I. INTRODUCTION

1.1 Background

Agricultural sector has been considered the most important sector in Nepalese economy. It contributes about 38 percent of the Gross Domestic Product (GDP) and employs about 65.6 percent of the economically active population (CBS, 2002). Moreover, crops account for about 60 percent, livestock 30 percent, and forestry 10 percent of the total agricultural gross domestic product (AGDP). Horticulture contributes 14 percent to the total agricultural GDP (Thapa, 1998). The share of horticulture to the AGDP is increasing in the recent years. Agricultural diversification and commercialization have drawn attention of the planners and policy makers in terms of generating more income, employment opportunities and biodiversity conservation. The cultivation of high-value low-volume fruits and vegetables and optimum utilization of the available resources for production, processing, and marketing operations has been conceived for the sustainable development of nation.

His Majesty's Government of Nepal (HMG/N) has implemented a 20-Years Agriculture Perspective Plan (APP) since 1995 with a view to develop overall economy and alleviate poverty. This plan has identified priority inputs and outputs for investment in order to commercialize agricultural sector. Among other, high value horticultural commodities and agriculture business are priority outputs in APP. Agricultural marketing has been considered as an integral component. It is also proposed to establish strong forward and backward linkages.

Under the APP the High Value Crops (HVC) are emphasized as (i) citrus throughput the mid hills; (ii) apple in the inner Himalayan zone; (iii) off-season vegetables in the hill as well as Terai (iv) vegetable seeds in the hill and mountains. Given the diversity of climatic conditions, Nepal has a wider scope for the production of various types of vegetables and fruits. Horticultural crops have played important role in Nepalese agriculture. Horticultural crops contribute to augmenting food, improvement in nutrition, employment and help in income generation and maintain/improve environment. HVCs help to generate alternative employment opportunities in the farm and non-farm sector, as it is more labor intensive and demands different activities to make horticultural crops ready for marketing.

Similarly as focused by the APP, commercialization of agriculture and thereby increasing production and income of farmers is the main strategy of HMG in the 10^{th} plan. For this strategy to function, a number of policies has been initiated and it is believed that once policies become consistent, facilitative and coherent to the needs of farmers, businessmen, processors, exporters and other stakeholder, the production and income levels will rise.

The mid-hill region (1000 meter to 1500 meter altitude) has a comparative advantage in the cultivation of citrus fruits, especially mandarin and sweet orange. Compared to the traditional food grain crops like maize, wheat and millet cultivation of these fruits has been found more profitable. Not withstanding the vast potentials for the production of mandarin

and sweet orange domestically, these fruits and fruit products are being imported in a large quantity to meet the growing demand in the country. The area under citrus fruits constituted about 29.4 percent of the total area covered (2002/03) by all types of fruits in Nepal. Citrus alone contributes about 26.81 percent of the total fruits production. It is estimated that Nepal imports 85 percent of its fruits consumption. However, during harvesting season citrus production is more than fresh demand.

The fruit cultivation in homestead area in Nepalese agriculture is a traditional practice. It is grown in almost all mid-hill areas (900-1400 masl) of the country between 26º 45' and 29º 40' latitude and 80º 15' and 88º 12' longitude. The mid-hill region of Nepal, which accounts about 1.5 million ha is quite suitable for citrus cultivation (Shrestha and Verma, 1998).

Mandarin orange contributes to augmenting food availability, improvements in nutrition, generation of employment and income and also helps in maintaining the environment (Shah, 1992; Gurung, 1993; Shrestha *et al*., 1997; Tomiyashu *et al*., 1998). The total area under cultivation, productive area and production of citrus in Nepal during 2003/04 were 24799 ha, 13931 ha and 148010 mt, respectively. Similarly, the total area under cultivation, productive area and production of mandarin orange are 15205 ha, 8146 ha and 91094 mt, respectively. The area under mandarin is 61.31 percent of the citrus fruits and 17.54 percent of the total area covered by fruits in the country. Citrus, particularly the mandarin orange is the most important and highly commercial fruit crop in the hills of Nepal.

APP has prioritized mandarin orange as a cash-generating commodity for middle hill farmers. To implement the priority-integrated program to citrus growing areas, Agricultural Project Service Center (APROSC) had conducted feasibility study of 16 mid hill districts in 1989 to bring additional area under citrus plantation. It is estimated that about 25 per cent of total fruit area in the country is covered by citrus which is about 15,940 ha (Shrestha and Verma, 1998). The APP targets to increase the area of citrus production by 130 per cent by 2015. The national productivity of existing orchard is very low (11.18t/ha) as compared to 43 t/ha of other citrus growing countries.

1.2 Rationale of the Study

Due to growing demand for juice, jam and jelly as a result of urbanization and tourism industry in the country, such products are being imported in larger quantity. At the same time, citrus fruits like mandarin and sweet orange being perishable in its nature, they cannot be kept for longer time without proper storage facility maintaining their freshness and quality. So, from the viewpoint of import substitution and postharvest loss, establishment of mandarin and sweet orange processing industry is a need in the present context and for this concerned matter; the ABPP has taken a modest attempt to vitalize the situation.

1.3 Objective of the Study

The objectives (specified in TOR) of the study was to explore the feasibility of mandarin and sweet orange processing industry in Nepal which will facilitate the enterprenuers to establish mandarin and sweet orange processing industry in Nepal. The specific objectives of the study were to:

- Review of the existing pockets areas for mandarin and sweet orange.
- Identifying the existing mandarin and sweet orange farming practices adopted by the farmers, the problems and constraints encountered by the farmers and potential for the increment of productivity.
- Study of the existing marketing system of mandarin and sweet orange.
- Reveal existing marketing system of processed mandarin and sweet orange products.
- Study the present situation of processing of mandarin and sweet orange.
- Examine the level of interest of farmers from subsistence to commercial farming of mandarin and sweet orange.

1.4 Scope of the Study

The study was focused to reveal the existing production market and market channel of mandarin and sweet orange by major production pockets. An account of processed items of mandarin and sweet orange has been revealed and the scope for establishing processing industry of mandarin and sweet orange in Nepal has also assessed. Within the coverage of the scope, following activities were undertaken;

- Production pocket survey to collect information on pocket profile (pocket size, production volume, bearing and non-bearing trees of mandarin and sweet orange productivity level access irrigation facility and input supply situation.
- Market survey of the produce in the local and district market, home consumption, local market demand, volume to distant market supplied, marketing channel, farm gate price, grading system, price fixation method, packaging materials used, surplus remained unmarketed.
- Household survey to gather information on farming practices of mandarin and sweet orange on different aspects of cultural practices.
- List out problems and constraints faced by farmers, trader, agro-processor and gather their suggestion for improvement.
- Preparation of an inventory of registered departmental stores, processing industry by reviewing secondary sources of data (Published report, official document of relevant institute, Department of Commerce and Industry, Food Technology and Quality Control Department.
- Preparation of a list of processed items of mandarin and sweet orange available in departmental stores and manufactured by the different processed industry under study of targeted district and market.

- Collection of marketing information of processed product of the processing industry that is being sold in departmental stores.
- Household survey to gather information on the interest of farmers shifting from subsistence to commercial farming

1.5 Study Area

The study was conducted in the following districts and potential markets. The districts were identified by Agribusiness Promotion Program, Agribusiness Promotion and Market Development Directorate, Hariharbhawan, Lalitpur.

1.5.1 Districts

- Dhankuta in Eastern Development Region
- Sindhuli and Ramechhap in Central Development Region
- Tanahu in Western Development Region

1.5.2 Potential Market

- Biratnagar in Eastern Development Region
- Kathmandu in Central Development Region
- Pokhara in Western Development Region

1.5.3 Department Stores and Processing Industries

- Kathmandu
- Biratnagar
- Pokhara

II. METHODOLOGY

To meet the objectives of the study and to carryout the activities specified in the scope of the study a holistic approach was undertaken. Involvement of farmers, District Agriculture Development Office, Agriculture Service Centre, Traders, Entrepreneurs and Dealers were consulted during the collection of primary data. Discussion with concerned line agencies such as Food Technology and Quality Control Department, Fruits Development Directorate, Agri-business Promotion and Marketing Development Directorate, National Citrus Development Program and Agribusiness Promotion Program was made. Published materials were reviewed for collecting secondary information.

Potential pockets of mandarin/sweet orange was selected in consultation with District Agriculture Development Office. Sample farmers were selected from the pocket with the help of DADO and ASC. Interview schedule was administered to the selected 30 farmers each from the study district. Each district under study, one PRA was conducted to get community level information (e.g. pocket size, infrastructure development, strategic location for collection centre, processing industry establishment, general problems/constraints and suggestion. A set of checklist was prepared to carryout market survey. Traders, middleman, cooperative, entrepreneurs, departmental stores and processing industry were interviewed by separate checklists to collect relevant information. The questionnaires administered were in Nepali vernacular so that the enumerator can pick up/agitate the issues easily. Specifically, the survey instruments were:

- Household survey in the production pocket
- Market survey for fresh product of mandarin and sweet orange
- Market survey for processed items of mandarin and sweet orange and their marketing

Experienced field enumerators were deployed for field survey. The study professionals supervised the field survey work and they collected necessary information from various concerned line agencies. The professionals had conducted one PRA in consultation with DADO from each study district to generate community level information

All information collected from various sources were entered into MS Excel and analyzed using computer software SPSS (Statistical Package for Social Science). Descriptive statistical tools like mean, range, and percent were used to analyze the information.

III. POLICY AND STRATEGY

Tenth Five Year Plan stresses on two major fruits crops, apple and citrus. This plan is based on agriculture perspective plan 1995. It focuses on the high value crops such as apple in high hills and citrus in middle hills. The emphasis is on the pocket package development strategy, which must be carried out on a participatory basis from the grass roots level to higher up. There are seven major components such as agricultural inputs, technology development, institutional strengthening, creation of processing and marketing opportunities, development and promotion of agro-based industries, availability of agricultural finance and building adequate agricultural infrastructure such as agricultural road and electricity. Based on the availability of resource and facilities the development strategy is grouped into three packages such as basic, semi-commercial and commercial. There will be gradual and sequential change from basic to commercial one. The emphasis is to improve and strengthen existing activities in order to increase number of citrus and apple orchards, expand their area, and improve production technology and enhance fruit quality. Intended in the plan is also to dispose the fruits properly and timely to the place, where they are consumed fresh or in processed form. A special focus is spelt out to establish apple and citrus orchards along the highway corridor so that transportation and other infrastructures are easily available for distribution and marketing of these fruits.

3.1 Government Policies in Citrus Development

The government policies in citrus development in Nepal are as follows:

- Linking the development of fruit crops with agro-based industries. Executing related policies and support services programs in order to synchronize industrial and agricultural activities.
- Introducing structural change in programs relating to agricultural statistics, market development and economic analysis to enhance analytical capability of internal and external market opportunities.
- Emphasis has been placed on developing indigenous raw materials based on agro-industry.
- Productivity movement drives to strengthen enhance the productivity of processing units as to boost exports as well as meet domestic consumption need.
- Development production program according to need of market including processing industries.
- The private sector would not be inspired to invest in agro-base industries in the absence of agricultural road linked with highway and feeder road and rural electrification. Agro- based industries cannot prosper in such environment and employment opportunities cannot expand without the involvement of the private sector. Identification of such areas on priority basis for gradually launching the programs in an integrated manner.
- Developing light gravity rope may, suspension bridge and the related ones in order to facilitate market development in the hilly areas. Whenever feasible emphasizing the

implementation of programs on the development of collection centers, shopping stalls and wholesale markets on local initiatives.

- Paying attention towards formulating a separate policy on agro-based industries as agro-based industries use agricultural product and are in the form of agri-market.
- Providing agri-business orientation in implementing agricultural development programs emphasizing commercial production of horticultural crops identified by APP.
- Emphasizing commercial production of horticultural crops identified by APP.
- Emphasizing export promotion by identifying pocket specific horticultural commodities in order to attain exportable scale production.
- Mustering up the effective participation of agro-commodity associations, agro-entrepreneurs and businessmen in planning and implementation of fruits development activities in the country.
- Encouraging the active participation of commodity organizations, institution and private sector in the development of warehouse, cold stores and related marketing infrastructures.

3.2 Government Strategies

In order to implement the fruit development activities effectively, the government has outlined short term and long term strategies. The short term strategy includes:

- National survey of fruit tree plantation, area, production and marketing
- Adoption of decentralization principle in the formulation and implementation of development plan
- Quality control of planting materials
- Rejuvenation and management of existing fruit orchards
- Promotion and expansion of commercial orchard
- Development of fruit production technologies
- Introduction and evaluation of superior varieties of exotic fruit species
- Collection and maintenance of indigenous fruit germplasms
- Infrastructure development: development of market centers in the major consumption areas
- Construction of low cost cellar stores at production sites
- Cellar storage and cold storage development through private sector.
- Construction of cold storage facilities
- Construction of feeder roads to join production areas with the motorable roads to the consumption centers.
- Promotion of women participation in fruit development programs
- Formulation of groups to make fruit extension system cost-effective and
- Preparation of project profile of fruit crops for future investment
- Demand driven and Market led production, market information dissemination and strengthening market management
- Market yard, collection centre, wholesale market, and agriculture road and twin construction to link production to market.

- Establishment of wholesale markets in major cities
- Replacement low yielding traditional varieties by the superior ones
- Development of low cost post-harvesting technologies
- Development of fruit preservation and processing industries to support production

To support the fruit development programs several activities have been spelt out in the Tenth Five Year Plan. Among them the major activities are establishment of more nurseries and strengthening of existing nurseries, distribution of necessary tools and equipments, demonstration and model orchard development, training support to farmers and technicians of various levels and status, provision of technical group to support and solve farmers problems, monitoring and follow up activities survey and surveillance of pest problems and advice methods to control them, market information collection and their dissemination of pertinent information to the farmers, construction of fruit collection centers and construction of cellar storages for long term storage.

3.3 Postharvest Handling in Nepal

Post harvest handling of horticultural crops from harvest to the time they reach the consumers, must be understood by farmers in order to reduce losses which are caused by biological (respiration, ethylene production, compositional changes, transpiration of water, physiological break down and physical damages) and the environmental factors (temperature, relative humidity, atmospheric composition and light).

