interviews with farmers are entirely based on the memory of the respondents and hence consists of memory biases. Many sought information were not available even in the District Agriculture Development Office. Another difficulty was felt lack of discussions and interactions between the surveyor horticulturist and government technicians concerned and the VDCs officials. It was also not possible to visit and interact with other apple orchardists producing and selling apples in other villages than the surveyed project area.

With all these types of limitation and lack of reliable and systematic records, the surveyor made his all out efforts to collect accurate and reliable data and information as far as possible and managed to produce this report.

2 Background of Project Area

2.1 Location and Physical Features

Solukhambu district is located in the Eastern Development Region of Nepal. Geographically, the district lies between $86^0$22'- 87^0 3' east longitudes and 27^0- 20'- $28^0$6' north latitudes. The district is bordered by Sankhuasabha and Bhojpur in the east, Dolakha and Ramechhap in the west and Khotang and Okhaldunga in the south. The elevation of the district ranges from 1500 to 8848 meters from mean sea level. A number of Himalaya peaks lie in the district including the highest peak of the world (Mt.Everest). Major Rivers of the district are Dudhkoshi, Howang, Inakhu, Likhu, Lumding and Solu. Administratively the district is divided into nine Ilakas and 34 Village Development Committees.

Based on the physical structure of the country the district can be divided into three major parts. First, the northern high mountain area which is always covered by snow. Second, the middle high mountain part where temperate climate is found and the southern mid-hill part where sub-tropical to sub-temperate climate is found. Thus, due to its climatic diversity, citrus fruit is grown in lower southern Solu where as apple and other temperate fruits are grown in middle temperate areas of the district.

As per the given assignment two VDCs Taksindu and Beni which lie in the middle part of the district were surveyed to collect the required information on apple cultivation and promotion purposes. Ringmo village, the biggest apple producer in Taksindu VDC and Mapung, Junbesi, Charghare and Phera villages in Beni VDC were visited for the survey work.

Ringmo village lies in north from Salleri, the district head quarter, in the main trek connecting both the Jiri and Salleri route to Namche and other northern part of Solu. Ringmo can easily be reached in four hours walk from Salleri and the Phaplu airport. The village has moderate slope and most apple plantations have west to north side facing. The elevation of the area is estimated to be from 2600 to 2800 meters.

Beni VDC is more near to district head quarter, Salleri and Phaplu airport than Taksindu and appears much potential for apple cultivation and development. Mapung, Junbesi, Salbesi, Charghare and Phera are the important apple production pockets in Beni VDC. All these villages are easily accessible through good treks and Junbesi and Phera villages are situated along the main way connecting Jiri-Namche and Jiri-Phaplu-Namche trek route. Foreign trekkers as well as local travelers trekking into upper northern Solu have to pass through these villages. This situation has provisioned these villages to operate hotel restaurants and good opportunity to sell fresh apples and processed apple products like dried apple, apple juice and cider and brandy to passers

by. Thukten Chholing Monastery, a very famous monastery in the country, situated near the Mapung village is also a very good market place for apple disposal at reasonable price. The whole area stretching from Mapung village to Junbesi, Salbesi, Charghare and Phera to Phaplu along the Solu river presents a unique valley with immense potential for agriculture including the horticulture development. Most of the apple plantations are seen on both sides of the river and the elevation of the villages is estimated to be ranging from 2500 to 2800 meters.

2.2 Climate

Both of the Beni and Taksindu VDCs consist of humid temperate climate. Due to differences in physical structure of the district the rainfall situation also varies in different parts of the district. Ten years of record taken on amount of rainfall at Salleri indicate that the district has a mean rainfall of about 1775 millimeter with approximately 80 percent of the total precipitation occurring during the period from June to September. Similarly, the average annual maximum temperature and the average annual minimum temperature was recorded 28^0c and 2^0c respectively. Interviews with farmers also revealed that there was occurrence of frequent hailstones too. Such hailstones if take place during the flowering and fruit set period, it is more damaging to trees as well as fruit set and production. The topographical aspects and facing of land are other factors causing micro climatic differences within short distances. For instance, Mapung valley is having colder climate and more rainfall than Salbesi and Phera Villages.

2.3 Soil

Climate, vegetation, parent material, altitude and time duration play a great role in soil formation. Accordingly variations in soil type are found. Especially in hilly region of Nepal the parent materials of soils are semi-hard to hard rocks. Generally they are found low in nitrogen and medium in phosphorus and potassium. Visual observation of the soil of the project area indicated that the soil types were loam to sandy loam with less organic matter content. Soil PH has been reported from slightly acidic to neutral. Thus to make the soil more suitable for fruit cultivation, larger quantities of farm yard manure and green manures need to be applied. However, as regards the depth of soil it was found appropriate to apple plantation.

2.4 Population and Households

The total population of Beni VDC is estimated at 2094 of which 1088 are males and 1006 are females. The number of households is 361, which gives an average family size of 5.8 persons. Sherpa is the dominating caste followed by Magar, Tamang and Kami. In case of Taksindu VDC, the total population is estimated at 2670 of which 1369 are males and 1301 are females. The number of household is 477 giving an average family size of about six persons. In this VDC also Sherpa is the dominating caste. Besides Sherpa other castes residing in the VDC are Rai, Magar, Tamang and Kami.

