SIX DECADES OF FRUIT DEVELOPMENT IN NEPAL

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ABSTRACT

Growing fruit trees in the kitchen garden were practiced in Nepal since time immemorial. The establishments of the Horticulture Section under the Department of Agriculture in 1955 and 13 Horticulture Farms at different agro-ecological zones of the country with the support of Indian Cooperation Mission (ICM) were very important steps of modern fruit development in Nepal. The Department of Horticulture that was created in 1967 had lost its identity in 1972. Then Fruit Development Division and National Citrus Development Program were created in the same year. Fruit development programs were also supported by many donor-funded projects during the period of 1970 to 1990. Despite the fact that the number of manpower has increased from one horticulturist in 1941 to a few hundred at present, there is erosion in the quality of manpower. Furthermore, due to poor resources and opportunities in the horticulture farm/centres, horticulturists do not like to work in the horticulture farm/centres these days. In the last four decades, area was increased by 11 times whereas increase in production was 12 times. Fruit sapling production and distribution was a public sector business, before 1975. The government initiated the establishment of private nurseries from 1975. Today more than 90 percent share of total fruit sapling production and distribution is met by the private nurseries. Despite of these changes, the quantity and value of importation of fruits is increasing in recent years due to the rate of demand increasing faster than the increasing rate of production, resulting in a wider trade deficit. Research back-up is very weak and progress on the development of grading and packaging facilities is very poor. NGOs and other development partners are least interested in fruit development as most of the fruit crops take long time to give returns or results.However, most of the fruit crops are environment friendly and some of these crops can be successfully grown even in the undulating and earthquake-induced cracked lands.

INTRODUCTION

Fruits and flowers are very important for the everyday life of human beings. Hindus regard the Bael tree (Aegle marmelos) as a plant of Lord Shiva and the wood and bark used in the ritualistic pooja or worship. Ehee or Bel bibah is a cultural ceremony, in which a Newari young girl is said to have married to the sacred fruit of Bael, and she is not considered widow even after death of her husband (Shrestha, 1998). Coconuts and other fruits are offered to God during worships. Mango leaves and banana plants and leaves have similar religious values. Different types of fruits in the baskets are being prepared to offer to the Gods in the temples. It is also a common culture to carry some fruits when visiting a sick person; this may be due to the nutritional value of fruits. All these indicate that growing fruit trees in the kitchen garden was practiced in Nepal since time immemorial but their commercial cultivation started only after the establishment of horticultural institutions in the country during sixties (Shrestha, 1993) and celebration of agricultural year in 1975. In this article, development made in institutions; manpower; infrastructure; area coverage and production; nursery plant production; research; policies, plan and programs are briefly reviewed.

INSTITUTIONAL DEVELOPMENT

Although introduction of fruits and their cultivation was started from the Pre-Rana Regime, the necessity for fruit cultivation on a scientific basis was realized only after 1940 when an Indian fruit expert assisted in scientific fruit cultivation. Horticulture units were established at Agriculture Station of Kakani in 1948 and Parwanipur in 1959. The establishment of the Horticulture Section under the Department of Agriculture in 1955 was also an important step for promotion of fruit development in the country. One Fruit Preservation Unit established at Kirtipur Farm in 1961 has been upgraded to the Department of Food Technology and Quality Control in the year 2000.The establishment of 13 Horticulture Farms by the government at different agro-ecological zones of the country with the support of Indian Cooperation Mission was the foundation of modern fruit development in Nepal (MOA, 1990). These farms were established with the following mandates:

- Establishment of progeny orchards at horticulture farms.
- Introduction and evaluation of exotic varieties of fruit crops.
- Production technology development and verification.
- Production and distribution of quality planting materials.
- Identification of some production pockets for different fruits.
- Providing technical service in orchard establishment and management.
- Conducting trainings for field level technicians and fruit growers.

The Indian bilateral assistance program was implemented during 1960-1973. A separate Department of Horticulture (DoH) was created in 1967 to initiate horticulture development all over the country in an organized and planned ways. The department was responsible for both research and development. But the Department of Horticulture had no extension network at the grass root level. Both research and extension activities used to be carried out by the horticulture farms/ centers within their limited command areas. Research activities were focused on introduction and selection of fruit crop varieties, root stock selection, development of propagation methods under local condition, and orchard establishment. Extension activities were focused on site selection, planting material distribution and demonstration on orchard layout.