- **Harvesting**: Proper harvesting at proper level of maturity reduces the losses. Harvesting of maturity stage and mature fruits result in shriveling during storage. Crops are cuts, bruised and being collected in heaps without protecting from direct sunlight and rain which results in rapid decay of the harvested crops.
- **Grading**: In Nepal, so far proper grading is not practiced. The grading is categorized normally as large, medium and small.
- **Packing**: While packing horticultural crops, one must consider the immobility within the container, cushioned well against impact and compression. Container may be Doko, plastic crates or large bins. In Nepal, fruits crops are generally packed into Doko (conical bamboo basket) with or without cushion. Wrapping of fruits with newspaper and tissue papers, dried grasses/stews and padding with polyethylene sheets has also been done before packing.
- **Transportation**: High damage occurs during transportation. This damage can be minimized by the use of proper container. Porter's transportation may cause little damage if proper care is given. Mule transportation may cause higher damages than porter. Fruits shelf life can be increased if the temperature and humidity are regulated on long distance transport.
- **Loading and Unloading**: Careless loading at farm and throwing produce while loading and unloading are common. All loading and unloading works are carried out by worker.
- **Storage**: Prolonged shelf life can be possible by proper use of storage
- **Processing**: Horticultural crops can be preserved to different forms. .

3.4 Rate of Postharvest Loss

Post harvest loss is a serious problem for horticultural crops marketing in Nepal. Rate of quantitative or physical losses are different depending on types of crops, perishability, distance between collected points and retail outlets, packaging handling during transaction and storage and display systems. Qualitative issues such as appearance deterioration, flavors, nutritive value and sale ability decrease are low in winter and high in summer season. Records on post harvest losses have been reported as follows;

- Tomiyasu/Verma (JICA Project): 29% storage losses of Junar in Nepal.
- The Rural Save Grain Project: 20-25% in case of horticultural crops.
- National Horticultural Board of India: Average 20-25% losses in horticultural crops in Bhopal, India.

3.5 Potential District of Citrus Farming

According to Citrus Development Section under Fruit Development Directorate, 42 districts of the mid-hills have been identified as commercially viable districts for citrus farming. However, there are citrus pocket formed for citrus cultivation are 51 (annex 3).

3.6 Status of Processing Industry

There are about 137 registered fruit and vegetable processing industries in the country (Shrestha and Shrestha, 1999). These industries produce dehydrated fruits, juice, jam, jelly, marmalade, pickles and fermented beverages. These processing industries collect the raw materials mostly locally but their requirements are not met with local collection in case of quality and quantity, they are bound to collect raw materials from abroad. Most of the processing industries are highly underutilized. The utilization of the installed processing capacity is around 50 percent. Horticulture centre Marpha also produces dehydrated slice of apple and apricot. Jam, cider and brandy. Some women co-operatives have been found to be involved in the processing e.g. Pragatee Women Multipurpose Co-operative at Prasoni, Nawalparasi and WEAN co-operative at Kathmandu. Under-exploited fruits like Lapsi, Amala and Chiuri are conventionally processed as Lapsi Mada, Dried Amala and Chiuri Ghee etc.

The food technology and quality controls department gives short-term training on fruit processing. This department also administers the food quality regulation enforced by HMG/N to maintain the quality standards of the product. The department has also been undertaking research-development activities for processed product development and quality improvement to support the processing industries. Bureau of standard and metrology develops prescribed standards comparable to export markets. Institute of Science and Technology of TU is running academic courses on Food Technology to produce food technology within the country.

IV. GENERAL DESCRIPTION OF THE PRODUCTION AREA

As a Himalayan kingdom, it exhibits a wide variation in its geographic settings so that the country has divided into three parallel ecological zones running east to west – the terai, the hills and the mountains. The northern high altitude belt referred to as the mountain region covers almost 35 per cent of the total area and 1.7 per cent of the area is under cultivation. This region at an altitude above 3,353 masl has an alpine climate with a considerably lower temperature in winter and includes perpetual snow, glaciers and high altitude river valleys where human habitation is sparse. The middle region called the hilly region or known as '*Pahad*' (midhill) is a broad zone between Mahabharat Lekh[2] and main Himalayas. It covers 42 per cent of the total area of Nepal in which 10.04 per cent of the area is under cultivation. This region has pleasant climate all the year round and the winter mornings and nights are cool. The region is quite extensive in west in comparison to central and eastern part of the country. This is a zone of innumerable North-South, and East-West running valleys and mountain spars and ridges radiating in different directions. The region has average breadth from 50 to 100 km and elevation ranging from 600 m to 3000 m. This is a complex region of low to medium hills and mountains, river basins and tectonic valleys. The southern plain known as Terai 23 per cent in which 8.37 per cent of the area is under cultivation. Terai region of the country has a hot humid climate.

There is a marked variation in climate and rainfall due to the diverse topographic structure of the country. It encompasses almost all-climatic zones of the world ranging from tropical through temperate to alpine climate. In such a small country, the vertical variation causes a stark contrast in Nepal's meteorological variables, namely, temperature, moisture, wind and precipitation. Owing to altitude and locational setting intricate variations in climatic condition occur within a short distance. The mean annual temperature of the country is 15.5ºC, this decreases sharply as elevation increases from south to north. In the mid hills, the average maximum temperature is recorded as 12 ºC which drops to a minimum of below freezing point (Silwal, 1993).

Similarly, the distribution of rainfall varies according to topography. Topographic differentiation is an important controlling factor for precipitation. Since, the annual average rainfall for the country as a whole is 1000 mm, the volume of rainfall varies greatly from the northern mountain region to southern terai ranging from 250 to 5000 mm annually while the northern mountain is the driest part. The central hill receives the highest rainfall. Almost 80 per cent of the total rainfall is received during June to September and the rest mainly in winter. There is uncertainty of monsoon rainfall from year to year in the country.

Administratively and statistically, 35 districts out of 75 in Nepal, stretching from Dhadedldhura in the West to Illam in the East comes under hills. It covers 62 per cent of the total area. This region has a pleasant climate all the year and the winter morning and night are cool.

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[2] High altitude

There are wide microclimatic variations within the area resulting from the interaction of elevation with aspect, air movement and shading. So, the extreme microclimatic variation to the data available from weather stations are of little value, except where work is being carried out adjacent to a weather station site. Generally, the climate of this region is monsoonal in characters with 80-90 per cent of annual precipitation occurring from June to September (HMG/N, 2000). The region also experiences non-monsoon rains. The contribution of this type of rainfall to total annual rainfall is very small, but is important.

The temperature displays seasonal variation, the coldest month being January and warmest May/June. Frost can be expected from the first week on December to the third week in February. Temperature is strongly modified by altitude and aspect. South facing slopes receive more sunshine than north facing. Slopes and temperature on the former can be expected to be higher. The climate is warm and moist.

In response the characteristics, the hill farming systems are complex, diverse and risk prone (Jodha *et al*., 1992). The land use patterns in the hills are influenced by relief, climate and distribution of population. In general, the steeper the slope, more is the proportion of forest preserved; the higher the rainfall, more the agricultural activity. Sal forest remains as a pure community on these lower hill slopes and in the valleys.

The crops and cropping pattern are distinguished based on arable land types. Two types of land: Khetland and Bariland are cultivated. Khetland are irrigated and rain-fed low lands and is bunded for stream irrigation, tapping of rainwater. Bariland is usually rain-fed lands. Limited crops and cropping patterns are practiced by the farmers in the hills. General descriptions of the surveyed districts are described hereunder:

4.1 Tanahun District

Tanahu District is located in the western region of Nepal. Gorkha borders it in the east, Lamjung and Kaski in the north, Syangja in the west and Palpa, Nawalparasi and Chitwan in the south. Geographically, it lies at 27º 36' and 28º 5' North latitude and 83º 57' and 84 º 34' East longitudes with altitude ranging from 187 to 2134 masl and occupies an area 156877 ha. This district comprises 46 VDC and the Byas Municipality.

There are three different climates with respect to its geographic situation namely tropical upto 1000 masl, sub-tropical between 1000 to 2000 masl and temperate from more than 2000 masl. The mean monthly temperature is about 2-3^{o}C in January and about 38^{o}C in June (DADO, 2003). Heavy monsoon rain begins in May and end in October; this monsoon comprises about 85 per cent. Average annual rainfall to Tanahu District ranges from 1500 to 2000 mm. The seasonal change in temperature experiences different types of climate in different months of a year.

Tanahu District has a total area of 156877 ha out of which only 66,100 ha is cultivable land. However, only 52000 ha are currently under cultivation. Out of agricultural land about 14 per cent is irrigated land. The average parcel size is 3.3.

Paddy, maize, millet are the major cereal crops grown in Tanahu District. The area is famous for fruit especially citrus and pear but pear has not yet got the commercial momentum. Cattle, buffalo and goat are common livestock raised in the area. District Agricultural Development Office (DADO) has given emphasis on horticultural development in Tanahu District. At present, fruit trees (citrus, winter fruits, and evergreen fruits) cover 1532.5 ha land on which citrus covers 808.5 ha. Mandarin-orange is cultivated in 554 ha. Horticultural scenario of Tanahu District is presented in Table 1.

Table 1: Horticultural Crops Area and Production Status of Tanahu District

Fruits	Area (ha)	Total production (mt)	Yield (t/ha)
Citrus	809	6685	8.26
Mandarin	554	4587	8.28
Sweet Orange	17	157	9.52
Lemon	68	481	7.07
Others	170	1460	8.59
Winter Fruits	53	753	14.21
Pear	35	573	16.37
Peach	11	112	10.18
Plum	6	68	9.71
Summer Fruits	671	8315	12.39
Mango	192	804	4.19
Banana	206	2745	13.33
Litchi	13	35	2.80
Others	261	4731	18.16
Total	1533	15753	10.27

Source: DADO Tanahu, 2000.

4.2 Ramechhap District

Ramechhap is one of the hill district of Janakpur Zone. It is situated between altitude 27º 20" to 27º 50" north and longitude 85º 50" to 86º 35" east. It is surrounded by Okhaldhunga and Solukhumbu in the east, Kavre in western side, Sindhuli in southern side Dolkha in northen side. The total area of the district is 1564 sq km (156433 ha). Cultivable land is 59180 ha and cultivated land is 50908 ha. The Irrigated land is 1968 ha. Manathali is the districts headquarter. The altitude of the district ranges from 369 to 6958 masl. Most of the soil is made of sandy loam type. The highest peak of the district Numbur Chuli (6958 m) and lowest place of the district is Kalonjore Ghat (369 m) which is situated in the Rampur VDC.

The climate is mostly subtropical type and some tropical, warm temperate and cool temperate and high altitude climate and Tundra type climate due to its altitude. The average annual rainfall is 2020 mm. Maximum temperature is 31.3^0C and minimum is 11.9^0C. Majority of the people are Newar, Brahaman, Chhetri, Bhote, Sunuwar, Damai, Sarki, Gurung, Tamang caste/ethnicity. The local markets of the district are Manthali, Ramechhap, Khimti, Dhobi, Sanghutar, Salupati, Dorumba, Devitar, Galpa, Sawadanda. Population of this district is

212408 (2058BS) which consists 100853 male and 111555 female. The total household number is 40386 and average population density 136 persons per sq km.

The citrus pockets of the district are Ramechhap Valuwajore, Okhreni Salu and Danduwa Phulasi. The pocket areas and production of citrus fruits presented in Table 2.

Table 2: Special Pocket Area of Citrus Fruits and Production (mt)

SN	Pocket Name	Citrus Production (mt)		
		Orange	Sweet Orange	Lime
1	Okharane Salu	175.5	3990	11400
2	Ramechhap Valuwajore	113	1288.2	11400
3	Danduwa Fulas.	73.5	837.9	11400
Total		362	5116.1	11400

Source: Ramechhap DADO, 2061 BS.

The total area under citrus productive area and production of Ramechhap are presented in Table 3.

Table 3: Productive Area and Production of Citrus Fruits in Ramechhap District

SN	Citrus fruit	Total Area (ha)	Productive Area (ha)	Production (mt)
		90.33	43	483
2	Sweet orange	1261.3	684	9438
3	Lemon	0.03	-	-
4	Lime	53.46	20	156
5	Other citrus	0.10	1	1
Total		1405.2	746	10078

* Statistical Information on Nepalese Agriculture 2002/2003 Ministry of Agriculture and Cooperatives, Singha Darbar, Kathmandu, Nepal.

There is one Junar processing industry. At present this industry is producing concentrated juice of Junar. The potentiality of establishing other Junar juice processing industries in pockets by innovative farmers seem good for increasing the competition and provide better price for small scale growers. The district has different type of climate; however is a food deficit district. To overcome the food deficit the district has to increase the production, productivity and marketing of citrus fruits in order to increase the purchasing power of the people. If citrus production and marketing are commercialized, purchasing power of the farmer will be increased and food security can be achieved through market economy.

4.3 Sindhuli District

Sindhuli District is surrounded by Udaipur and Siraha in east, Makawanpur in west, Ramechhap, Kavrepalanchowak and Okhaldhunga in north and Dhanusha, Mahottary and Sarlahi in south. This district lies between the latitude 26°55”- 27°22” north and Longitude 85°25”-86°15” east. The elevation of the district ranges from 168 to 2785 masl. The total

area of the district is 247709 sq km. The land use pattern has been categorized as cultivated land 49789 ha, residential area 10904 ha, mountain and river area 35224 ha, pasture land and other area 2020 ha. Irrigated area is 12550 ha and unirrigated area is 37239 ha and forest land is covered by the area of 149772 ha. This district is divided into three topographical ranges– i Mahabharat range, ii Chure range and iii Inner terai and plain. The major rivers of the district are Sunkosi, Bagmati, Arun, Goanghkola, Bitijorekhola, Marinkhola, Rosikhola, Kamala River.

Climate is subtropical and vegetation is mostly deciduous type. In inner terai area, there is ample climate for cereal farming and in hill area has ample climate for sweet orange. The major citrus producing pockets and area coverage are presented in Table 4.

Table 4: Special Pocket and Area (ha) of Citrus Fruit

SN	Pocket Name	Orange	Sweet Orange	Lime	Total
1	Tinkanya	20	125	5	150
2	Ratanchura	15	167	8	190
3	Highway Side	10	185	5	200
Total		45	472	18	540

Source: Sindhuli DADO, 2061 BS.

The area, productive area and production of citrus fruits are presented in Table 5.