2.5 Land Resource and Land Use

The total physical area of Solukhambu district is 3394.15 sq. km. Out of this; nearly ten percent comes under agricultural land, though only 6.32 per cent is currently in agricultural use. Forest area covers about 31 per cent and meadows and pasture cover nearly 15 per cent. Rest of the area (about 45 %) is under snow covered Himalayas, rivers, lakes, settlements, roads, etc. Similarly, the project area also consists of agricultural Bari land, forest areas, and shrub land, grazing land and rivers. In hilly areas, agricultural Bari land means land around farmers' home where fruits, vegetables, potato, maize, wheat, barley and millets are generally grown. Such agricultural Bari land under cultivation is estimated at 1332 hectare and 1297 hectare in Taksindu and Beni VDC respectively.

2.6 Crops and Cropping Pattern

A no. of crops is cultivated in the project area, though major ones are wheat, potato, maize and barley. Other minor crops are oilseeds, buckwheat, beans and some vegetables. As Ringmo and Mapung villages are colder than other villages in the project area, they grow mostly wheat and potato, where as Junbesi, Charghare and Phera villages grow maize also besides wheat and potato. But one crop that was found very common growing every where was white beans. Some farmers also grow soybeans mixed with maize crop. Due to cold temperate climate of the project area farmers are able to take just one crop in a year. For instance, wheat is shown in November and harvested in July. But in some warmer parts farmers are taking two crops also in a year. The dominating cropping patterns in this area are – potato; maize-wheat; maize-oil seed; buckwheat-potato, etc. Potato and wheat were found as the principal intercrops in apple orchards. Sometimes wheat is rotated by barley and buckwheat.

3 Apple Fruit Production Situation

The presence of wild crab apple locally called 'Goshil' in upper Solu areas indicated that there was possibilities of growing improved apples also. In view of this HMG/Nepal initiated apple development program in Solu through the establishment of Horticulture Station at Phaplu, Salleri VDC in 1977 with objectives of producing and distributing temperate fruit saplings; providing necessary technical services to fruit growers; and conducting training programs on fruit growing to farmers and junior technicians.

During the same time about three decades ago, thousands of apple saplings of different cultivars were distributed free to farmers under Remote Area Development Committee and Intensive Agriculture Development program. Establishment of government horticulture farm and free apple saplings distribution encouraged many farmers of Beni and Taksindu VDC also to undertake apple farming as cash earning agriculture activity. It was certainly a great deviation from traditional agriculture towards improved apple farming. During the survey it was found that Ringmo was one of the villages that had obtained maximum benefit during the initial years of apple development program in Solu. Late Dorji Pasang Sherpa, the then chief of Taksindu VDC and also a rich and influential politician planted about 1500 apple saplings himself and distributed few saplings to other neighboring farmers also. People still recall that it was like a fruit

plantation campaign. The program was successful as after five- six years of plantation, the apple trees began to bear attractive fruits. In order to deal with the fruit storage problem, Mr.D.P.Shrpa borrowed loan from Agriculture Development Bank and constructed an apple store house which is still standing refreshing the old memories of apple promotion program at Ringmo village. Few years latter, after the death of Mr.D.P.Sherpa the big apple orchard was fragmented into three parts with transfer of ownership to his three sons. Perhaps this is the oldest and biggest apple orchard of Solu district. Mr.Furwa Sherpa, one of the three sons of late D.P.Sherpa, is running Apple House Restaurant there and showing interest in replacing the old unproductive apple trees with new apple saplings of suitable variety.

Motivated with the successful fruiting of apples at Phaplu Horticulture Station and Ringmo village a large number of farmers of various VDCs undertook apple cultivation program and about 75 per cent of the farmers of Taksindu and Beni VDC planted apple saplings in their homestead gardens. Some rich and elite farmers established big apple orchards covering even one hectare of land. The latest apple cultivation area, production and productivity in Solu are presented as below (DADO, Solu, Report, 2003-2004):

Crop	**Area(ha)**	**Production(m ton)**	**Productivity (M.Ton/ha)**
Apple	207	1050	5.07

The principal apple growing VDCs in Solu are:
Salleri, Gorakhani, Garma, Taksindu, Beni, Tamakhani, Kerung and Kaku.

The recent survey of the Himalayan Project villages has given the following estimated apple plant population.

Village	***No. of Households***	***Apple Plants***	***Production(m ton)***
Ringmo	32	2800	70
Mapung	20	450	9
Junbesi	6	300	5
Charghare	12	95	1.5
Phera	70	3000	75
Total	**140**	**6645**	**160.5**

The above estimated apple production figure presents a very grim situation in terms of apple productivity per tree. Reasons for such poor performance of apple trees are listed as – unproductive old apple trees; lack of technical knowledge on the part of fruit growers; almost non-existence of extension services; insect and disease problems; no motivation from any organization for taking up apple cultivation as commercial enterprise; conflict situation; lack of ensured market; lack of technical know how for making processed value added products; migration to city areas; apathy on the part of fruit growers due to low quality of apple fruits; and supplementing household expenses through other jobs. However, most of the farmers interviewed during the survey

showed great enthusiasm to take up apple farming seriously if provided with the required materials, skill development technical trainings and intensive technical support and services.