Little attention was given on orchard management. Like other programs, fruit development programs were supply driven and the Department of Horticulture was solely responsible to implement them. Institutions at the private sector were not established. However, the Department of Horticulture lost its identity in 1972 with the merging of five departments to create the Department of Agriculture. Then under this Department of Agriculture, Fruit Development Division and National Citrus Development Program were created in the same year. DADOs of the 75 districts were given responsibility of horticulture extension along with other regular programs.

After the celebration of the "Agriculture Year" in 1975, there was a paradigm shift in production function of horticulture. Private fruit nurseries were then established all over the country to produce fruit saplings locally. Because of the proactive roles played by the National

Citrus Development Program, both research and extension activities in citrus were implemented in all mid-hill districts of Nepal effectively and intensively. Emphasis was given to train farmers in nursery and orchard management.

The Hill Agriculture Development Project (1977-1980) implemented with the technical assistance of FAO, strengthened horticulture farms of Kirtipur and Jumla by providing horticultural equipment and exotic varieties of warm-temperate and temperate fruit crops. In 1982, a post of Deputy Director General (DDG on horticulture) was created in the Department of Agriculture realizing the importance of horticulture in the country. In the context of organizational development, a major step was taken in 1985 by creating the National Agricultural Research and Services Center (NARSC) to undertake research activities separately. In the same year, the Horticulture Development Project was commenced with its project office at Horticulture center Kirtipur. This project promoted Junar in Ramechhap and Sindhuli, pear and chestnut in Kathmandu, Bhaktapur and Lalitpur and grapes in Banke and Bardiya. Variety introduction, variety selection, fruit quality assessment, packaging of production technologies, demonstration of production technologies and training were the main activities undertaken by this project. The demo-farm approach of technology transfer and long term crop cycle based training for field level technicians introduced by this project were very successful innovations and hence, suggested to scale-up in the future programs of fruit development.

In 1988, another project, known as the Hill Fruit Development Project (HFDP), was implemented in the 11 districts of the Eastern Development Region with the financial and technical support of the ADB. The main objective of this project was to increase fruit production and productivity without degrading environment of the hill areas. Despite the noble objective of the project, this project could not be successful due to design and implementation problems. This project was in implementation for a period of eight years (1988/89-1996/97). The contributions of Integrated Hill Development Project (1975-1985) in Dolakha and Sindhupalchok, Pakhribas Agriculture Center in eastern hills and Lumle Agriculture Center in western hills to fruit development were also quite significant, particularly in variety evaluation and selection,

nursery management, and orchard establishment.

Fruit development programs were thus supported by a few donor funded projects during the period of 1970 to 1990. However, the transfer of research responsibility for fruit crops to NARC posed a major problem as most horticultural farms/stations and trained manpower remained with the department. Furthermore, the NARC was cereal crop biased while prioritizing the research programs. This resulted in poor allocation of research budget in fruit crops. Similarly, DOA's extension service was also cereal crop biased and the staff of DADO offices used to give little attention to fruit development programs.

Given the importance of horticultural crops including fruits in the national economy, the Department of Horticulture (DOH) was re-established under the Ministry of Agriculture in 1990. 75 District Horticulture Offices (DHOs) were proposed to be created under this department but only 30 DHOs could be established. The DOH started to function with these 30 offices along with two technical divisions (fruit and vegetables), five commodity programs and 23 farms/stations. The National Agricultural Research and Services Center was given autonomy to exercise its research functions independently and was renamed as the Nepal Agricultural Research Council (NARC) in the year 1991. But horticultural research in general and fruit research in particular was kept at low profile even by this autonomous NARC. Furthermore, the lingering issue of handing-over of the farms could not be resolved for a long period and this affected fruit crop research negatively.

After the restoration of democracy in 1990, four departments under the Ministry of Agriculture including the Department of Horticulture were again merged to create the Department of Agriculture Development. A horticulture unit was then established in each DADO office and provision was also made to have one horticulture development officer in each district. Thus, in this restructuring extension network was extended to all 75 districts for horticulture development. Similarly some more officer level posts were also created in the ministry, the department and training centers. The Fruit Development Section was promoted to the Division with more responsibilities and manpower. In this context, the Tea and Coffee Development Section was established and placed

under this division. But the National Citrus Development Program was demoted to a section of the Fruit Development Division and shifted to Kirtipur from Paripatle, Dhankuta. However, it has been again promoted to the original position of National Program and the Fruit Development Division has been renamed as Fruit Development Directorate in 2007.