Table 5: Productive Area and Production of Citrus Fruits

SN	Citrus fruit	Area (ha)	Productive Area(ha)	Production(mt)
1	Orange	75.37	27	307
2	Sweet orange	1055.2	625	7259
3	Lemon	0.02	0	0
4	Lime	47.08	27	217
5	Other citrus	0.10	1	1
Total		1177.8	680	7784

* Statistical Information on Nepalese Agriculture 2002/2003 Ministry of Agriculture and Cooperatives, Singha Durbar, Kathmandu, Nepal.

4.4 Dhankuta District

Dhankuta is one of the hill districts of the Eastern Development Region. This district Dhankuta is situated in between latitude 26^0 53" to 27^0 19" north and longitude 87^0 19"– 87^0 33" east. The district is surrounded by Tehrathum and Panchthar in the east, Bhojpur and Udaypur in the west, Sankhuwasabha in the north and Morang and Sunsari in the south. The total area of the district is 825 sq km (82529 ha). Cultivable land is 40723 ha with 8660 ha Khetland and 32,063 ha Bariland. The Irrigated land is 9396 ha during rainy season. In the winter and spring season only 3537 ha Khetland and 1145 ha Bariland is irrigate. Dhankuta Bazar is the districts headquarter and this district has parliamentary constituencies with one municipality, 35 VDCs and 11-Elakas.

The district is situated from 120 meter from mean sea level to 2,702 meters. The major soil type is loam with mica particles. The highest point of the district is Chitrelekh and lowest point is the Tamor river basin. The District consists of some upland (TAR), low land, and river basin. Due to the diversified geographic situation and altitudinal variation different types of climate prevails in Dhankuta district. The major area falls under warm temperate type and sub-tropical and cold temperate climate are also found due to its altitude. The annual average rainfall is 2100 mm. More than 0.8% precipitation is received during rainy season (June to September). River basins are frost-free while high hill zone receive snow during winter. The south faced hills receive more rain during rainy, however it is dry during winter due to direct Sunshine.

In this district the major citrus growing pocket includes Teliya. Khoku, Chhintang. Belhara, Khuwaphok, Maunabudhuk and Dankuta municipality area. In general most areas are planted with citrus crops. Khoku is most famous pocket for orange in Dhankuta. The major fruit crops grown, area, productive area and productivity are presented in Table 6.

Table 6: Major Fruit Crops Grown in Dhankuta District

Types of Fruits	Area covered by fruits (ha)	Productive Area (ha)	Production (mt)	Yield (kg/ha)
Orange	579	400	4640	11600
Sweet Orange	216	192	2149	11250
Lime	147	92	782	8500
Mango	154	83	755.3	9100
Litchi	40	23.5	129.25	5500
Guava	40	35	297.5	8500
Pear	140	117	1579.5	13500
Apple	81.7	49	259.5	5300
Peach	36.5	32	304	9500
Plum	18	15	112.5	7500
Walnut	22.5	13.5	42.9	3300
Others	56	47.5	424.6	8936
Total	1530.7	1099.5	11476.05	10438

Source: Dhankuta DADO, 2061 BS.

The major fruit exported from the district include Orange, sweet orange, lime and pear. The total fruit production in the district is 11476.05 mt and demand within the district is 5178 mt. Thus there is a surplus of 6298.05 mt. A major harvesting time is from November to January. Therefore, storage facilities and small scale processing industry seems potential. During off-season for citrus guava and pear could be processed. The district has different type of climate and is potential for growing early, medium and late types of citrus fruits. However such types of varieties are not available in demanded quantity and technology is lagging behind.

V. RESULTS AND DISCUSSION

5.1 Socioeconomic Status

Land Holdings: The average land holding was found 35 ropani of the study site where landholding per household in Ramechhap District (2.7 ha) was found higher as compared to other districts. Land is one of the most economic assets of Nepalese farmers as it indicates the socioeconomic status of the farmers. Citrus (mandarin and sweet orange) are highly sensitive to water lodging condition. Thus, most of orchards in mid-hills of Nepal are established in Bariland. Bariland is an important variable to increase the acreage of citrus. The survey result showed that the average size of Bariland holding was 1.2 ha ranging from 0.2 to 4.5 hectare. The averages of different types of land in the surveyed districts are presented in Table 11.

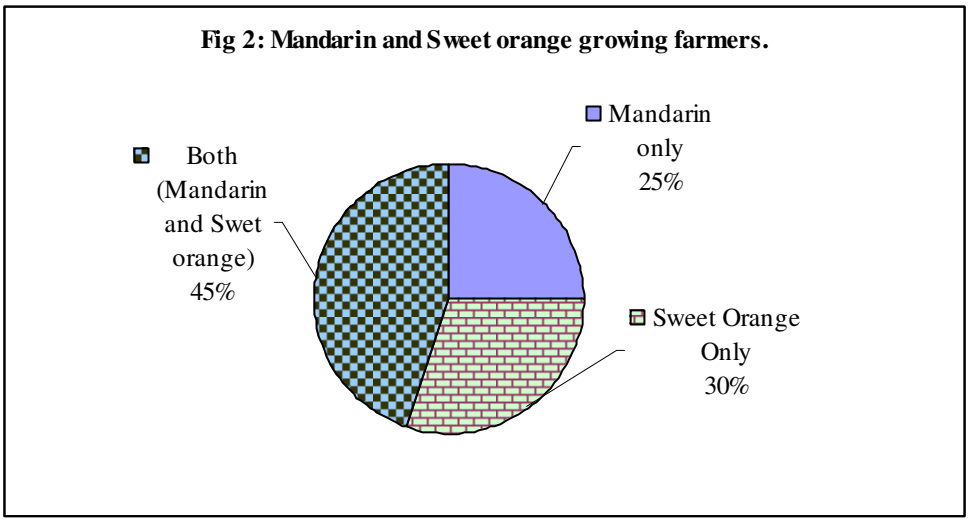
Table 7: Average Land holding (ha) of the Surveyed Farmers

District	Khetland	Bariland	Other Land*	Total
Sindhuli	0.55	0.92	0.05	1.52
Ramechhap	0.14	1.88	0.68	2.70
Tanahu	0.06	1.13	0.21	1.39
Dhankuta	0.26	0.86	0.19	1.31
Average	0.25	1.20	0.28	1.73

* Other land indicates Kharbari, Marginal land, steeply sloppy land.

Source: Field Survey, 2005

Citrus Cultivating Farmers: Based on the survey, 25 percent of the farmers were rowing mandarin only, similarly 30 percent were growing sweet orange and remaining 45 percent of the farmers are growing mandarin and sweet orange simultaneously. (Fig. 2). The detail of number of mandarin and sweet orange farmers are presented in Annex 2.



Citrus Orchard: The size of the mandarin orchard by tree number was 89 ranging from 2 to 250 (Table 13). Among the study districts, the average orchard size was 165 in Tanahun

District followed by Ramechhap (91), Dhankuta (55) and Sindhuli (35) respectively. About 56% of the trees were found bearing in the study area. Likewise, average orchard size of sweet orange was 119 trees ranging from 7 to 450 trees. Among these four districts, Ramechhap has the highest sweet orange tree (180) per household followed by Sindhuli (113), Dhankuta (68) and Tanahu (20) Districts.

Table 8: The Average Number of Mandarin and Sweet Orange Plants per Farm Household

District	Mandarin trees			Sweet orange trees		
	Bearing	Non-Bearing	Total	Bearing	Non-Bearing	Total
Sindhuli	28	7	35	80	32	113
Ramechhap	58	32	91	119	61	180
Tanahu	76	89	165	70	82	152
Dhankuta	40	15	55	66	2	68
Average	50	39	89	86	33	119

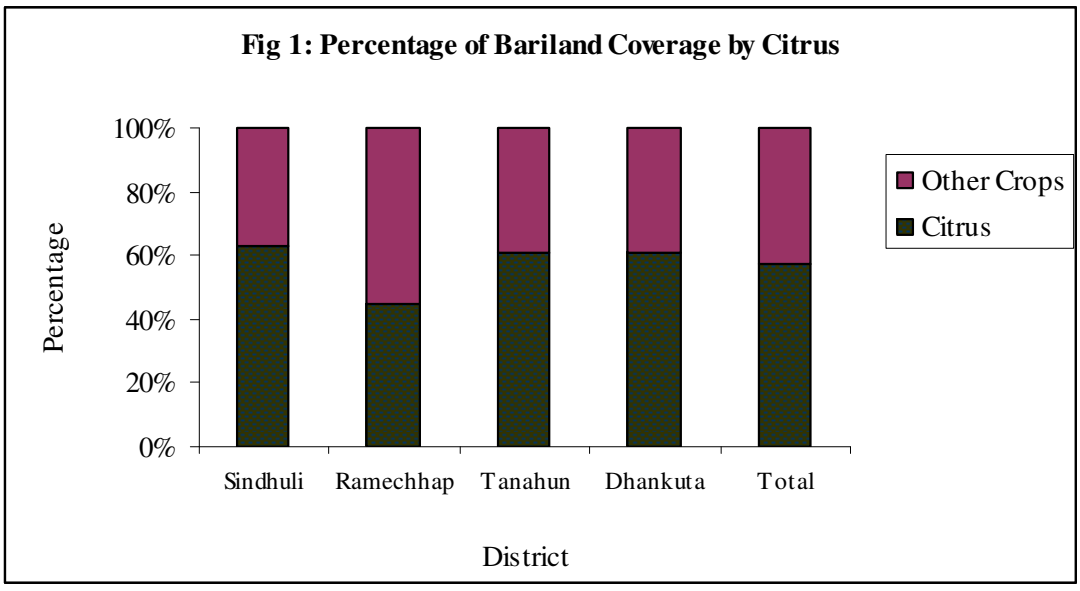
The result showed that average area per household covered by mandarin was found 10.83 ropani and sweet orange was found 8.96 ropani (Table 9). Comparing the Bariland holding with mandarin and sweet orange area, Ramechhap has more expanding area (12 ropani) than other districts.

Table 9: Average Land (ropani) covered by Citrus in the Surveyed Farmers

District	Mandarin	Sweet Orange
Sindhuli	6.96	7.16
Ramechhap	11.90	13.03
Tanahu	15.00	2.25
Dhankuta	9.34	6.38
Average	10.83	8.96

Source: Field Survey, 2005.

Figure 1 shows the percentage cover by citrus crops and other crops in the locals under study. The data showed there still scope of increment for citrus farming.



Source: Field Survey, 2005

5.2 Production Areas

There are 42 districts where citrus is cultivated and are feasible to grow citrus fruits like mandarin, sweet orange, lime, lemon, pumelo and so on. Dhankuta, Bhojpur, Sankhuwasabha, Illam, Terathum Districts in EDR, Ramechhap, Sindhuli, Kavre, Makwanpur, Nuwakot, Dhading in CDR, Gorkha, Tanahu, Lamjung, Kaski, Syangjya, Parbat, Baglung, Palpa, Gulmi in WDR, Surkhet, Dailekh, Pyuthan, Jajarkot, Kalikot in MWDR and Dadeldhura, Baitadi, Bhajang, Achham in FWDR are the potential citrus growing districts. The citrus growing area extends to midhills region from Illam in eastern to Dadeldhura in the western. In this growing area some specific areas have ecological advantages to produce citrus fruits. North facing gently slopping hills where 5-6 hrs of sun light available can harvest good quality citrus in the country. For example mandarin of Gorkha, Tanahu and Dhankuta are famous for its fruit quality. Similarly, in case of sweet orange Dhankuta, Sindhuli, Ramechhap and Dadeldhura have observed good quality production.

5.3 Existing Farming Practices

Cropping Pattern: The sample represents the typical mid hill area where mandarin and sweet orange cultivation has been done extensively and other cereal and legume crops are also grown as main as well as secondary crop. The cropping pattern followed in the study districts is presented in Table 10.

Table 10: Major Cropping Pattern of the Study District

Khetland	**Bariland**
Rice-Wheat-Fallow	Citrus (Mandarin and Sweet Orange)
Rice-Fallow-Maize	Ghaiya-Tori/Blackgram-Fallow
Rice-Tori -Rice	Maize-Millet-Fallow
Rice-Fallow	Maize-Millet-Tori
Rice-Vegetables	Maize-Tori-Fallow
	Maize-Potato

Source: Field Survey, 2005.

Planting Material Used: Majority of farmers of Dhankuta and Ramechhap brought saplings from DADO. Farmers of Sindhuli brought from local private nursery and farmers of Tanahu planted sapling produced by seed. The scenario showed that 75% of the farmers have planted saplings while 25% have planted through seedlings (Table 11).

Table 11: Source of Planting Material

Source of Planting Material	Frequency	Percentage
Planted own Seedlings	29	25
Brought from local Nursery	31	25
Brought form DADO	60	50
Total	120	100

Source: Field Survey, 2005.

Land Preparation: Pit digging prior to one month of sapling plantation and were filled with compost/FYM. Pit size 1.5m X 1.5m and the distance between two pits were 5 m. planting is usually done in rainy season.

Weeding: It is done during Jan-Feb FYM/ compost is applied in the periphery of citrus plant weeds are removed. The orchard becomes neat and clean place.

Training Pruning: Dried and diseased stems are removed generally in Jan-Feb..

Chemical Treatment: Rogor is used to control bugs. Use of bourdeux-paste and bourdeux mixture to control other pathogen is common in all surveyed districts

5.4 Potentiality for Increment of the Productivity

The technologies adopted by the farmers were mostly found conventional type. Manures and fertilizers were not applied in adequate level. Only the farmers of Dhankuta have been applying chemical fertilizers. As per the requirement some of the farmers were cultivating maize, millet and black gram as inter crops. Proper orchard management was seems to be lacking while the research team visited farmer field. Majority of the establishing bearing trees planted were seedlings. The farmers did not remove the dried, diseased branches. The landscape of the orchard is not satisfactory. The research and extension have ambient places to play to increase the productivity at farmer's level. Only 50-60% of the yield potential (More than 30t/ha other developed country) is harvesting by the farmers from their orchard (PRA discussion). Good variety saplings followed by intercultural operation input application vis-a-visa marketing and post harvest activities are more important to harness the potentialities of citrus orchard at farmers' level. Demonstration and practical training to the farmers could improve the production and productivity.