3.1 Apple Varieties

The Systematic horticulture development program commenced in Nepal in the decade of 1960 when HMG/Nepal and Government of India signed an agreement and many horticulture expert came to Nepal for technical cooperation and at the same time various types of fruits and varieties were also imported from India including the apple cultivars. Thus, in 1970s, in Solu also thousands of apple saplings of Indian origin entered the district without any screening and test of suitable varieties. It was thought that apple verities established in temperate part of Northern India would also perform well under similar climatic conditions in Nepal. The introduced apple varieties in Nepal from India were Golden Delicious, Red Delicious, Royal Delicious, Rich a Red, Jonathan, Benoni, McIntosh, Cox's Orange Pippin and Granny Smith. In Nepal Delicious apple performed better than other varieties. Delicious apples were liked and selected for further multiplication and area expansion program. The Delicious varieties were chosen on account for their good size, flavor, attractive color, juiciness, sweetness and longer storability even under natural condition.

During the survey, Solu farmers also indicated similar views regarding apple varieties. Farmers have categorized apple fruits in two groups, first delicious group and the second non-delicious group or the low and inferior quality apples. During the survey it was observed that medium size delicious apples fetched the highest price and were much in demand for fresh consumption. Among the earlier apple plantations fifty per cent of apple trees appeared of delicious groups while fifty per cent were non-delicious varieties like Jonathon, Benoni, Cox's Orange Pippin, etc. in which Jonathan was found dominating. These varieties are mostly used for making apple brandy using the conventional methods.

An indigenous person named Lakpa Sherpa belonging to Garma VDC of Solu had intended to promote apple cultivation in a big way about a decade ago. He established a formal organization in the name of Sherpa Horticulture Farm Private Limited at Newar, Solu. He was technically trained in Switzerland on apple cultivation and wanted to apply his knowledge and skill in his home district. He did remarkable job by introducing thirty renowned apple varieties from all over the world with the idea of identifying the best ones suitable to Solu situation or humid temperate climate. Some varieties were found planted at Ringmo village but presently they are in neglected condition. According to the record the varieties are:

- Vista Vella (USA)
- Discovery (England)
- Summer Red (Canada)
- Graveinsferiner (Denmark)
- Gold Parmaeue (France)
- Kidds Orange (New Zealand)
- Elster (Holland)

?? Glocken Apple (Switzerland)
?? Gala (New Zealand)
?? Ida Red (USA)
?? Empire (USA)
?? Spartan (Canada)
?? Mai Gold (Switzerland)
?? Prime Rouge (Japan), etc.

At present, the above organization is non-operational and the varietal study plot at Ringmo is in abandoned condition.

3.2 Use of Modern cultivation Practices

As stated earlier, apple fruit trees in the surveyed villages are being grown in the homestead area haphazardly in an unscientific way. Such homestead fruit growing has hardly seen the systematic plantation with recommended pit digging, pit filling, plantation, use of compost and chemical fertilizers, use of agro-chemicals, plant protection measures, pruning and training and post-harvest handling. Few commercial orchards established at Ringmo, Phera and Junbesi villages were found properly planted but still crowded with 15-20% more trees and also poorly attended with improved fruit cultivation practices. Thus, most of the farmers of the project area have been following the traditional cultural practices.

Almost all of the farmers of the study area practice intercropping. The apple orchards are generally intercropped with maize, wheat, potato and vegetables which are expected to be contributing significantly in giving unhealthy appearance to the fruit trees. Damage to the plants and root zone of fruit trees while ploughing the field for intercrop plantation is conspicuous for poor orchard health.

3.3 Yield of Apple

In general, productivity of apple trees being grown in the project area is very low. This may be easily understood as most of the fruit growers have homestead gardens and farmers seldom use improved techniques of fruit production. The average fruit yield estimation has been calculated to be 6.25 tons per hectare based on the farmers' answers and this yield is less by 3.32 tons per hectare if compared with national average of 9.5 tons per hectare. It is very disheartening to mention that apple fruit yield has been decreasing since last ten to fifteen years. The reason for it is very obvious that apple trees planted in late seventies have become old and less productive. Also, management aspects are very poor. Farmers are neither uprooting the old trees nor rehabilitating them with proper maintenance. It appeared that apple trees yielded more in the beginning due to good soil fertility and care by the farmers. But, after 15-20 years, declining soil fertility, market problems, conflict situation, less than the expected income, decline in the number of tourists, migration to other areas, insects and diseases, etc. resulted in the reduction in the fruit yield also. Now, based on the climatic situation of the year farmers obtain some year more yield and some year less yield and feel satisfied with it. Year 2005 became good for apple framers in terms of apple yield and

quality as there was less rainfall and no occurrence of hailstone during the fruit set and maturity period.