After 1990, the democratic government of Nepal took several initiatives in private sector that led economic development. The new cooperative law was enacted changing state directed Sajha to more autonomous Sahakari. The department of agriculture adopted group approach of extension to cover more farmers and areas. Since then many cooperatives and groups are formed and functioning in fruit development. In some important fruits, such as Junar, mandarin orange and apple, cooperative federations have also been formed to promote their production and marketing.

With the objective of import substitution of these fruits, the government has implemented the Lime Mission Program from the fiscal year 2007/8 and the Apple Self Reliance Program from the fiscal year 2013/14. The Citrus Orchard Rejuvenation Program has been implemented from the fiscal year 2013/14 in order to combat the citrus decline problem. The Lime Mission program was discontinued after the fiscal year 2013/14, however, the Apple Self Reliance Program and the Citrus Orchard Rejuvenation Program are having a good impact on quality fruit production. There are a number of other related institutions and projects which are involved in fruit development in Nepal. The Hill Agriculture Research Project (1997-2004) and the National Agriculture Research and Development Fund established in 2001 have supported fruit development programs through the competitive grant system. Similarly, Project for Agriculture Commercialization and Trade (commenced from 2010), High Value Agriculture Project in Hill and Mountain Areas (commenced from 2010), Commercial Agriculture Development Project (commenced from 2009), Raising Incomes of Small and Medium Farmers Projects (commenced from 2012) and High Mountain Agriculture and Livelihood Project (commenced from 2011) have also supported some fruit development projects selected on competitive basis. The problem with these institutions is that they have kept fruit development projects in low profile.

NGOs (both national and international) are also showing least interest in fruit development due to, probably, long gestation period of most of the fruit crops. In recent years, private organizations such as FNCCI, AEC and DCCI, are also supporting fruit development programs as the key partners of the fruit value chain.

MANPOWER DEVELOPMENT

Though Mr. Satya Lal Ranjitkar was appointed as the first Fruit Culture Specialist by the then Chief Saheb Padma Shamsher in 1941, the work of Mr. Dibya Bahadur Basnyat (B.Sc.Ag.) in fruit development should not be forgotten (Shrestha, 1998; Shrestha, 1993). He introduced and planted apple, mosambi, pineapple, banana and persimmon in Balaju and Godawari. Mr. Shambhu Man Singh, who is now over 90 years of age, was the Director of the Horticulture Department from its establishment year of 1967 to merging period of 1972. Up to the late sixties, the number of horticulturist working in the country was within the range of 15-16. After 1970, many agriculture graduates returned to Nepal after completing their B. Sc. Ag. Course in different universities of India under the Participant Program (USAID) and majority of them joined the Department of Agriculture; few of them started work in the Ministry of Education and Agriculture Development Bank (HDP, 1995). The number of agriculture graduates who started their jobs as horticulturists during the seventies was about 20. Since then the number of horticulturists working in the country is in increasing trends. The number of trained manpower in horticulture working under the ministry of agriculture during 1990 and 2014 are shown in the following table.

Table 1. The number of trained manpower in horticulture working under the Ministry of Agricultural Development

Level of manpower	1990			2014		
	Central offices	District offices	Total	Central offices	District offices	Total
Officer level (G.class III-I)	109	14	123	146	75	221
Assistant level (JTs/JTAs)	191	68	259	191	71	262
Total	300	82	382	337	146	483

Source: MPHD, 1990; MOAD, 2014; DOA 2014.

Besides the manpower shown in the above table, a significant number of horticulturists are working in non-governmental organizations. However, it can be assumed that horticulturists dedicated to fruit development are few in number.

Despite the fact that the number of manpower has increased from one-horticulturist in 1941 to few hundreds at present, there is erosion in the quality of manpower. The senior horticulturists working in fruit development have now been phased out, while young horticulturists have little interest to work in fruit crops. Trained manpower has not been retained and there are several instances where a staff member who has been trained on a particular subject matter is transferred to a job with a different set of responsibilities even before the expertise gained through training intervention can be utilised or transferred into the system. Due to poor resources and opportunities in the horticulture farm/centres, horticulturists do not like to work in the horticulturefarms/centres these days.