5.5 Input Supply Situation

Majority of the farmers were not applying chemical fertilizers to their orchard. However, most of the farmers of Dhankuta were using chemical fertilizers. But in other districts the timely availability and expensiveness were constraints side by side availability of Farm Yard Manure enhanced to the farmers to apply FYM in their orchard. Some of the farmers were doing mulching to protect soil moisture in their orchard. Some of the farmers were inter cropping maize, millet, black gram in their orchard to get maximum benefits from the land, however the trend of inter cropping has reducing due to the awareness/knowledge that the pathogen activities would be more prune and transmitted to the citrus tree by the root. It was also noticed by the farmers that root was damaged by intercultural operation of secondary crops.

5.6 Marketing System

The marketing system prevailed in the areas are discussed hereunder in different sub-heads:

5.6.1 Marketing Facilities

Agricultural road, collection center, transportation facilities, availability of pre-harvest contractors and agents are some of the major marketing facilities to enhance production and marketing of citrus. The transportation facilities are found good in Dhankuta compared to other districts. The views of the respondents about the existence of transportation facilities are presented in Table 12. Fifty nine out of 120 responded the existing transportation facilities existed as good. Eighteen respondents reported improving and forty three may be due to the location where respondent reside.

Table 12: Situation of Transportation Facilities

District	Transportation situation						Total
	Transportation Facility Good Existence		Improving Situation		No facilities		
	Freq.	Percent	Freq.	Percent	Freq.	Percent	
Sindhuli	13	43.33	-	-	17	56.67	30
Ramechhap	17	56.67	-	-	13	43.33	30
Tanahu	5	16.67	15	50.00	10	33.33	30
Dhankuta	24	80.00	3	10.00	3	10.00	30
Total	59	49.17	18	15.00	43	35.83	120

Source: Field Survey, 2005.

The major means of transportation of citrus (mandarin and sweet orange) under study district is presented in Table 13. Sixty one out of 120 responded that the transportation is done by porter where as 59 responded that they transport by means of bus, truck and tractors.

Table 13: Means of Transportation

District	Transportation Means				Total
	Porter		Bus, Truck, Tractor		
	Freq.	Percent	Freq.	Percent	
Sindhuli	17	56.67	13	43.33	30
Ramechhap	13	43.33	17	56.67	30
Tanahu	25	83.33	5	16.67	30
Dhankuta	6	20.00	24	80.00	30
Total	61	50.83	59	49.17	120

Source: Field Survey, 2005.

5.6.2 Storage

Due to lack of storage facilities, farmers are forced to sell the produce right after the harvest or sold on pre-contractual basis resulting lower farmgate prices during the peak harvesting season. In Dhankuta one cellar store was found to be constructed but according to the farmer it does not work properly due to some faults in the construction of cellar storage. In the survey almost all farmer reported that they need storage facilities so that they can regulate the supply during off-season and fetch higher price of their produce. Almost all the respondents responded that storage facilities are not available in the surveyed area (Table 14).

Table 14: Storage Facilities

District	Not Available	
	Freq	Percent
Sindhuli	30	100.00
Ramechhap	30	100.00
Tanahu	30	100.00
Dhankuta	30	100.00
Total	120	100.00

Source: Field Survey, 2005.

5.6.3 Marketing Outlets

The major outlets are business agent and pre-contractual agreement. The main marketing outlets for citrus marketing under study are presented in Table 15.

Table 15: Marketing Outlets Preferred by Farmers

District	Market for Citrus					Total
	Sindhuli Bazar	Manthali Bazar	Field (Pre-contractual)	Businessman/Agent	Dhankuta Bazar	
Sindhuli	30					30
Ramechhap		3	13	14		30
Tanahu			19	11		30
Dhankuta				28	2	30
Total	**30**	**3**	**32**	**53**	**2**	**120**
Percentage	25.00	2.50	26.67	44.17	1.67	100

Source: Field Survey, 2005.

5.6.4 Consumption and Losses at Household Level

The study showed that out of total production of mandarin and sweet orange, 10-15 percentages consumed at household level. The Table 16 represents the household consumption, losses and market selling of mandarin and sweet orange respectively. Out of 80% marketed 5-20% losses during transportation and selling at wholesalers and retailers

level. On an average 15-25% of the total produce in damaged due to proper case and handling after harvesting at farmers level and due to losses occurs during loading, unlading, packing, transportation and exhibition.

Table 16: Percentage HH Consumption, Losses, Market Selling of Mandarin and Sweet Orange

District	Mandarin			Sweet Orange		
	HH Consumption	Losses	Market selling	HH Consumption	Losses	Market selling
Sindhuli	13.22	5.70	81.52	11.03	7.13	81.83
Ramechhap	7.30	4.90	88.30	16.19	6.58	77.23
Tanahu	6.44	4.59	88.96	19.25	8.25	72.50
Dhankuta	14.00	5.13	80.87	15.53	7.13	77.33
Average	10.52	5.08	84.58	14.39	7.02	78.59

Source: Field Survey, 2005.

5.6.5 Number of Bearing Trees and Production Areas

The Table 17 and 18 represents the number of bearing trees, area, production and amount sold from mandarin and sweet orange respectively.

Table 17: Number of Bearing Trees, Area, Production, Productivity, and Amount Sold of Mandarin

District	Bearing Tree (Nos.)	Mandarin Area (ha)	Production (t)	Productivity (t/ha)	Amount Sold (t)
Sindhuli	28	0.35	3.45	9.90	2.72
Ramechhap	58	0.60	6.70	**11.26**	5.97
Tanahu	76	0.75	8.02	10.69	7.10
Dhankuta	41	0.47	4.70	10.04	3.86
Average	51	0.54	5.67	10.47	4.86

Source: Field Survey, 2005.

Table 18: Number of Bearing Trees, Production, Area, and Amount Sold and Gross Income from Sweet Orange

District	Bearing Tree (Nos.)	Area (ha)	Production (t)	Productivity (t/ha)	Amount Sold (kg)
Sindhuli	80	0.36	4.15	11.58	3.56
Ramechhap	119	0.65	8.76	**13.43**	7.23
Tanahu	70	0.76	7.24	9.49	6.25
Dhankuta	66	0.32	3.61	11.33	10.20
Average	86	0.52	5.94	11.46	10.52

Source: Field Survey, 2005.

5.6.6 Price and Pricing

Average farmgate price was Rs 10 per kg of Mandarin (Table 19) ranging from Rs 8.88 to Rs 11.43. The farmers of Ramechhap fetch lower price Rs 8.80 as compared to Tanahu (Rs 9.50) Sindhuli (Rs 10.26) and Dhankuta (Rs 10.74). Likewise farmers fetch Rs 6.65 per kg for sweet

orange ranging from Rs 5.60 to Rs 7.56. Among these district Sindhuli and Ramechhap districts farmers fetch lower price as compared to Tanahu and Dhankuta (Table 19).

Table 19: Farmers' Selling Price of Mandarin

District	Mandarin (Rs/kg)			Sweet Orange (Rs/kg)		
	Minimum	Average	Maximum	Minimum	Average	Maximum
Sindhuli	9.26	10.26	11.35	4.73	5.43	6.20
Ramechhap	7.40	8.80	10.40	4.73	5.81	6.88
Tanahu	8.04	9.56	11.22	5.00	6.00	7.00
Dhankuta	10.13	10.74	12.22	7.30	8.67	9.57
Average	8.88	9.99	11.43	5.60	6.64	7.56

Source: Field Survey, 2005.

As the farm output increases, there must be a market for these products and a price enough to repay the farmer for his incurred costs and his efforts in production. Agriculture marketing is a process, which starts with a decision to produce a saleable farm commodity, and it involves all aspects of market structure or system, both functional and institutional, based on technical and academic considerations and includes pre- and post- harvest operations, assembly, grading, storage, transportation and distribution. For the farmer, disposal of his product is an important as the adoption of improved methods to produce more. The correlation among what the farmer grows and what, when, how and where he/she sells is very important.

The journey of each product from the farm to the ultimate consumer plays a crucial role in determining prices to the farmers. It is well-accepted facts that as more and more people are employed in the towns and cities and the income of many of them rise, they want not only to buy more food but also the food of better quality. Prices of the products are affected by the different factors like supply and demand of market, quality of the produce, speculative price based on situation and supply, previous day price, time, season, weather, ceremony, catering of businessman, quantity disposed at the market, consultation/agreement with the farmers, availability of substitutes and bargaining based on quality. Besides these factors, previous days/week/month, seasonality and cyclic variation are important for price formation in specific markets.

Majority of the respondent responded that price of mandarin is formed in lump sum basis followed by weighing and counting (Table 20).

Table 20: Price Formation of Mandarin

District	Price formation				Total
	Weighing and Counting		Lump sum		
	Freq	Percent	Freq	Percent	
Sindhuli	19	82.61	4	17.39	23
Ramechhap	-	-	10	100	10
Tanahu	-	-	27	100	27
Dhankuta	2	8.70	21	91.30	23
Total	21	25.30	62	74.70	83

Source: Field Survey, 2005.

Majority of the respondent responded that price of sweet orange is formed in lump sum basis followed by weighing and counting (Table 21).

Table 21: Price Formation of Sweet Orange

District	Price formation				Total
	Weighing and Counting		Lump sum		
	Freq	Percent	Freq	Percent	
Sindhuli	26	86.67	4	12.33	30
Ramechhap	2	7.69	24	92.31	26
Tanahu	-	-	4	100	4
Dhankuta	2	6.67	28	93.33	30
Total	30	33.33	60	66.67	90

Source: Field Survey, 2005.

The discussion prioritized that the price formation at farmers' level depends on the supply and demand of the market followed by previous day price, dealing with contractors and brokers' commission, quality of the produce, speculative price based on situation and supply, and product amount. Similarly, at wholesalers' level, the supply and demand of the market determines the price followed by carteling of businessman, quality of the produce, speculative price based on situation and supply, based on purchased price, and bargaining based on quality. At retailer's level, the purchased price played the retail price formation at all the retail markets followed by supply and demand of market, quality of the produce, previous day price, bargaining based on quality, and addition of profit (Table 22).

Table 22: Price Formation at Farmers, Wholesalers and Retailers Level

Farmers' Level	**Wholesalers' Level**	**Retailers' Level**
Supply and demand of market	Supply and demand of market	Based on purchased price
Previous day price	Cartering of businessman	Supply and demand of market
Dealing with contractors and Brokers' commission	Quality of the produce	Quality of the produce
Quality of the produce	Speculative price based on situation and supply	Previous day price
Speculative price based on situation and supply	Based on purchased price	Bargaining based on quality
Product amount	Bargaining based on quality	Addition of profit

Source: Discussion at PRA and RMA.

For the farmer, with the commercialization of agriculture, disposal of the produce has become as important as the adoption of new farm practices. It is recognized that better and more stable prices alone can sustain the increased intensity of input use on the farms to increase production. The journey of each product from farm to the ultimate consumer plays a crucial role in determining the price to the farmers. Unless marketing improves, no incentive to increase production will attract the cultivators. This is all the more important in case of fruits which needed more cost to store for long periods due to their perishability and quality deterioration. In their case, the speed as well as efficiency of marketing

operations is crucial in determining profits of the product on the one hand, the level of satisfaction of the consumer, on the other.

Table 23: Farmers' Price Satisfaction Level Mandarin

District	Satisfaction Level (Mandarin)			Total	Index
	Satisfaction	Neutral	Dissatisfaction		
Sindhuli	3	17	3	23	0.00
Ramechhap	3	5	2	10	0.10
Tanahun	9	18		27	0.33
Dhankuta	2	19	2	23	0.00
Total	17	59	7	83	0.12

Source: Field Survey, 2005.

Table 24: Farmers' Price Satisfaction Level of Sweet Orange

District	Satisfaction Level (Sweet Orange)			Total	Index
	Satisfaction	Neutral	Dissatisfaction		
Sindhuli	3	23	4	30	-0.03
Ramechhap	2	19	5	26	-0.12
Tanahun		4		4	0.00
Dhankuta	3	25	2	30	0.03
Total	8	71	11	90	-0.03

Source: Field Survey, 2005.

5.6.7 Product Market Channel

The farm product which reaches to the ultimate consumers through the hands of various marketing agents is called the marketing channels. Marketing channel also helps determining the prices. Higher the numbers of marketing channel, higher the price and vice versa. Market itself organized the intermediaries, so that market is functioning well. The invisible roles of the intermediatories are organized by market.

Table 25: Marketing Channel

District	Marketing channel			Total
	Pre-contractual system	Farmer-Wholesaler-retailer-Consumer	Farmer-Agent-Wholesaler-Retailer-Consumer	
Sindhuli	4	26		30
Ramechhap	18	8	4	30
Tanahun	4	2	24	30
Dhankuta	5	25		30
Total	31	61	28	120

Source: Field Survey, 2005.

The farm products of districts brought to collection center through marketing agents or farmers themselves or group of farmers or cooperatives. From collection center it is brought to Narayanghad, Kalimati, Pokhara, Biratnagar, Janakpur market for sale. Then from district centered market these fruits sales to retailer, bicycle vendor, brokers,

school/hostels, hotels/restaurants, and distant wholesaler and also to exporter. In these case also involving various marketing agencies or middlemen. The retailer brought to retailer market, bicycle vendor walks to door to door to sale these fruits and goes to the hand of ultimate consumers.

5.6.8 Marketing of Citrus Fruits

Out of 83 respondents from the different districts under study 56.63 percent of respondent reported that all the mandarin could not be sold in time. This means there is problem of selling of mandarin orange (Table 26) the reason after not selling is given as lack of transportation facilities 82.98 percent (Table 27) and due to strike was 17.02 percent.

Table 26: Timely Selling of Mandarin

District	Yes		No		Total
	Freq	Percent	Freq	Percent	
Sindhuli	-	-	23	100	23
Ramechhap	7	70.00	3	30.00	10
Tanahun	13	48.15	14	51.85	27
Dhankuta	16	69.57	7	30.43	23
Total	36	43.37	47	56.63	83

Source: Field Survey, 2005.

Table 27: Reasons for not Selling Mandarin in Time

District	Lack of transportation facilities		Due to strike (Bandha, Nakabandhi)		Total
	Freq	Percent	Freq	Percent	
Sindhuli	18	78.26	5	21.74	23
Ramechhap	1	33.33	2	66.67	3
Tanahun	14	100.00	-	-	14
Dhankuta	6	85.71	1	14.29	7
Total	39	82.98	8	17.02	47

Source: Field Survey, 2005.