3.4 Major Insects and Diseases of Apple

During the field survey farmers seemed very much concerned over increasing attacks of insects and diseases on apple trees and fruits. Many farmers were found identifying some of the insects damaging the fruit trees and crops but none ever tried using chemicals to control the insect damage except few cases of applying kerosene oil on holes made by stem borers and pesticide sprays. The most common insects observed were apple root borer, apple bark borer, apple stem borer, wooly apple aphid, tent caterpillar, defoliating beetle and codling moth. Similarly, the common diseases observed were powdery mildew, pink disease, papery bark, root and collar rot, alternaria blight and sooty blotch. Other problems mentioned by the farmers were drying of twigs starting from the tip, fruit drops, fruit cracking, biennial bearing, fruit rotting during storage, fruit damage by monkeys and birds, lichens, etc. Infected twigs, leaves and fruits were brought from project area for further laboratory analysis and identification of diseases and their causal organisms. Thus based on laboratory analysis at Pathology Division, Nepal Agriculture Research Council, responses of farmers and field observation during the survey, the following table depicts major insects and diseases prevailing in the project area.

Major Insects

S.No.	*Insects*	*Scientific Name*
1.	Wooly Apple Aphid	Eriosoma lanigerum
2.	Tent Caterpillar	Malaw indica
3.	Defoliating Beetle	Brahmina coriacea (Black Beetle) Anomala ryfiventris (Green Beetle)
4.	Codling Moth	Cydia pomonella
5.	Apple Root Borer	Doryothenus hugelii
6.	Apple Stem Borer	Zeuzera sps.
7.	Apple Bark Borer	Zeuzera sps.

Major Diseases

S.No	*Disease*	*Causal Organism*
1.	Powdery mildew	Podosphaera leucotricha
2.	Papery bark	Botryobasidiom Salmonicolor
3.	Nectaria twig blight	Necteria galligena
4.	Alternaria twig blight	Alternaria mali
5.	Sooty blotch	Gloeodes pomigena
6.	Pink disease	Corticium salmonicolor
7.	Collar rot	Phytopthora Cactorom Fusarium sps.

Details on characteristics of diseases and insects' damages to apple trees and fruits and the recommended control measures can be presented separately while formulating the project programs.

3.5 Extension and Other Support, Services

A number of institutions in the district provide different services to the farmers. The institutions which help directly for the development of horticulture by providing technical backstopping, material inputs, marketing information, credit and research services are District Agriculture Development Office, Horticulture Station, private dealers, Agriculture Development Bank and cooperatives. The most important one is DADO which is responsible for providing technical know-how and services to the farmers. In addition to the technical support, the DADO also provides material inputs such as fruit saplings, horticultural tools, plant protection equipments and chemicals. The technical services are provided in the form of trainings, demonstrations, farmers' day and visits, organization of competition among farmers, agricultural fairs, farmers' tours, etc. by DADO through their regular as well as special programs. Besides DADO, Horticulture Station, Phaplu is the other important government organization in the district that had targeted programs to produce and supply quality fruit saplings to the farmers, conduct training programs, carry out studies and trials relating to apple cultivation problems and provide technical services to apple growers. According to the organizational structure of DADO, Agriculture Service Centers established at Junbesi and Jubling villages under it are supposed to provide intensive technical support to the farmers as per their needs and requirements.

When asked the farmers about the extension services through DADO, its ASCs, HS, or farmers' participation in any of above mentioned extension activities, surprisingly, majority of the farmers replied negatively. Similar was the response in case credit and technical support also. Many farmers opined that availability of such services was better in past than now. Many farmers responded positively regarding the existence of agriculture support organizations at Salleri but neither these institutions not the farmers were approaching each other for both the parties work and benefit.

Thus, the extension service, technical support, skill development trainings and credit provisions are almost nil to apple fruit growers in the project area. Chief, DADO was reluctant to indicate that ASCs were not serving and there was very less movement of agriculture technicians in Solu, particularly in upper Solu areas. So, majority of the farmers are doing apple cultivation on their own and sometimes they get technical suggestions from innovative farmers and HS, Phaplu, if visits are paid there for the purpose.

3.6 Marketing

Apple fruit produced in the project area are consumed by following ways:

1. Sale as fresh apple: - Salleri Bazar, the district head quarter of Solu, is the important apple consumption market. Phaplu airport is the other important place where good quality apple is sought and bought by travelers leaving for

Kathmandu by air. There are six-seven flights (Kathmandu-Phaplu-Kathmandu) in a week. Other important fresh apple consumption places are Thukten Chholung Monastery, lodge and restaurants situated on the sides of main trekking routes like Junbesi, Ringmo and Phera villages. Based on the apple growers' information during the survey, fresh apple sale is estimated at thirty to forty per cent of total production. But significant to note is that good quality apples of Delicious varieties are much more in demand by the consumers at Salleri and Phaplu.

2. Use for brandy making: - Most of the discarded, non-delicious, inferior quality and sour apple varieties are utilized for brandy making. Apple brandy making was not only very common in houses of apple producers but it was also common in hotel and restaurants and in houses of non-apple farmers. Thus, apple has become a very common raw material for making alcohol and it has substantially substituted cereal grains for the purpose. Quantity of apple being utilized for making rakshi (local name of alcoholic drinks) in the project area has been estimated at fifty to sixty per cent of total apple fruit production.