INFRASTRUCTURE DEVELOPMENT

The basic infrastructures required for fruit development in a sustainable way are: (1) transportation facilities, (2) irrigation facilities, (3) value addition facilities, and (4) marketing facilities. Transportation is the key link in the value chain of any commodities including fruits. Road transport is the only possible means of transportation of fruits in Nepal. There was no motorable road in Nepal during the early forties. Now the scenario had been changed. At present, the total length of all kinds or road is 25115 km (MOF, 2010). There are three east west highways extending from the eastern border to the western border. The number of north-south roads is more than a dozen. Such road network has provided an opportunity to expand areas under fruit crops manifold. For example Karnali High Way has now shown its impact on the market access of apple production of those areas. Road transport in Nepal consists of mainly trucks owned by the private transport companies. However, there are still many fruit production pockets having no access to road. Fruits from such production areas are transported by the porters using Dokos as the means of transport. In some hilly areas mules are used to transport

fruits from production areas to the road heads. In the terai, bullock carts are used where there is nomotorable road access.

Regarding irrigation facilities, fruit crops in Nepal are generally grown under rain fed conditions. But some commercial farmers have started to establish plastic ponds, drip or sprinkle irrigation facilities in their orchards. In hilly and mountainous areas, cellar stores have now becoming popular to store fruits in the production areas especially for apple and citrus. Besides, there area few cold stores in the vicinities of highways and wholesale markets. In recent years, many collection centres are developed in the production areas and wholesale market facilities at the strategic points. For example, wholesale-cum retail market facilities are developed in Kathmandu, Narayangadh, Butwal, Kohalpur, Attariya, Pokhara, Dhalkebar, Dharan and Birtamod. Fruit processing facilities are also developed in many strategic points by private entrepreneurs and cooperatives. But progress on the development of grading and packaging facilities is very poor. Hence grading and packaging operations are manually done.

FRUIT PRODUCTION AND GOVERNMENT POLICIES

Area , Production and Productivity

Fruit cultivation in scientific ways was started only after the 1960. In 1967, the area under different fruit crops was estimated to be 2000ha (Shrestha, 1993). The area, production and productivity of different fruits from 1970 to 2014 are as shown in the Table 2.

Table 2.Area, production and yield of fruits

Year	Area (000 ha)	Production (000 MT)	Yield (ton/ha)
1970	13	80	6.0
1975	33	254	6.5
1980	42	274	8.3
1985	51	343	9.0
1990	63	442	9.0
1995	59	398	10.1
2000	70	447	9.62
2005	89	553	9.99
2010	107	707	10.00
2014	148	965	8.77

Sources: MOAC, 2014 and FDD, 2014; Note: Yield is calculated based on the productive area.

In all the periodic plan periods, both area and production were increased except during the eighth plan period (1992-1997) in which both area and production were decreased. The unusual figures of this period were the results of data adjustment which was made in 1993 based on the mortality of plants in the orchard. Productivity was stagnant or increased very slowly during all plan periods. The table 2 shows that the area was increased by 11 times in the last 44 years, but production increased by only12 times. Productivity increased by 1.5 times.It clearly indicates that the main reason for increased production was the area expansion.

Figure 1 shows the area of these three categories of fruit crops since the year 2000; area of all these crops are increasing, however, the rate of increase in area is faster for summer fruit crops in recent years (after 2009).

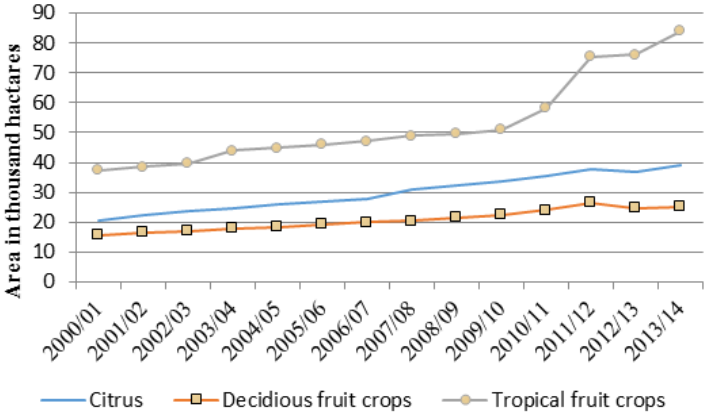

Figure 1: Area of major category of fruit crops in hectares in the FY 2013/14.

Source: FDD, 2014.