Like mandarin, problem is also found are similar kind of problems in case of sweet orange (Table 28 and 29).

Table 28: All the Sweet orange sold in time?

District	Yes		No		Total
	Freq	Percent	Freq	Percent	
Sindhuli	-	-	30	100	30
Ramechhap	21	80.77	5	19.23	26
Tanahun	4	100.00	-	-	4
Dhankuta	20	66.67	10	33.33	30
Total	45	50.00	45	50.00	90

Source: Field Survey, 2005.

Table 29: Reasons for not Selling Sweet Orange in Time

District	Lack of transportation facilities		Due to strike (Bandha, Nakabandhi)		Total
	Freq	Percent	Freq	Percent	
Sindhuli	25	83.33	5	16.67	30
Ramechhap	2	40.00	3	60.00	5
Dhankuta	8	80.00	2	20.00	10
Total	35	77.78	10	22.22	45

Source: Field Survey, 2005.

5.6.9 Preferred Market Outlet

Most of the farmer preferred pre-contractual selling from field and their nearest market where they have to transport short distance. As already identified that, there is substantial losses in transportation and required transportation costs and risk of not selling the goods in time so that they have to bear extra expenses

Table 30: Farmer Preferred Outlets for Disposal of Citrus

District	Market Outlet		
	Place	Freq	Percent
Sindhuli	Sindhuli Bazar	30	25.00
Ramechhap	RamechhapVDC	26	21.67
Tanahu + Ramechhap	District Headquarter	10	8.33
Tanahu + Dhankuta	From Field	34	28.33
Dhankuta District	Dhankuta Bazar	20	16.67

Source: Field Survey, 2005.

5.6.10 Marketing Information

Fruit production are scattered in the districts. These production mostly consumed in the urban area like Kathmandu, Pokhara, Narayanghad, Biratnagar, Bhairahawa, Nepalgunj, Mahendranagar. Most of farmers cannot bring their farm products to the hands of ultimate consumers until and unless the middlemen are actively involved. Hence, MIS plays a pivotal role in channeling the agricultural produce with market. The information getting by different level of the citrus production and marketing are:

Table 31: Sources of Market Information

District	Marketing Information						Total
	Friends		Businessmen, Agents		Not informed		
	Freq	Percent	Freq	Percent	Freq	Percent	
Sindhuli	15	50.00	14	46.67	1	3.33	30
Ramechhap	8	26.67	6	20.00	16	53.33	30
Tanahu	8	26.67	20	66.67	2	6.67	30
Dhankuta	14	46.67	13	43.33	3	10.00	30
Total	45	37.50	53	44.17	22	18.33	120

Source: Field Survey, 2005.

Table 32: Marketing Agents

District	Marketing Agent				Total
	Junar Bikash Sangh or Wholesaler or Retailer		Middleman or Contractor		
	Freq	Percent	Freq	Percent	
Sindhuli	26	86.67	4	13.33	30
Ramechhap	14	46.67	16	53.33	30
Tanahu	4	13.33	26	86.67	30
Dhankuta	27	90.00	3	10.00	30
Total	71	59.17	49	40.83	120

5.6.11 Constraints and Suggestions in Marketing

Different marketing problems and suggestions provided by the farmers, entrepreneurs and traders group while discussing the processing feasibility of the citrus (Table 33).

Table 33: Marketing Problems and Suggestions Provided by Different Stakeholders

Particular	**Problems**	**Suggestions**
Price	Inappropriate and fluctuating, compelled to sell at lower prices	Market price should be regulated Regularly published in daily newspapers/radios
Information	Inadequate and incomplete and market information	Correct and timely information is needed and should be disseminated by different media
Transportation	Lack of roads and expensive transportation cost, difficult to get transport means	Develop road facilities, improve traffic rules for fresh products problem
Facilities	Lacking storage, cold storage, weighing, facilities	Storage and weighing arrangements should be provided.
Packaging, grading	No knowledge of packaging, grading and quality maintenance and high wastage due to improper grading and packaging	Training on Postharvest handling, market management should be provided to the farmers and businessmen
Processing	Lack of processing facility	Establish processing plant and create production and market diversification
Unorganized market	Networking and coordination is lacking.	Marketing centers should be developed in different places and market should be better organized.
Payment	Irregular payment exploitation by middleman	Regular and corporations marketing
Traffic/police check	Illegal charges imposed and creates problem	Follow strictly rule and regulations
Production input	Not available in time and quality	Increase timely availability
Others	Strike (Nepal *Bandh, Nakabandhi*): rottening/damage produce, losses Irregular supply s due to road close and different types of strikes.	Needs political stability
	Import from India	Government should think and analyze it with farmers' perspective and support to the Nepalese farmers not the Indian farmers.

Source: Field Survey, 2005.

5.7 Demand and Supply Situation

By assuming the non productive area of Mandarin and Sweet orange next two year of unproductive area of 25 percent will be come into productive area and at the rate of productivity of concern districts the production come to 7740 mt., 9780 mt., 12886 mt., 7825 mt., 4501 mt., and 4529 mt., of orange and sweet orange in districts Dhankuta, Sindhuli, Ramechhap, Tanahu, Gorkha and Lamjung respectively. After selling 75 percent of above orange and sweet orange production, the only 25 percent of orange and sweet orange available for processing industry.

Table 34: Production and Market Supply Situation of Mandarin and Sweet Orange

Description	District					
	Dhankuta	Sindhuli	Ramechhap	Tanahu	Gorkha	Lamjung
Total area of orange	587.5	85.4	94.3	858.6	519.9	590.2
Productive areas	396.0	34.0	46.0	480.0	310.0	298.0
Production	4752.0	392.0	529.0	6139.0	3510.0	3278.0
Productivity	12.0	11.5	11.5	12.8	11.3	11.0
Productive area increase in 25 %up to next two yrs.	443.9	46.9	58.1	574.7	362.5	371.1
In next two year Production of orange increase	5326.5	540.2	667.9	7349.5	4104.2	4081.6
Total area of Sweet orange	224.8	1070.0	1301.0	65.2	53.9	67.6
Productive areas	205.0	670.0	730.0	41.0	35.0	36.0
Production	2357.0	8040.0	10220.0	414.0	350.0	367.0
Productivity	11.5	12.0	14.0	10.1	10.0	10.2
Near future Productive area increase in 25 % up to next two yrs.	210.0	770.0	872.8	47.1	39.7	43.9
Near future Production of sweet orange increase	2413.9	9240.0	12218.5	475.1	397.3	447.5
Total production of both	7740.4	9780.2	12886.4	7824.6	4501.4	4529.1
75% of Production sale and self consumption	5805.3	7335.1	9664.8	5868.5	3376.1	3396.8
Surplus available to Processing industry 25%	1935.1	2445.0	3221.6	1956.2	1125.4	1132.3
Feasibility of processing industry up to 80% of (n) available metric tons	1548.1	1956.0	2577.3	1564.9	900.3	905.8

Due to loses or people demand increasing there are available of orange and sweet orange in the above districts, 80 percent of 25 percent available of orange and sweet orange come to 1548 mt, 1956 mt., 2577 mt., 1565 mt., 900 mt and 906 mt. in the districts Dhankuta, Sindhuli, Ramechhap, Tanahu, Gorkha and Lamjung respectively. Incase of Tanahu the establishment of processing industry at near Dumbre Bazar. In the near Dumbre Bazar the supply of Mandarin and sweet orange will be available from Gorkha and Lamjung districts also.

Demand of processed products of Mandarin and sweet orange from field survey of Department stores of Kathmandu, Biratnagar and Pokhara the Kathmandu alone juice of Sweet orange and Mandarin sold to Kathmandu people and hotel comes to 144000 liters in a year estimated . In case of Biratnagar department stores and other wholesalers sold 60000 liters and in Pokhara the department stores and wholesalers sold the juice of Mandarin and sweet orange come to 50000 liters. In which there is only 1 percent Nepalese products and 99 percent they sold juice is imported from India, Singapore, Malaysia, Thailand, Australia, etc. Due to urbanization the urban people use to change their food habit they used to adopt the fruit processed products like juices drinking and eat the breads with Jams, Jelly and Marmalades. The using of processed products of fruits like jam, jelly,

marmalades and fruits juices are increasing day by day. The people of departmental stores told us products of Nepal are not good quality. So the buyers of processed fruits products wanted from Department stores the assured good quality products. The buyers are used to buy foreign processed fruits products. To increase the demand of processed fruits products of Nepal there should be improve in quality production.

With considering of consumers demands if Nepalese processed fruits products come to produce in improving quality, there will be increasing the demand and gradually replaced the imported foreign product by Nepalese fruit processed products.

By considering all these factors of supply and demands of Mandarin and sweet orange the medium scale capacity fruit processing industry will be feasible in the following districts.

- In Dhankuta there should be strengthened the Kavita Processing industry.
- In Sindhuli it will be feasible to establish the medium scale processing industry with capacity of 1956 metric tons Mandarin and sweet orange.
- In Ramechhap it will be feasible to establish with a capacity of the medium scale processing industry with capacity of up to 2577 metric tons Mandarin and sweet orange.
- In Tanahu it will be feasible to establish with a capacity of the medium scale processing industry with capacity of up to 2500 metric tons Mandarin and sweet orange at near Dumbre Bazar where it will available of supply of Mandarin and sweet orange fro Gorkha and Lamjung districts easily.

5.8 Processing Scenario and Potentialities

5.8.1 Processing Facilities

In the surveyed districts, a few processing plants are operating in Dhankuta and Sindhuli. The processing plant of Sindhuli was found closed during the field visit. However, Kavita Fruit Processing Plant, Dhankuta is running successfully. The major urban areas of the study districts are linked by motorable roads. Beyond urban areas, no road networks linking the citrus producing areas with market. The modes of transportation are porters, mules, bus, truck and tractors. As a result, it involves high transportation costs and is time consuming. A number of institutions in support of agriculture are working in the study area. Mainly, governmental institution DADO and its sub centers, NGOs, CBOs, and Agriculture Development Bank. 90 percent use *Doko* and cartoon for packing the citrus fruits. The packing materials used by farmers are presented in Table 35.

Table 35: Packaging Materials

District	Doko and Carton Pieces		Jute Sack, Carton, Rice Straw		Total
	Freq	Percent	Freq	Percent	
Sindhuli	30	100	-	-	30
Ramechhap	21	70.00	9	30.00	30
Tanahun	29	96.67	1	3.33	30
Dhankuta	28	93.33	2	6.67	30
Total	108	90.00	12	10.00	120

Source: Field Survey, 2005.

5.8.2 Need of the Processing Industry

Most of the farmers (82.50%) expressed the need of establishing processing industry (Table 36). However, some of the respondents (17.50%) suggested for not to establish the processing industry. They viewed that supply could be regularized and prolonged by established cold storage and cellar storage can fulfill the demand of farmers and consumer. This can only substitute the import of citrus fruits from India. If processing industries are established, the quality of the Nepal processed product and competition with the imported produced displaces Nepalese product due to poor marketing strategy and investment vis-a-visa limited export opportunities of processed products.

Table 36: Need Processing Industry

District	Yes		No		Total
	Freq	Percent	Freq	Percent	
Sindhuli	25	83.33	5	16.67	30
Ramechhap	24	80.00	6	20.00	30
Tanahun	25	83.33	5	16.67	30
Dhankuta	23	76.67	7	23.33	30
Total	99	82.50	21	17.50	120

Source: Field Survey, 2005.

5.8.3 Processing Feasibility

Processing industries are needed to produce diversified processed products, which can reduce the difficulties of transport and transfer fresh fruits to low volume high value products. These products not only add value to the produce but create more income to the farmers by giving employment, and also can reduce the volume of loss and damage due to timely use of raw materials. Therefore linking the production to processing industries is essential and important where there is commercial fruit production. In this connection, the surveyed pocket area being climatically more suitable for commercial cultivation of citrus especially mandarin, sweet orange and lime. Processing industry can be feasible because commercial production of citrus has been coming to the markets. Farmers are being encouraged towards expanding the citrus area under cultivation. This parameter shows the possibility of establishing processing industries in the district. It has also been reported that the lack of processing industry are the hindrances on commercialization of citrus farming

in the districts. Farmers found to be discouraged due to low price of the produce. When farmers were asked about the feasibility of establishing processing industry in their districts 89% replied that it was feasible (Table 37).

Table 37: Processing Feasibility

District	Feasible		Not Feasible		Total
	Freq	Percent	Freq	Percent	
Sindhuli	27	90.00	3	10.00	30
Ramechhap	25	83.33	5	16.67	30
Tanahun	25	83.33	5	16.67	30
Dhankuta	30	100.00	-	-	30
Total	107	89.17	13	10.83	120

Source: Field Survey, 2005.

5.8.4 Feasibility to Set-up the Industry

Among the surveyed districts, one processing industry is working in Dhankuta and one in Ramechhap. In case of Sindhuli, there is a fruit processing industry which is closed now, due to mismanagement. In Tanahu, not a single processing industry was found.

The processing industry at Ramechhap is run by sweet orange farmer. The industry produces 2500 lit Junar Juice and is marketed in 2.5 lit and 1 lit plastic bottle costing Rs 270 and Rs. 80, respectively. The industry focuses the Ramechhap market and there is no marketing problem for that amount of juice.

In Sindhuli, Hill Fruits (Pahadi Phalphool) Processing Industry was established in 2052 BS in Kamalamai Municipality-6 with the cooperation of Agriculture Development Bank. The capital investment of the industry was Rs 190 thousand. It used produce to only sweet orange juice and marketed in 250 ml. Plastic bottle, which had good market in eastern Nepal. The annual production was 4000 liters of juice. The industry worked well till 2054 BS. From 2055 BS it did not work. As the industry was run in rented building at present they have already left the building and there is no chance of reviving the industry. No any technical reasons were found during the survey for the industry's failure except very weak management and co-ordination among the partners No transparency in financial dealing has been the main cause of the failure. ADB due loan has been raised to around Rs 900 thousand by now.