3. Production of dry apple slices and fresh juice: - For producing dry apples apple fruits are manually sliced and dried using solar energy. Similarly, apple fruits are cut into pieces and crushed and then squeezed for producing fresh juice. Such sun dried apple slices and fresh apple juice produced locally and generally consumed by the tourists and trekkers. Very small amount of apples is used for this purpose.

4. Finally, the remaining five to ten per cent of produced apples are home consumed and some are left on the ground and disposed without any use. Such discarded apples are of very inferior quality, diseased, insect damaged or rotten apples.

The selling prices of fresh apple fruit and other apple products are as follows: -

1. Good quality Delicious variety apples	Rs. 25.0 per kg in October
2. Good quality Delicious variety apples	Rs. 35-40 per kg after October
3. Bad quality small sized Deli. apples	Rs. 15.0 per kg in October
4. Non-delicious acidic apples	Rs. 10.0 per kg in October
5. Dried apples	Rs 50.0 per pocket
6. Fresh apple juice	Rs. 40.0 per glass (150 ml)
7. Apple brandy (Rakshi)	Rs. 50 to 100 per bottle (600 ml)

The selling rate of apple brandy varies depending upon the quality and place.

During the survey Phaplu Horticulture Station was also visited and information on apple sale was found very encouraging and motivating. The government Horticulture Station had easily sold all its four ton apples at the rate of Rs.25.0 per kg immediately after the harvest in October worth 100000.0 Rs.

Thus, to summarize the marketing situation of apple fruits produced in the project area it can be stated that there is not established fruit marketing mechanism and network, even then there is no problem of apple markets and marketing at present. However, the critical matter is how to protect the apple trees for making them more productive and produce quality fruits.

Asked about the income from apple farming most of the farmers were of the opinion that it was not so profitable as compared to apple growing in Mustang district. None of the farmers was found keeping records on fruit yield, quantity of fruits sold, inputs and cultivation expenses and net profit. However, based on the farmers response gross income has been estimated at Rs.300.0 per bearing apple tree on an average in the project villages. Some innovative farmers are even earning much more than that by producing and selling good quality Delicious apples.

3.7 Constraints to Apple Farming

There exists a number of constraints to the promotion of apple farming in the project area. The constraints are both at the farm level and at the institutional level. Major constraints are summarized below: -

At farm level

1. Pre-dominance of small land holdings and therefore farmers' emphasis is to maximize stable food crops.
2. There is relatively longer gestation period of fruit which discourages farmers to put their scarce land resource under fruit.
3. Lack of technical know-how about apple farming has discouraged those farmers who take interest in this area.
4. Lack of established market and marketing mechanism and also lack of remunerative prices.
5. Unfavorable climatic factors such as hailstone and high rainfall during fruit set and maturity period causing low productivity and low quality fruits.
6. Profitability is not ensured against investment.
7. Conflict situation and decrease in number of tourists and trekkers.
8. More incidences of insects and diseases.
9. Lack of quality fruit saplings and other inputs.
10. Fruit damage by wild animals (deer, monkey) and birds.

At institutional level

1. Apathy on the part of concerned institutions to provide necessary support and services due to their own problems.
2. Concerned institutions have given less priority to apple farming in Solu.
3. Inability of concerned authorities to meet the farmers' requirements (saplings, fertilizers, pesticides, technical services and marketing facilities).
4. Inability of concerned authorities to motivate farmers towards apple fruit cultivation.
5. Big gap between what the technical knowledge the concerned institutions have and what are the required technologies suited to local conditions.

4. Apple Production Potentialities

The project area seems to have enormous apple production potentiality. Then the question arises, why are the farmers of that area reluctant to take up apple farming largely as an income generating cash crop? To answer this question numerous factual reasons have already been explained in previous pages. Of course, high rainfall has been observed the sole climatic natural factor that has resulted in providing favorable conditions for insects and disease infections to apple trees and fruits and finally damaging the appearance and look of fruits. But this problem can be resolved to some extent by adopting recommended orchard management practices. Mustang and Karnali districts in Nepal are known to have the most suitable natural climate for quality apple production, but these districts are also facing serious insect and disease problems like San Jose Scale insects, scab and die-back diseases. Enormous private public joint efforts have been put into practice to solve above plant protection problems in Mustang district.

During the survey, many farmers showed interest and enthusiasm to grow apple fruit provided that needed support and services are made accessible to them. In order to further exploit the gained experience and knowledge of many apple growers, planned apple promotional programs need to be continued. Availability of consumption market, increasing demand for apple and possibility of road linkage in future are all positive aspects for promoting apple development in the project area. Apple cultivation, besides providing nutritional and commercial value to farmers, is also important to conserve soil and balance ecology. Establishment and operation of apple fruit processing units at production pockets will provide employment opportunity to women farmers also.