Recently, some fruit crops namely strawberry, avocado and kiwi are emerging as the potential crops in warm temperate and sub-tropical areas of eastern and central regions and olive in drier mid-western and far western hilly regions of the country.

Fruit Sapling Production

Review of the fruit plant production system in Nepal revealed that the establishment of fruit nurseries at Chhauni, Balaju and Godawari in 1937, establishment of horticulture farms during 1960s and celebration of the Agriculture year in1975 were very important milestones in fruit sapling production. Asexual propagation of fruit plants (apple, pear, peach, plum etc) was started after the establishment of these three nurseriesat the government level. . Researches were carried out to find out appropriate method and time of propagation under Kathmandu conditions. In terai, grafted plants of mango used to be imported from private nurseries of India located near the border. When many other horticultural farms were established during the sixties, fruit plant production and distribution programs were implemented by the government through these farms. Thus, fruit plant production function was the public sector function up to 1974 and there was always shortage of fruit plants in the country.

Realizing this fact, the government initiated establishing private nurseries in intensive fruit production pockets from 1975. Nursery owners were trained in different aspects of fruit plant production and they were then supported to establish the nurseries. Then private nurseries were established in many parts of the country and the function of fruit sapling production was gradually shifted from the government farms to these nurseries. In 2014, the number of registered private fruit nurseries in Nepal was 32 for citrus, 161 for winter fruits and 53 for summer fruits (FDD, 2014). About 2.5 million fruit saplings are produced and distributed annually, and the share of private nurseries in it is more than 90 percent(Figure 2).

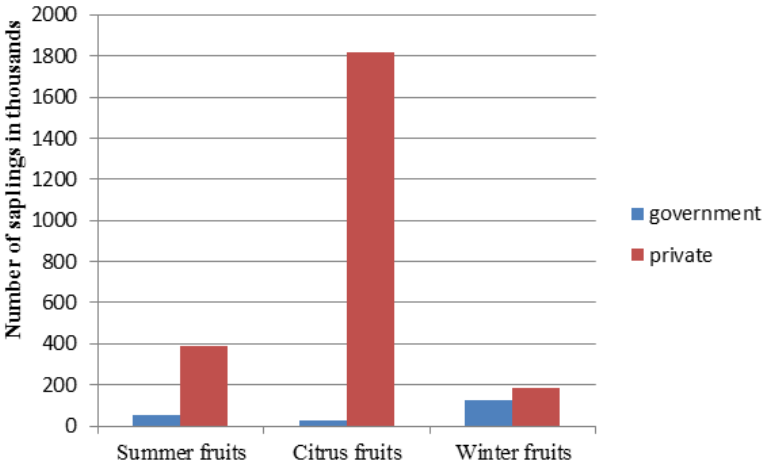

Figure 2: Share of government and private nurseries in fruit sapling production in the FY 2013/14

Source: FDD, 2014.

Government Policies, Plan and Programs

Many efforts have been made in developing favorable plans to harness the potential of horticulture in Nepal since the fifth five-year plan (1975-80). The fifth five-year plan concentrated on strengthening of organization and production oriented researches. It gave high priority to farmers' problem solving adaptive researches. In the sixth five-year plan (1980-85) efforts were made to fruit development in road accessible areas. The seventh five-year plan (1985-90) also directed fruit development programs along the highway corridors and densely populated areas. The prioritized fruit crops for commercial production were mango, banana, mandarin orange, sweet orange, apple, pear and walnut. Priority programs were launched in 20 districts for citrus, 15 districts for mango, 11 districts for apple, 10 districts for pear and 7 districts for walnut. In order to encourage farmers in fruit production, the government provided interest subsidy on the credit for fruit farming. Then the government felt a need for a long term plan for horticulture development and a 20-year Master Plan for Horticulture Development (MPHD) was developed with

technical and financial support of the Asian Development Bank. The MPHD was developed based on the concept of agro-ecological zones. According to this plan, suitable fruit development programs were to be formulated on the basis of 15 horticultural units.