Kavita Fruit Processing Industry, Dhankuta uses 154 mt. of fresh citrus fruit which is about seven percent of the district production. It produces fresh juice & local sell of the production is 40 percent and 60 percent of the product goes to Bhojpur, Tehrathum, Morang and nearby districts. From the processing of 1 kg fresh fruit the industry earns Rs 1.30 net profit. Thus in total it comes Rs. 154000*1.3 = Rs 200200. Thus, this could be taken as model for the small scale processing industry.

Therefore from the survey, three type of cases have been observed one failure due to the weak management and co-ordination (in Sindhuli) one very primitive type industry (in Ramechhap) and the one successfully running to catch the outside district market (in Dhankuta). From these case studies it is clear that the small scale processing industry seems to be feasible to take the start in the beginning. The capacity of the processing industry is need to be assessed in detail based on the availability of raw material. But during the survey some of the responded has indicated the medium sized as 1000-1200 mt capacity industry. Therefore for local level market (neighboring district markets can be included) setting up a medium scale processing industry capacity (around 1000 mt) can be feasible in the strategic points.

In Dhankuta 80% of fresh produce goes to Rijal Tashi Processing Industry and J.V processing industry Itahari, Kavita Processing industry utilizes 7% and 13% fresh fruit is sold in local market. Therefore instead of establishing new processing industry, strengthening of the running one should be taken into consideration. Similarly, the running processing industry in Ramechhap being very primitive type, it should also be strengthened. But for Sindhuli and Tanahu, one medium scale processing industries seen to be feasible, not at these districts but at strategic points where year around processing could be done utilizing other raw materials also.

However, while talking to processing in the context of Nepal, where there is very poor post-harvest handling practices, processing industry should not be taken in isolation but also combined with packaging, house cold storage are processing unit etc. So, that good quality fresh fruits could be marketed according to the demand and so as to the processed products.

Therefore, from the information gathered from survey a medium scale processing industry could be a profitable enterprise. Realizing this fact setting-up of medium scale processing industries (Capacity up to 1000 mt) can be feasible in the strategic point in the appropriate districts. In case of Dhankuta where there is one processing industry, strengthening of the running one should be taken into consideration.

In Dhankuta 80 percent of fresh produce goes to Rijal Tashi processing industry and JV processing industry Itahari 7 percent to Kavita fruit processing industry and 13 percent fresh fruit in local market, Hence instead of establishing new processing industry, strengthening the running one should be taken into consideration.

Regarding the strategic point to establish industry from the survey, Sindhuli Bazar area in Sindhuli, Manthali (Ramechhap Bazar area in Ramechhap) and Baradi Bazar in Tanahu have been found recommended by the respondents. While talking to processing in the context of Nepal where there is very poor post-harvest handling practices, processing industry should not be taken in isolation but also combined to packaging house, cold

storage and processing unit, so that good quality fresh fruits could be marketed according to the demand and so as to processed products.

5.8.5 Site Selection to Open Processing Industry

During survey the respondent farmers were asked to suggest the appropriate site for establishing the processing industry. The responses of the farmers showed area specific business about the site most respondents desired to establish the industry at their own district without considering the site, the production volume and accessibility. The responses of the farmers are presented in Table 38.

Table 38: Place to Open Processing Industry

District	Place to Establish Processing Plant	Freq	Percent
Sindhuli	Sindhuli Bazar	30	100
Ramechhap	RamechhapVDC	30	100
Tanahu	Baradi Bazar	20	67
Tanahu	Khairani Bazar	10	33
Dhankuta	Near to Dhankuta Bus Park	30	100

Source: Field Survey, 2005.

It is evident from Table 39 that in case, Sindhuli, Dhankuta and Ramechhap the farmer were unanimous, whereas in case of Tanahu they were divided. At the same time, the respondent's response towards the effects establishing processing industry is presented in Table 38.

Table 39: Farmers Responses on Citrus Business Activity after Establishing Processing Plant

Farmers Responses	Freq	Percent
Decreases fruit business activities	48	40.00
Increases fruit business activities	13	10.83
Reduce contractors involvement	9	7.50
Retailers employment escaped	5	4.17
Not affected the local market	45	37.50

Source: Field Survey, 2005.

5.8.6 Product Diversification

The form of the citrus fruit can be changed to different product to add value to the produce through processing. In most of the survey area local farmers have been to extracting juice of citrus fruits especially lime and lemon for local consumption. In Dhankuta a processing industry is found to extract juice of mandarin & sweet orange to make orange juice and squash. Through citrus fruits could be diversified in various form namely jam, jelly, wine, essential oils for cosmetics flavoring agents for food products, this is very much limited to juice and squash only in the study area.

5.8.7 Citrus Products available in Department Store

In the survey of department store, different citrus products found are presented in Table 40. In general all the Departmental stores characteristic are more or less same type. The following things are found commonly in Kathmandu Departmental stores:

Departmental Stores of Kathmandu have various types of Citrus fruits processed products. One type of processed product is available in different sizes one kilo tetra packed packet, half kilo packed package and 200 grams packed package. These are orange /Mandarin concentrate powder. In case of liquids The Orange juice, Mandarin juice, Lemon juice and these fruit squash are available in the departmental storage. These are also available in different size and different package like tetra packed paper bottle, glass bottle and canning. The same way the jam, jelly, mermaids are also available in can, bottle with wide neck and mouth package. The uses of lemon and lime are found in mix-pickles packed in bottles.

The Departmental stores used to bring the goods from wholesalers and some good are sent for these goods from manufacturers/company directly. Some retailers used to come to buy the goods from departmental stores. The Most of the buyers are home consumers and some buyers are hotel and restaurants. Some buyers are wholesalers and retailers also.

These are mostly imported from foreign countries. But some processed products of Nepal made are available. The processed products of Orange, Mandarin, and lemon are using by more than mid high economic status people and foreigners. The consumers of the departmental stores are gladly willing to consume processed product, if the processed industries are maintaining the hygienic and standard quality products.

Large quantities of these fruits processed products had been sale annually. The processed industries establishment is mostly feasibility if the production of these fruits processing industries should be come in the forms like out side the country processed products.

The Nepal of these processed products is not maintaining the standard quality products. Some of Nepalese processed product found adulterations and not good quality and also can not keep long time. Departmental store staff says that most of the customers are demanding out side the country made. The Nepalese processed products would not come very excellent adverting in many TVs Channels as compared to the foreign product do.

Table 40: Citrus Products Available in Department Stores

SN	Name of the Product	Manufacturer	Country	Packet Size	Price
2	Berry Orange Juice	Berry Ltd.	Australia	1 lit	130
3	Butterfly Orange Squash	Fruit Canning Company	Nepal	700 ml	45
4	Cerees Orange Juice	Cerees Fruit Processing Comapnay	South Africa	1 liter	129
5	Cerelac Powder Apple, Orange, Mixed Fruit)	Nestle Consumer Services	India	400 gm	160
6	Chabaa Juice (Pineapple, Apple, Mango, Grape, Orange)	Malee Bangkok Company Ltd.	Thailand	240 ml	27
7	Cooly-powder (Mango, Banana, Orange)	Unipex Dairy Products Ltd.	UAE	700 gm	220
8	Cyprina (Natural Tropical	New Sevegep Ltd.	Nicosia	1 Liter	115

SN	Name of the Product	Manufacturer	Country	Packet Size	Price
	Juice) Pineapple, Grape, Mango)				
9	Druck Jam (Lemon, Mango, Orange)	Rijal Tashi Industries (Pvt) Ltd.	Nepal	500 gm	70
10	Foaster	Foster Clork Product Ltd.	Malta	450 gm	130
11	Fontano Cranberry Juice (Grape, Lemon, Orange, Pineapple)	New Sevegep Ltd.	Cyprus	1 lit	130
12	Foster Clark Orange, Lemon, Lime juice	Foster Clarks Products	Malta	750 gm	210
13	Freeze Juice (Orange , Lemon, Grape, Apple, Litchi)	Nuboon Company Ltd.	Thailand	240 ml	33
14	Frooti Juice (Mango)	Dugad Fruit and Beverage (P) Ltd.	Nepal	200 ml	15
15	Fruity Orange Juice	Fruity Company Ltd.	Nepal	250 ml	15
16	Future Orange Juice	Thai Victor Food Co. Ltd.	Bangkok	500 ml	50
17	Harmony Soap	PT. Mega Surya Mass	Indonesia	80 gm	11
18	Harnomics Berri Juice (Orange, Apple, Grape, Mango)	Adluri Foods Chennai	India	2 Liter	275
19	Harnomics Berri Juice (Orange, Apple, Grape, Mango)	New Sevegep Ltd.	India	1.5 Liter	209
20	Harnomics Berri Juice (Orange, Apple, Lemon, Grape, Mango)	Berri Limited 15-31 Pelham	India	1 Liter	176
21	Kordial Limau Juice (Lemon, Orange, Grape, Pineapple)	Shoon Kee Fruit Juice SDN, BHD	Malaysia	1 lit	165
22	KTC. Lemon Juice	KTC (Edibles) Ltd.	Australia	250 ml	166
23	Lemon Pickle	EAV Multipurpose Co-operative	Nepal	425 gm	65
24	Lemon used in Shampoo				
25	Liril Soap used Lemon	Unilever Ltd.	Nepal	75 gm	18
26	Malee Orange Juice	Malee Sanforba Public Com. Ltd.	Thailand	240 ml	40
27	Mango Juice, Pineapple Juice, Orange Juice	Rijal Tashi Industries (P) Ltd.	Nepal	800 ml	82
28	Marigold Orange Juice	Malaysia Dairy Malaysia Dairy Industry	Singapore	1 liter	130
29	Morton Orange Powder	Allahabad Canning Comapnay	India	250 ml	29
30	Navaras Sweet Chutney (Mango, Lemon, Lapsi)	EAN Co-operative, Kupondole	Nepal	500 gm	77
31	Nuoc Xoai Juice (Pineapple, Apple, Mango, Orange)	Dona New Tower Natural Drink and Food Ltd.	Vietnam	240 ml	30
32					
33	Orange Jam	Rijal Tashi Industries Pvt. Ltd.	Nepal	500 gm	65
34	Orange Juice	Nubcom Company Ltd.	UAE	250 gm	28
35	Orange Juice (Real)	Dabur Nepal Pvt. Ltd.	Nepal	1 liter	100
36	P&N Orange Juice (Orange, Apple, Mango)	P&N Beverage	Australia	2 lit	275
37	Parade Cranberry Juice	Federated Group Inc	America	1 lit	280

SN	Name of the Product	Manufacturer	Country	Packet Size	Price
	(Grape, Lemon, Orange, Pineapple)				
38	Rajch Orange Juice	Gmbh and Company	Austria	250 ml	50
39	Rasna Powder (Mango, Apple, Orange, Grape, Banana)	Pioma Industries Ahmedabad	India	750 gm	220
40	Real Juice (Mango, Orange, Grape, Pineapple, Mixed)	Dabur Nepal Ltd.	Nepal	1 Liter	110
41					
42	Rite (Mixed Fruit Juice)	Himalayan Fruit and Beverage (P) Ltd.	Nepal	200 ml	15
43	Rusana	Prioma Industry	India	2.5 kg	698
44	Skuas Buah Campuran Juice (Lemon, Orange, Grape, Pine-apple)	Shoon Kee Fruit Juice SDN BHD	Malaysia	1 lit	165
45	Squash Oven Orange Juice	Shoor Doe Fruit Processing SDN. RHI.	Malaysia	1 liter	160
46	Sunkist Juice (Orange, Grape, Apple)	RFM Milk and Juice Division	Philippines	250 ml	30
48	Takura Orange Squash	Nebula Fruit Product	Nepal	700 gm	40
49	Takura Orange Squash	Nebula Fruit Product	Nepal	700.gm	40
50	Tang	Kraft Foods Thailand.	USA	500 gm	100
51	Tang Powder (Orange, Lemon, Grape)	Kraft Foods Ltd.	Thailand	750 gm	152
52	Tang Powder (Orange, Lemon, Grape)	Kraft Foods Ltd.	Thailand	1 kg	210
53	Tango Orange Juice	Shinclok Produt	Malta	300 ml	48
54	UFC Juice (Pineapple, Apple, Mango, Grape, Orange)	Universal Food Public Company Ltd.	Taiwan	240 ml	27

Source: Field Survey, 2005.

5.8.8 Market of the Processed Products

The respondent farmers were asked about the effect of local products on the marketing of imported processed products of citrus in Nepal. The responses of the respondents are presented in Table 41.

Table 41: Imported Processed Products

District	Don't Know		Brings Competition		Total
	Freq	Percent	Freq	Percent	
Sindhuli	23	76.67	7	23.33	30
Ramechhap	24	80.00	6	20.00	30
Tanahun	18	60.00	12	40.00	30
Dhankuta	20	66.67	10	33.33	30
Total	85	70.83	35	29.17	120

Source: Field Survey, 2005.

Seventy one percent respondents replied that they do not know, however 29 percent replied that it will increase the competition in the market. They were further probed about the

prospects of the marketing of Nepal processed citrus products. In reply to the prospects of processed product 69 percent said it has good marketing prospects whereas 31 percent said it is not good (Table 42).

Table 42: Market for Processed Products

District	Good		Not Good		Total
	Freq	Percent	Freq	Percent	
Sindhuli	5	71.43	2	28.57	7
Ramechhap	4	66.67	2	33.33	6
Tanahun	7	58.33	5	41.67	12
Dhankuta	8	80.00	2	20.00	10
Total	24	68.57	11	31.43	35

Source: Field Survey, 2005.

When the farmers were asked about the effect on price of imported processed product and citrus fresh fruit due to Nepalese processed product, 5 respondents said processed product will be cheaper, 11 said it will have no effect on both and 19 replied it will make citrus fruit expensive (Table 43).

Table 43: Processed Product Market Price

District	Processed product market price			Total	Index
	Cheap	Neutral	Expensive		
Sindhuli	1	2	4	7	-0.43
Ramechhap		3	3	6	-0.50
Tanahun	1	3	8	12	-0.58
Dhankuta	3	3	4	10	-0.10
Total	5	11	19	35	-0.40

Source: Field Survey, 2005.

5.8.9 Farmers Interest on Citrus Area Expansion

The farmers were also asked if they wanted to expand the citrus cultivation area the farmers were divided into equal half. The survey result showed that the 50 percent of the farmers were found interested for increment of their citrus crops (Table 44). Fifty percent farmers were interested to increase the production and rest fifty percent were not interested.