5. Recommended Programs for Apple Promotion

5.1 Homestead Fruit Garden Program

There are a few big commercial apple orchards established at Phera and Ringmo villages while others are homestead gardens. Considering the present situation of extension and support services, availability of inputs, market and marketing ways and technical know-how, emphasis should be laid on improving and developing small size apple gardens. Development of such homestead apple gardens is expected to meeting the following objectives:

- ?? To produce fresh fruit for family consumption in order to improve the nutritional status of farm families.
- ?? To educate and expose the farmers about apple cultivation practices with a view to prepare ground for launching apple development program on a large scale in future, when farmers gain experience, develop more confidence and other facilities such as transport, storage, packaging, processing, marketing process and markets become available or improve.
- ?? To help farmers produce good quality fruits and sell them at reasonable prices.
- ?? To supplement the household income through apple fruit cultivation.

?? To help develop an agro-enterprise that will reinforce apple farmers to work unitedly in groups for arranging needed inputs, applying appropriate fruit growing technique, fruit storing, processing, transporting and marketing apples in local as well as distant markets.
?? To raise awareness among farming community regarding the need of soil fertility conservation, nutritional diet, possibility of generating additional income and better management of available local resources such as land, water, labor, etc. for more income.
?? To provide opportunity to all interested farmers to participate in apple growing program.

It has been assumed that the average size of such gardens will be about of 1000 square meters (0.1 ha), which will on an average be adequate to plant 25 to 35 apple saplings depending upon the land structure and slope, from which one ton of apple fruit is expected to be produced per year at full development stage. Wherever applicable, apple plantation plot should be selected where sunlight remains for longer time and farmers feel ease to look after the trees. Regarding the varieties, Royal Delicious, Golden Delicious, Rich a Red should be preferred and planted because they are the most successful established apple cultivars all over the country. Four five saplings of improved varieties of stone fruits like plums, peaches and apricot can also be planted by interested farmers.

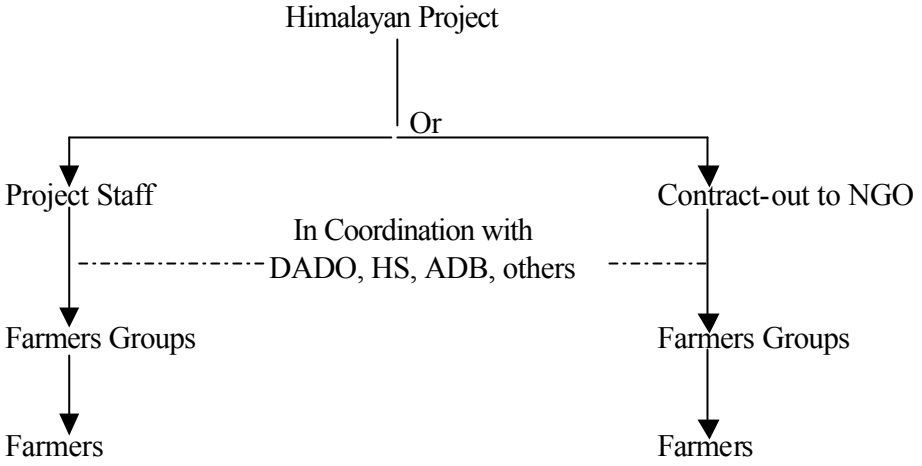
Apple farmers who are already having some apple trees are recommended to practice the following apple cultivation tips:

?? Uproot the old unproductive apple trees.
?? Uproot the insect and disease infected unproductive trees and also the trees that produce acidic, non-salable and non-usable fruits.
?? Must adopt the recommended improved cultivation practices such as proper pruning, irrigation, protection from insects and diseases, mulching, fertilizer application and appropriate post-harvest handling.

6. Farmers Participation and Area Coverage

Establishment of new homestead apple gardens and rehabilitation of old apple orchards will be two principal apple promotional activities. It is envisaged that a total of about 250 farm families (about 60-70 % of the total number in project area) will participate in the program and this will involve area coverage under fruit of about 30 ha. The area estimated and the number of participating farm families have been calculated on the basis of the conditions of existing apple trees, the present pace of fruit development, availability of resource materials and natural potentialities. Regarding the total area coverage it is envisaged that in 2-3 years the proposed target will be met. At full development stage (ten years after the plantation) the total apple production is anticipated to be about 200 tons per year. Encouraged with the success of homestead apple gardens if more commercial orchards are established and developed the volume of marketable fruit will also be increased in the same manner. Such homesteads apple gardens are estimated at providing Rs.15000.0 income to each participating farmers.

7. Implementation Arrangements



As shown in the above figure apple promotion activities in the project area can be carried out in two ways. First way is, the project itself implements the program recruiting some technical persons and deploying them at the field with given responsibility. Second way is, the project implements the program by contracting out to an appropriate NGO to fulfill the project's objectives and targeted programs. But it is very clear that in both the cases apple development programs need meaningful cooperation and support from the concerned organizations of the district such as DADO, HS, ADB, Salleri VDC, traders, hotels and restaurants, etc.

Technical support programs should be launched by adopting participatory group approach. Farmers should be organized into groups and such FGs should be the focal point of project activities. These FGs should be motivated to raise group welfare fund also and such common fund be utilized for common interest works like construction of common apple stores, purchase of plant protection equipments and horticultural tools and packaging materials, etc. Efforts should also be directed to form a cooperative with appropriate representations of all FGs of the project area. This federation like cooperative should be rested with responsibility of coordinating with external support institutions and sustaining the project activities. This cooperative can also play significant role in managing required inputs, marketing outputs and maintaining links with concerned government, non-government and private organizations.