Table 44: Farmers' Interest on Citrus Area Expansion

District	Yes		No		Total
	Freq	Percent	Freq	Percent	
Sindhuli	18	60.00	12	40.00	30
Ramechhap	15	50.00	15	50.00	30
Tanahun	19	63.33	11	36.67	30
Dhankuta	8	26.67	22	73.33	30
Total	60	50.00	60	50.00	120

Source: Field Survey, 2005.

Similarly, the farmer response towards area and number of trees and areas under orange and sweet orange the responses are presented in Table 45.

Table 45: Farmers Interest to Increase Area and Number of Trees of Mandarin and Sweet Orange

District	Mandarin		Sweet Orange	
	Area (ha)	Trees (Nos)	Area (ha)	Trees (Nos)
Sindhuli	0.19	51.67	0.14	44.06
Ramechhap	0.21	51.33	0.28	82.00
Tanahu	0.21	61.32	0.50	120.00
Dhankuta	0.21	52.50	0.10	26.67
Total	0.20	54.75	0.19	56.66

Source: Field Survey, 2005.

In an average, farmers wanted to increase plantation in 0.20 ha and 0.19 ha land respectively for mandarin and sweet orange nearly 55 trees each.

VI. CONCLUSION AND RECOMENDATION

6.1 Conclusion

HMG/N has formulated long-term visionary Agricultural Perspective Plan (APP). Its implementation started since the Ninth Five Year Plan. APP emphasizes the promotion of High Value Crops (HVCs) and agribusinesses of agro-climatic potentials to reduce rural poverty. The marketing and agribusiness objectives of the APP are (i) to transform the subsistence based agriculture into a commercial one through diversification and widespread realization of commercialization, (ii) the use of the "pocket-package" strategy for marketing through concentration of a production base and therefore augment the product volume to be marketed in conjunction with building agricultural roads between pockets and markets, (iii) the encouragement of an efficient and competitive private sector, and (iv) the identification of high value commodity priorities. The programs and policies of the government are focusing to develop a good market system so that the farmers can fetch the real benefits at local level are:

- Introducing structural changes in domestic and international market development.
- Encouraging the active participation of commodity organizations, institutions and private sector in the development of warehouses, cold store and related marketing infrastructures.

Fruit production pockets are scattered in the districts. These productions are mostly consumed in the urban area like Kathmandu, Pokhara, Narayanghad, Biratnagar, Bhairahawa, Nepalgunj, Mahendranagar. Most of the farmers cannot bring their farm products to the hands of ultimate consumers until and unless the middlemen are actively involved.

Post-harvest loss is a serious problem in the study area for citrus crops marketing in Nepal. Rate of quantitative or physical losses are different depending on types of crops, perishability, distance between collection points and retail outlets, packaging handling during transaction and storage and display systems. Qualitative issues such as appearance deterioration, flavors, nutritive value and sale ability decrease are low in winter and high in rainy season.

The citrus fruit can be converted to different forms of products to add value to the produce through processing. In most of the survey area local farmers are found to extract juice of citrus fruits especially lime and lemon for local consumption. In Dhankuta a processing industry is found to extract juice of mandarin & sweet orange to make orange juice and squash. Though, from citrus fruits various products such as jam, jelly, wine, essential oils for cosmetics flavoring agents for food products could be prepared, it is limited to juice and squash only in the study area.

Processing industries are needed to produce diversified processed products, which can reduce the difficulties of transport and transfer fresh fruits to low volume high value

products. These products not only add value to the produce but also create more income to the farmers by giving employment and also reduce the volume of loss and damage. Therefore, linking the production to processing industries is essential and important where there is commercial fruit production. In this connection, the surveyed pocket area being climatically more suitable for commercial cultivation of citrus especially mandarin, sweet orange and lime, processing industries are feasible. Commercial production of citrus has been coming to the markets. Farmers are being encouraged towards expanding the citrus area under cultivation. These parameters show the possibility of establishing processing industries in the district. It has also been reported that the lack of processing industry are the hindrances on commercialization of citrus farming in the districts. Farmers are discouraged due to low price of the produce.

Among the surveyed districts, one Fruits Processing industry of Dhankuta is found running successfully. It utilizes 154 mt. of fresh citrus fruit, which is about 7 percent of the district production. It produces fresh juice and local sell of the production is 40 percent and 60 percent of the product goes to Bhojpur, Tehrathum, Morang and nearby districts. From the processing of 1 kg fresh fruit the industry earns Rs 1.30 net profit. Thus in total it comes Rs. 154000 * 1.3 = Rs 200200. Therefore, from the survey, it is found that setting up a medium scale processing industry could be a profitable enterprise. In case of Dhankuta where there is one processing industry already working, strengthening of the running one should be taken into consideration.

Regarding the strategic point to establish processing industry from the analysis of survey, Bardibas areas of Mahottari for both Sindhuli and Ramechhap and other neighboring districts would be best suited. For Tanahun, near Dumre area of Tanahun or Bharatpur Municipality of Chitwan have been recommended. While considering processing of fruit in the context of Nepal where there is very poor post-harvest handling practices, processing industry should not be taken in isolation but in combination with packaging house, cold storage and processing unit, so that good quality fresh fruits could be marketed according to the demand and then to processing industry.

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6.2 General Recommendation

Developing commercial production pockets and providing both the production and post-harvest technology to the farmers scattered production of horticultural crops should consolidate.

Research on post-harvest technology should be accorded a high priority. Significant research on specific production oriented problems should be under taken by creating capable and highly trained manpower, allocating significant budget and building infrastructures.

Appropriate post-harvest technology packages should be developed and demonstrated for horticulture industry in Nepal Packaging, transportation, marketing system and marketing infrastructure should be developed for horticulture industry. Adaptive research that responding to market requirements need should be emphasized.

Packaging of the citrus produce is not done properly with proper container, so more losses occur due to damage. In order to reduce post-harvest losses, an educational program for producers and harvesters need to be conducted on subjects like harvesting time, harvesting technique, sorting, grading, proper packaging and storage.

In order to improve the situation of post-harvest losses of citrus fruits in the country, the government should consider undertaking the Post-harvest Losses Reduction Program to support farmers and traders (wholesalers/retailer) by providing professional trainings and skills for handling, harvesting, packaging, transportation, storage and marketing of citrus fruits.

Group formation of people for transportation and marketing can tide over some of the problems in reducing post-harvest losses. At the same time, use of hand trolleys and forklift trucks to reduce the amount of manual handling should be encouraged. Likewise, post-harvest technology appropriate to the farmers' need and conditions should be developed, farmers and traders should be given training on post-harvest technology including sorting, packaging, storing.

Product utilization for reducing the losses and value adding through processing and other marketing activities should be developed and the users must be made responsible for the establishment, operation and maintenance of the basic market infrastructures as well as processing unit/industry at different identified locations as study recommended medium scale processing industry having capacity up to 1000 mt.

6.3 Specific Recommendation

- The existing "Kavita Fruit Processing Industry of Dhankuta" has been found utilizing 154 mt of fresh citrus fruits (Mandarin and Sweet orange). Most of the orange and sweet orange from Dhankuta district is sold as fresh fruits. A part of so sold fruit is utilized by Fruit Processing Factory of Itahari to manufacture citrus products. Kavita fruit processing industry of Dhankuta is running under capacity. In order to run this factory more efficiently to its maximum capacity, this plant needs strengthening. This will be more economic wisdom rather than opening new processing industry. Further Kavita fruit industry should diversify its fruit products utilizing lime, pear, guava and other fruits to run it year round.

- In case of Ramechhap, the existing juice extracting factory should diversify its activity to the extraction of fruit juice of other fruits. Small portable juice extraction unit at major production pockets will help farmers to reduce the bulk to carry to the market. The concentrated juice can easily be preserved for nearly a year by edible recommended chemicals.
- Considering the factors to run the fruit processing industries year-round, the processing industry seems feasible at Bardibas of Mahottari district situated on east west highway at the junction of Bardibas-Banepa highway.. The sweet orange and orange productions of Ramechhap district are 10220 mt and 529mt respectively. In Sindhuli district the production of sweet orange and orange are 8040 mt and 392 mt respectively. Altogether, production of orange and sweet orange is 18260 mt and 921 mt respectively. There is electricity supply available from national electricity supply grid. The 25 % (4795 mt) of above production of both orange and sweet orange will be available for processing industry. From this available orange and sweet orange the processing industry could be run for three months only. The rest of remaining months of the year processing industry could utilize local tomato, mango guava and run year round.
- Considering the availability of different fruit raw material and citrus of Tanahun, Lamjung and Gorkha one suitable site for establishing processing industry is nearby Dumre Bazar. The alternate site also could be a place somewhere in Bharatpur Municipality of Chitwan.

The following points have to be considered while selecting the sites to establish processing industry.

- The transportation and communication facilities are available
- Availability of water resource for industry uses and disposal of waste.
- Continues electricity is available.
- There should be availability of diversified raw materials in abundance.

The total production of mandarin is 12,827 mt (6141 mt from Tanahu, 3410 mt from Gorkha, and 3278 mt from Lamjung). From these production 25% of mandarin from these three districts could be utilized for processing. From these mandarins the processing industry can run for three months. For the remaining 9 months, bananas, Mangoes, guava, plum etc could be utilized. Based on the above analysis the following recommendations are made:

- Feasible for establishing medium scale processing industry having capacity up to 1000 mt in appropriate location after detailed study and business plan.
- Horizontal and vertical as well as backward and forward linkages between and among production, marketing and processing industry must be established.
- Integration between and among production marketing and processing activities and institutions are the basic developmental actors so that the linkages must be set up.
- Intensive training package for industry owners, farmers, traders and other stakeholder based on their requirements should be managed.

- Participatory program planning with farmers groups seems essential rather an individual farmers. However, there is need of cooperative movement for further strengthening the diversified products through processing in a sustainable way.
- Campaigning and effective implementation of Pocket Package Strategy (PPS).
- Alter the farming practice as per the latest scientific technique and knowledge.
- Adequate supplies of inputs like irrigation, fertilizer, credit, technology, and infrastructures.
- Intensive training packages on disease and pest control adopting IPM, harvesting techniques, reduction post harvest losses, handling techniques of transportation, loading, unloading and selling.
- Awareness/campaign of nutritional value of citrus consumption
- Explore alternative measures such as establishment of medium scale citrus processing industry, development of collection center, linkage with big wholesaler, cellar storage based on the level of production and agro-ecological belts.

6.4 Policy Implications

With a view to developing all the areas of the region simultaneously, efforts should be made to induce hill farmers to take up the cultivation of mandarin and sweet orange as a profession to supplement their income. There is a greater scope of increasing area under mandarin and sweet orange, which sufficiently increases farm income and helps reduce poverty. Introducing medium scale processing unit/industry may further continue the increase.

Development of agricultural technology has become very rapid due to a continuous flow of research and experimentation results. In this regard, to obtain the best results, the mandarin and sweet orange growers should be delivered with improved and location specific package developed by research through strong extension system. Similarly, emphasis should be given to the economics of profitability in mandarin and sweet orange production, predominating the optimum crop plan so that the area should be shifted from less profitable crops to more profitable in the existing crop plan. Therefore, the specialization in mandarin production helps in its farm income increment.

Since most of the farmers are presently away from cash economy and grow mainly food grain crops, the general price policy may not initially be practical for efficient farm level changes. The non-price economic incentives along with emphasis on optimal crop planning through extension education could constitute the more promising policy measures at the initial stage to achieve the desirable changes in the farm plan.

Difficult access from farms to markets is yet another factor inhibiting the remunerative sale of crops other than high value ones. So, the farm income could be increased both by mandarin and sweet orange by developing optimum level of processing units.

Though the study was concentrated on feasibility of processing industry of mandarin and sweet orange based on sampled districts, the findings and analysis reveals that many other

possible fruits and vegetables should be integrated to make the industry viable. However, the citrus cultivation has positively help to increase greenery and check the soil erosion because of its deep-rooted system. The soil erosion has been non-stop phenomena aggravated by floods and landslides. In this scenario, agrohorti system of farming specially citrus based may enrich the farmers' economic status as well as it may improve quality of land.

6.5 Scope for Further Study

Considering the above findings and discussions of the study, it is suggested that it would be worthwhile to undertake the following further research projects:

- Scope for further study on export market potential of mandarin orange.
- Need of further study on improving the storability of mandarin orange.
- Location specific business plan preparation and in-depth study on feasibility of processing industry.

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Annex-1: Area and production of citrus and mandarin orange in Nepal (1975-2000).

	Area (ha)		Productive area (ha)		Production (mt)	
Year	Mandarin	Citrus	Mandarin	Citrus	Mandarin	Citrus
1974/75	510	2600	296	1690	2937	15000
1979/80	3434	5200	1991	3300	19780	30000
1984/85	5070	8448	2940	5000	29656	45100
1989/90	7660	13515	4481	7136	48257	78639
1994/95	8175	14628	4806	8488	49905	83375
1995/96		15244		8977		88635
1996/97	9146	15940	5423	9335	57403	93046
1997/98	9864	17026	5863	10034	62094	100352
1998/99	10509	18007	6250	10592	66654	107250
1999/00	11102.52	19017.95	6588	11277	70824	115067

Source: NCDP, ASD, MOA, 1995, 1997, 1998, 1999 and ABPSD, 2000.

Annex-2: Mandarin and Sweet orange cultivating farmers.

District	Mandarin only		Sweet Orange Only		Both		Total
	Freq.	%	Freq.	%	Freq.	%	
Sindhuli	-	-	7	23.33	23	76.67	30
Ramechhap	4	13.33	20	66.67	6	20.00	30
Tanahun	26	86.67	3	10.00	1	3.33	30
Dhankuta	-	-	6	20.00	24	80.00	30
Total	30	25.00	36	30.00	54	45.00	120

Source: Field Survey, 2005

Annex-3: Citrus growing districts and pocket.

S.N.	District	Citrus Pocket
1.	Taplejung	Phungling, Donkhu, Change, Thenchambung, Sinam
2.	Panehthar	Amarpur, Nagi, Panchami, Ranigaw, Lumphabung, Eaktin, Phidim, Chokemago, Kurumba
3.	Illam	Sumbak/ Pyang, Illam municipality, Bhakha Bote, Soyang, Namsaling, Zicrmale , Soyak
4.	Sankhuwasabha	Sitalpati, Khandbari Municipality, Chaimpur, Siddha Phokari, Jhamling
5.	Bhojpur	Ranibas, Baikunthe, Kot, Annapurna, Gupteshor, Amtek, Sanjpang, Mulpani
6.	Terethum	Okhare, Jaljale, Salva, Jinkhimts, Sapla, Piple, Dagapa, Iwa
7.	Dhankuta	Dhankuta municipality, Maunabudhhak, Bode, Telia, Chhintang, Khoku, Aankhisalla
8.	Solukhumbu	Densa, Salyan, sotang, Kanku, Kangel
9.	Okhaldhunga	Manebhanjyang, Uunbu, Thulachhap, Rumjatar, Mouli
10.	Udayapur	Lekhani Mayankhu, Aanptar, Khambu, Limbatar
11.	Khotang	Rajapani, Simpani, Mangaltar, Ratanchha, Haleshi, Chisapani, Baraha Pokhari
12.	Dolakha	Pabati, Sunakhani
13.	Ramechhap	Sukajor, Ramechhap, Bhaluwajor, Okharane, Salu, Phulasi, Betali, Dhimipokhari,
14.	Sindhuli	Tinkannye, Ratanchura, Rajmarg side, Bahun, Tilpung, Bageshor, Jalakannya, Jhangajholi, Ratamata, Maghuwa, Kusheshor, Dumja
15.	Rasuwa	Saramthali (Danuswara)
16.	Sindhupalchowk	Baskharka, Bansbari, Sanosirabari, Nawalpur, Thulodhading, Sunkhani, Talamarang
17.	Dhading	Syardul, Sunaula Bazar, Katunje, Pulkharka, Zyamrung, Nalang, Gumdi, Jogimara, Patale
18.	Nuwakot	Samari
19.	Lalitpur	Jharubarashi
20.	Kavre	Sankhu, Panuti Municipality Balthali, Chalal Ganesh, Kusadevi, Patalakhet, Sunthan, Pasthali
21.	Makwanpur	Kalikatar, Bagmara
22.	Chitwan	Darechowk, Chandibanjyang
23.	Gorkha	Manakamana, Tangali Chowk, Bunkot, Mirkot, Ghampesyal, Harmi
24.	Tanahu	Dharampani, Dhorphirdi, Kyamin, Purkot, Chandrawati, Tharpu, Tanahun Sur, Bandipur
25.	Lamajung	Sundarbazar, Bhorletar, Chiti, Chandreshor, Khudi, Tarku, Udipur, Bhoteodar, Ishaneshor, Mohariyakot, Bhalaycharka, Simpani, Bhulbhule

S.N.	District	Citrus Pocket
26.	Kaski	Bharatpokhari, Critenachane Chour, Nirmal Pokhari, Aarmala, Thumki, Kalika, Thupa Ko Danda, Rupakot Salyan, Hansapur, Pumdibhumdi
27.	Syanjya	Arjunchaupari, Walling, Putali Bazar Municipality, Manakamana, Panegaude, Birawa, Rajmarga Chhetra, Setidovan
28.	Parbat	Devpur, Mallaz, Devistan, Khurgha
29.	Baglung	Damek, bhakunde, Bihun, Tityang, Sishakhani, Narethanti, Singana
30.	Myagdi	Dana, Okharkot, Ghatan, Ramche, Shikha, Bhagbati, Piple, Bim, Patalekhet
31.	Nawal Parasi	Ruchang, Rithe, Ruchang, Malkung, Mathelle Kuwakot, Jouwari, Raikot, Naram-lope
32.	Palpa	Khasanb, Chhahara, Batase, Rigneraha, Jalpa
33.	Gulmi	Nayagaun, Pipaldhara, Hadhade, Hamichar, Arkhale, Bhanbane, Siksene
34.	Argakhanchi	Pokharathak, Hansapur, Aargethos, Rabon, Padenpadela, Phidim, Mayang
35.	Dang	Bamla Saigha, Loharpani, Seenja, Karve
36.	Salyan	Marke, Tharmare, Kotbara, Dhorchour, Bhotechour, Ragechour, Bhalchour
37.	Rolpa	Dhawang, Kotgaun, Eribang, Kaleri, Libang, Ghartigawn
38.	Rukum	Syalapakha, Chaukhabang
39.	Pyuthan	Swargadwari (Dhanbang) Tusara, Maranthana
40.	Jajarkot	Dhim, Thalarekar
41.	Surkhet	Malarani, Kafalkot, Dharapani, Abalaching
42.	Dailekh	Narayan Municipality, Dullu, Malika
43.	Kalikot	Mehalmudi
44.	Bhojhang	Dwari, Bhatesola, Luyeta (Chhari), Chainpur
45.	Achham	Mangalsen, Kuntebandali, Misturum, Tosi, Seeudi, Payal
46.	Doti	Tichhanda, Ghangda, Sismada, Toli, Amarbhadisain, Sarswoti, Laxminagar
47.	Bajura	Bashabis, Jugada
48.	Kailali	Nigali, Pokharialang, Khairal, Sugerkhal, Sahazpur
49.	Darchula	Shankarpur, Dhapnisil
50.	Baitadi	Dehimandau, Shreekot, Nagarjun, Durgabhawani, Deulek, Singla, Shirling
51.	Dadeldhura	Bagarkot, Kalapalmandau, Belapur, Amargadi Municipality

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-4: Region wise number of citrus nursery

S.N	Development Region	Number of Nurseries
1.	Eastern Development Region	27
2.	Central Development Region	29
3.	Western Development Region	29
4.	Mid-Western Development Region	19
5.	Far-Western Development Region	8
Total		112

* Only 47 Nurseries are registered

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-5: Citrus Planting material selling

S.N	Source	No of Plants	Percentage
1.	Governmental Source	15747	4.59
2.	Private Sector	327100	95.41
Total		342847	100

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-6: Citrus fruits growing/cultivating in Nepal.

S.N	Local Name	English Name	Scientific Name
1.	Suntala/Kamala	Mandarin/Tangerin	Citrus reticulate Balanco/ C. tangerina
2.	Junar/Mausami	Sweet Orange	Citrus sinensis Osbeck
3.	Kagati	Acid Lime	Citrus aurantifolia Swingle
4.	Nibwa	Hill Lemon/ Galgal/ Nepali oblong Lemon ureka Lemon	Citrus aurantifolia Swingle
5.	Bhogate	Pummelo	C. grandis Osbeck/ C. maxima
6.	Kali Jyamir	Sour Orange	C. aurantium Linn.
7.	Keep	Bitter Orange	C. aurantium Linn.
8.	Seti/Neite Jyamir	Rough Lemon	C.Jambhiri Lush
9.	Bimiro	Citron	C. medica Linn
10.	Chacsi	Sweet Lime	C. Limettioides Tanaka
11.	Sankhatra	Possible Hybrid of Shaddock or Pummelo (seedling mutant)	
12.	Narayani	Possible hybrid	
13.	Chaku Pau	Possible hybrid	
14.	Teen Pate Suntala	Trifoliate Orange	Poncirus trifoliate L.
15.	Muntala	Kumquat	Fortunella Japonica Swingle/ F. margarita
16.	Kinno Suntala	Kinnow Mandarin	C. nobilis X C. deliciosa Hybrid
17.	Satsuma Suntala	Satsuma Orange	c. unshiu M.
18.	Markat Suntala	Mandarin	Citrus reticulata

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-7: Major citrus insect.

1.	Lemon Butterfly	Papilio demoleus Linn
2.	Citrus Leaf Miner	Phyllocnistis citrella Stainton
3.	Stem and Twig Borer	Stromatum barbatum
4.	Stem and Bark Borer	Chelidomium cinctum Gunerin
5.	Coconut Scale	Aspidiotus destroctar Signoret
6.	California Red Scale	Aonidiella aurantii (Maskell)
7.	Fluted Scale or Cottony Cushion Scale/	Icera purchasi (Maskell)
8.	White Fly	Dialeurodes citri Ashmed
9.	Black Aphid	Toxoptera urantii (Fonscolombe)
10.	Brown (Oriental) Aphid	Toxoptera citricidus (Kirkaildy)
11.	Citrus Psylla	Diaphorina citri Kuway
12.	Citrus Mealy Bug	Pseudococcus citri Risso
13.	Fruit Fly (Oriental)	Dacus dorsalls Hendel
14.	Citrus Red Mite	Panonychus citri McGregor
15.	Green Stink Bug (Green veg. bug)	
16.	Brown Stink Bug	

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-8: Major citrus disease.

Powdery Mildew	Acrosporium (Oidium) tingitanimum Cart
Sooty Mould	Capnodium citri Berk & Desm
Citrus Canker	Xanthomonas citri (Hasse) Dawson
Pink Disease	Pelicularia (Corticium) salmonicolor (Berj & Br.)
Scab	Elsinoe fawcettii Bitancourt & Jenkins
Root rot	Phytophthora nicotianae var. parasitica Dast
Foot rot/Stump rot	P. citrophthora (Sm. & Sen.) Leon
Brown rot gummosis	P. citrophthora (Sm. & Sen.) Leon
Leaf fall & Fruit Rot	P. Palmivora Buti/P. parasitica
Diplodia Gummosis	Diplodia natalensis Pole Evans
Melanose	Diaphorthe medusaca Nitsche/ Phomopsis citri (Fawcett) Wlf
Twig blight	Sclerotina sclerotiorum (Lig) Cabbage group, Stalk rot
Anthracnose/Wither Tip	Colletotrichum gloeosporides (penz) Sacc.
Tear stain/Leaf spot	Mycosphaerella citri Whiteside/
Greasy spot	Cercospora citrigrisea Fisher
Felt Disease	Septobasidium pseudopedicellatum Burt
Damping off	Rhizoctonia solani Kuhn Pythium ahanidermatum (Eds) Fitz. Pythium spp. Phytophthora citrophthora leon
Greening Disease PLB/	Liberobacter asiaticum
Huanglongbing HLB/	Liveribacter asiaticus, Candidatus
Green Mould	Penicillium digitatum Sall
Blue Mould	P. italium Whemer
Tristeza/Quick Decline/CTV	Mild virulent strain Stem Pitting

Source: Annual Progress Report -2061, Fruit Development Directorate, Kritipur

Annex-9: Major citrus nematodes.

Root Nematode	Tylenchulus semipenetrans Cobb.
Burrowing Nematode	Radopholus similies Cobb
Root Knot Nematode	Meloidogyne africane Whiten & M
Lession Nematode	Pratylenchus coffee Zimmer mann.]

Annex-10: Nesy Food and Beverage Private Limited Ltd.

Company Name:	Nesy Food Beverage Pvt. Ltd., Chovar, Kathmandu
Proprietor:	Mr. Maheshwor Ranjitkar
Total Raw Material used:	Junar 12 tons
Raw material brought from:	Sindhuli District
Marketing:	They sell to the wholesaler then wholesaler to retailer and retailer to consumer in Kathmandu

Background

The inspiration for the establishment of this company goes to late Mr. Satya L. Ranjitkar, who is the pioneer of horticulture development in Nepal, and the founder of Nesy Food & Beverage (P) Ltd. He worked initially as technical personnel in Morang Canning Company and started the canning of pineapple slices and juices for the first time in Nepal. He helped technically to establish the Rizal Canning Industry (now Druk Industry). He also gave technical ideas to establish Chitwan Canning Company and Himalayan Canning Company. Later, he himself established an agro-based industry, Nepal Phal Udhyog, and began producing squashes, juices and jams from fruits available in Nepal. He even jams from fruits available in Nepal. He even switched over to fermented beverage to produce wines and ciders from fruits. As recognition for his efforts in the area of horticulture, he was honored with a certificate from The Horticulture Society Nepal. King Mahendra Bir Bikram Shah Dev also decorated him with the Gorkha Dakshin Bahu IV considering his effort in the horticulture development in the country.

Introduction: Nesy Food & Beverage (P) Ltd. has been established as an undertaking to give continuity to Mr. Satya L. Ranjitkar's efforts and dreams to promote horticulture development in Nepal.

Vision: Promoting the agro-industry in Nepal with a view to contributing to a more economically active society in Nepal

Mission: To contribute to horticulture development in Nepal by producing a line of fruit-based products so as to replace imports, even by a nominal percentage.

Goals and Objectives

- To, give first priority to environment protection and sustainability
- To become firmly committed towards producing hygienic and quality products.
- To position itself as an organization that stands for purity, naturalness and health
- To affect an excellent distribution of its products for availability to achieve sales success in Nepal
- To use waste going resources of the country and thus improving the income generation of the people

Company Philosophy: Nesy Food & Beverage Pvt. Ltd. has a firm commitment towards quality. Quality analysis is done periodically at NESS (P) Ltd. – the first laboratory in Nepal to be accredited by the National Council of Standards – a Company established under a joint collaboration with Yagai-kagaku Ltd. Japan. This company assures that the product are hygienic and of a standard quality. Nesy gives first priority to environment protection and sustainability. The company has been practicing clean production management by training and building the capacity of its staff.

Products: The prime benefit that Nesy's Products offer is naturalness and purity. The company does not use artificial flavors and chemicals additives in any of its products. Nesy currently has the following products under its product line:

- Juices
- Drinks
- Candies

Juices: Juices are available in flavours according to season, and include orange, strawberry, mango, pineapple and lemon. One of the main attractions of the company is its line of honey- based juices – a product that truly speaks of naturalness and purity in all aspects. This product is currently available in the orange flavour. This has been introduced for the first time here in Nepal by a Nepali company.

Drinks: Drinks are also available in flavours according to season. These include orange, strawberry, mango, pineapple and lemon flavours.

Candies: In the category of other fruit products, Nesy's Lapsi Candy and Orange Peel Candy, Ginger Candy are in process to sell in the market. These products have been produced to suit the taste buds of both children and teenagers.

Future Products: In the Future, Nesy plans to add the following items in its line in products;

- Jellies
- Marmalades
- Fruit Preserves
- Sucrose free Marmalades

Problems: The product is more costly than other big company product like Real Juice (Orange Flavored) who used essences, not using real juice but this cottage industry is small cottage industry so they have difficult to compete with these company in Nepal, out side the Nepal.

Suggestion: Government charges VAT 13 percent though this is the food product therefore they suggested subsidizing the VAT in low percent. Government has to provide facilities and subsidizes.