8. Establishment of Demonstration Orchards

In order to educate and convince the farmers about the various aspects of fruit growing it is proposed that demonstration orchards of 0.1 to 0.15 ha size should be set up in farmers' field with their active cooperation. Costs of fruit plants, fertilizers and plant protection aspects should be borne by the project and other costs should be borne by the participating farmers. Three such demonstration orchards are recommended to be established in the project area at Junbesi, Phera and Ringmo villages. Set up and operation of such demonstration farms have been found very useful extension tool in other projects too and the DOA has also been encouraging to develop such model farms

in the districts under regular program. These demonstration orchards will serve as the site for on the spot training of farmers on fruit cultivation and also the sites can be utilized for other groups' visit, conduction of farmers' day, etc. Such demonstration orchards should be supported for 5-6 years till it comes into good bearing stage.

9. Establishment of Private Fruit Nursery

The availability of quality fruit planting materials is a very critical input in any fruit plantation program on which depends the growth as well as productivity of the fruit orchards. In the project area a government run Horticulture Station exists at Phaplu which has the mandate of producing and distributing quality fruit sapling to the interested fruit growers. This nursery is targeted to produce temperate fruit saplings and has to supply these nursery saplings to districts or areas as instructed by the Directorate of Fruit Development. But farmers of the project area do not possess good faith in the quality of apple saplings being produced at Phaplu Station. It is recommended that a private nursery be established in the project area at Phera or at Ringmo at farmer level. It is also recommended that varietals study plot established at Ringmo village be maintained and evaluated under the project program. The best performing varieties should be multiplied and distributed to the farmers by above private nursery.

10. Plant Protection Support

Apple fruit trees being grown by the farmers in the project area have very poor production status. Even the productive trees are never sprayed with any pesticide and similar is the state about training, pruning and other intercultural operations. Keeping in view of these existing situations, the following measures are recommended for protecting newly planted young saplings as well as for making the bearing trees more productive with higher yield.

- ?? In view of the problem of cultivating intercrops very close to the root zones of fruit saplings, plant protection cage made of local materials should be provided to protect the young trees.
- ?? In order to rehabilitate the poorly managed homestead gardens and increase their productivity, activities such as on-the-spot trainings, method demonstrations, problem solving campaigns and joint plant protection by FG members should be undertaken intensively.
- ?? A calendar of operation for fruit growing should be developed and given to farmers.

11. Training

Growing of fruit crops is a specialized job and requires special knowledge and skill for the success of fruit development program at the farmers' level and it is important that their knowledge on various aspects of fruit cultivation is improved. Training is also important for enhancing the technical capabilities of FGs so that they can perform their jobs confidently and effectively.

Interviews with various farmers in the project area have surprisingly revealed that not a single farmer has got opportunity to participate in any formal training program on

improved fruit cultivation techniques. Thus there is a need to organize specific training programs to impart them required technical knowledge and skills on improved fruit cultivation techniques. For this three types phase wise training programs for the farmers are proposed as below:

(a) Training for FG leaders

Training on orchard management should be organized for the FG leaders immediately so that they could guide and assist other fellow members also in their villages. The training program should be organized at HS, Phaplu.

(b) Training for fruit growers

A phased arrangement for providing training to FG members should be made emphasizing the type of fruit and varieties they have started growing or appears feasible to grow in their pocket areas. Four to five members from each FG should participate in such trainings and the selection of members be rested on the decision of FGs. The venue for such trainings is again proposed the HS, Phaplu.One or two members of each FG should be specially trained on particular subjects like plant protection, training pruning, post-harvest handling, etc.

(c) On the spot trainings

On-the-spot trainings on orchard management can be organized during FGs' meetings in the village itself for one or two hours depending upon the demand and interest of group members. Such short duration trainings have been very successful in group approach system of agriculture extension where each individual group member gets opportunity to share experiences and knowledge with each other and reinforces to succeed the program. In such trainings practical aspects should be emphasized rather than theory classes. Prior preparation of training materials and topics must be given due consideration. Such trainings can be conducted with the assistance of district level subject matter specialists or trained extension agents or experienced farmers as invited trainers.

In addition to above training programs for various level trainees in the village and district, few trainings can also be organized at Horticulture Center, Kirtipur which specializes imparting training on temperate and sub-temperate fruit cultivation. The Kirtipur Center has excellent training facilities and has been organizing various types of trainings on fruit cultivation techniques for different level of trainees since long time. Training at Kirtipur to few batches of farmers of the project area is expected to provide them additional motivation and exposure to take up fruit growing as a commercial enterprise.

12. Monitoring of Fruit Development Program

Project management at district as well as center level should monitor the results and operations on regular basis through reports designed for the purpose together with other relevant information. The management should also evaluate programs and activities at

frequent intervals using information specifically generated in respect of each program and activities. Such routine monitoring and evaluation is necessary to ensure that the project activities are proceeding in the desired direction and according to the recommended standard of cost, time, quantity and quality.

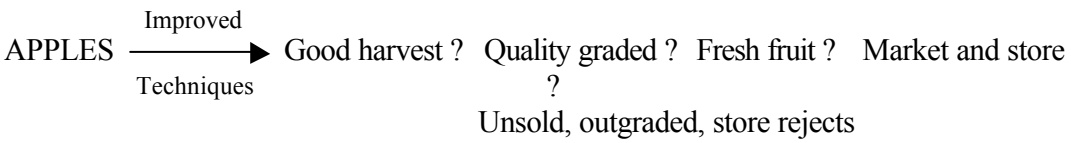
13. Women Farmers Participation

Women constitute around fifty percent of the total population in the project area. Discussions with some women farmers during the survey in the project area it was revealed that women farmers' participation in carrying out agricultural activities was more than their male counterparts. Therefore, it becomes imperative that the women folk which are the vast and highly industrious resource actively participate in fruit cultivation program also in the project area. Emphasis should be laid on involving as much women farmers as possible in various fruit development activities. Training in fruit cultivation and processing aspects should be imparted to women farmers also. Their increasing involvement should also be emphasized on harvesting, grading, packaging and marketing of fruits. Making of fruit processed value added products and their marketing should be highly encouraged in the project area with more involvement of women farmers. Similar specific programs with a little more incentives should also be undertaken for disadvantaged group of farmers who can meaningfully participate in fruit cultivation activity and make economic returns.

14. Economics of Fruit Production

It is very true that farmers generally are reluctant to bring a portion of their bari land under fruit cultivation on a commercial scale owing to the gestation period of important fruit crops and the various constraints in producing, transporting and marketing of fruits. However, in view of the situation arising out of soil erosion, land depletion, decreasing crop productivity and the limited scope available for on-farm activities, farmers are willing to switch over from the traditional cropping pattern to fruit crops with appropriate crop mixes, in view of their higher return in the long run. In the initial stages the impact of fruit crop cultivation may not be significantly felt, as the benefit would be received after a long gestation period. The pronounced impact on the economy would be felt only when sizable fruit production on a commercial scale starts picking up and the vertical integration between the various activities, right from input supply to farmers and the marketing of fruit to ultimate consumers get stabilized. The fruit development project would not only meet, to a great extent, the nutritional requirement of the people but also directly induce the farmers to take up cultivation of fruit crops at least in some portion of their land holdings after considering the merits of disposing of the produce at farm get itself and the inherent higher profit margin as compared to other alternative crops.

15. Utilization of the Apple



?
Processing according to condition
?
Slices (of reasonable size fruit)

Apple sauce, pie, confections (of medium quality fruit)

Juice, cider, wine, brandy (misshapen low quality fruit)

Persons met and exchanged information with on apple cultivation and promotion in Solu during the survey

S.No.	Name of Person	Occupation	Village
1.	Ngima Pakhrin	Secretary, Young Star Club	Salleri
2.	Furwa Sherpa	Apple farmer	Ringmo
3.	Temba Gelchen Sherpa	Apple farmer, Hotel Owner	Ringmo
4.	Pasang Sherpa	Hotel Owner	Ringmo
5.	Mrs.Furwa Sherpa	Hotel Owner, Fruit processor	Ringmo
6	Nuri Sherpa	Apple farmer, Tourist Guide	Ringmo
7.	Kandu Sherpa	Farmer	Ringmo
8.	Chhiring Doka	Apple farmer	Ringmo
9.	Gelu Sherpa	Trekker	Nanthala
10.	Udhav Khanal	Teacher	Ringmo
11.	Karna Karki	Teacher	Ringmo
12.	Uma Basnet	Official, Khumbu National Park	
13.	Sarki Lama	Apple farmer, Hotel Owner	Salbesi
14.	Tendy Sherpa	Apple farmer	Mapung
15.	Ang Babu Sherpa	Apple farmer	Mapung
16.	Nurbu Sherpa	Apple farmer	Salbesi
17.	Kami Sherpa	Apple farmer, Hotel Owner	Junbesi
18.	Ringi Lama	Apple farmer, Hotel Owner	Junbesi
19.	Dendi Sherpa	Apple farmer, Hotel Owner	Junbesi
20.	Pasang Sherpa	Apple farmer	Charghare
21.	Dig Bahadur Magar	Apple farmer	Charghare
22.	Maya Magar	Apple farmer	Charghare
23.	Ram Bahadur Magar	Apple farmer	Phera
24.	Buddha Singh Tamang	Apple farmer	Phera
25.	Sumbu Sherpa	Apple farmer	Phera
26.	Pula Sherpa	Apple farmer	Phera
27.	Kanchha Sherpa	Apple farmer	Phera
28.	Galchen Sherpa	Apple farmer	Phera
29.	Roshan Tamang	Apple farmer	Phera
30.	Harihar Kafle	Chief, DADO	Salleri
31.	Parsuram Shingh	JT, DADO	Salleri
32.	B.N. Ghimire	JT, DADO	Salleri
33.	Dil Bahadur Koirala	Staff, HS	Phaplu
34.	Mr.Mandal	JT, HS	Phaplu
35.	Bilas Bhattarai	Staff, HS	Phaplu