The MPHD could not get approval.If MPHD was approved and programs were implemented as per its suggestions, the amount of money we are now expending every year for import of fruits, would not only have been saved, but could have earned every year by exporting fruits. The eighth 5-year plan (1992-97) gave emphasis on bottom-up planning and intensive fruit development program in road corridors without incorporating the recommendations of the MPHD. However, NPC commissioned a project during the early phase of this plan to prepare a long term Agriculture Perspective Plan (APP), which recognized citrus and apple as high value commodities. The APP (1997-2017) is now at its final phase of implementation. All the programs envisioned in the APP for fruit development were reflected in the 9th and 10th plans. Similarly, the three consecutive three year interim plans (2007/08 onwards) were also supportive for fruit development. Apple Self-Reliance Program, Lime Mission Program and Citrus Rejuvenation Program have been implemented in these periods. In recent years, many private orchards have been established in many parts of the country. There are many visible pocket areas of major fruit crops, such as banana, mandarin orange, junar, and apple, and their value chain maps have also been developed for some districts. However, to ensure fair share of the domestic market; maintain competitiveness with the imported fruits; and ultimately to aim at exporting fruits to foreign markets, greater technological advancement is required in both production and post-production programs.

Recently the government has approved Agriculture Development Strategy (ADS) on 12 June 2015. ADS expects to guide agricultural sector for the next 20 years. Though the document mentions that horticulture has larger role to play, and points out increasing trend of deficit of trade due to import of fruits, ADS does not prioritize fruit development activities . Fruit is not even listed in top 15 value chain ranking. Fruit is just addressed in ADS as a commodity in special support to overall rural communities' livelihood across Nepal.

CONSTRAINTS TO FRUIT DEVELOPMENT

Fruit development in Nepal is constrained with a number of factors which can be broadly categorized as (1) input supply and production constraints; and (2) postharvest management and marketing constraints.

1. Input supply and production constraints:
    - Weak linkage between input suppliers and fruit producers.
    - Inadequate numbers of agrovets or other input suppliers in fruit production areas.
    - Existing suppliers have limited technical knowledge and outreach..
    - Nursery/orchard owners not aware of the varieties, pollinizers, and package of practices.
    - Inadequate credit support to the entrepreneurs and input suppliers.
    - Inadequate training to the nurserymen and other input suppliers.
    - Lack of road access in most of the production areas.
    - Poor market information service.
    - Poor nursery management practices and disease and insect-pest management.
    - Unavailability of improved varieties of rootstocks.
    - Difficult to identify mother plants of desired varieties.
    - Unavailability of nursery equipment.
    - High initial investment for orchard establishment.
    - Weak monitoring and follow-up support from the service providers.
    - Small and scattered land holding.
    - Long gestation period of the crop.
    - High risks due to natural calamities and lack of supportive insurance policy.

2. Postharvest management and marketing constraints
    - Inadequate knowledge and skill of the farmers on handlings of fresh fruits.
    - Inadequate packing facilities and high cost of packing materials.
    - Short harvesting period.
    - Inadequate support in processing industries.

- Inadequate storage facilities.
- Information on production, market demand and consumers' preferences lacking.
- Value chain not adequate and transparent.
- Poor road connectivity.
- Weak linkage between market functionaries.
- Inadequate marketing infrastructures.
- Higher marketing cost due to mainly high transportation cost.
- Poor road conditions and disturbances in transportation.
- Long time taken for transportation to consumer's markets.

WAY-FORWARD

- Significant change cannot be expected without research back stopping. Government should give priority to fruit research program.
- Without enhancing the capacity of technical units(Directorate, Program, Farm, Laboratory including quarantine etc) and their manpower, drastic change in fruit development cannot be achieved; so they should bestrengthened to tackle the technical issues of fruit farming.
- Government should focus the development of commercial pocket areas of fruit farming by developing road access including gravity rope ways in hilly areas where feasible, small irrigation, rural electrification and collection centers at strategic locations which will create an enabling environment to attract the fruit growers as well as private sectors investment on commercial fruit farming.
- Market/demand oriented commercial fruit production plan should be tied up with full package of activities including micro-finance, technical support, and insurance etc. Trading business man/company should be linked to the fruit grower's groups/cooperatives. Group marketing should be encouraged. Fruit processing industries should also be linked to the production groups/cooperatives.
- Provision of direct government support on up scaling of commercial fruit orchards and export market of fruit should be made. Initiative should be taken for establishment of cold chain system for exportable fruits of the country.

- Quality aspects in fruit saplings production and distribution; fruit production, postharvest and marketing should also be prioritized. Nursery Act should be formalized. Nepal Standards/Voluntary standards of fresh fruits should be developed and should be brought into practice.
- Private sectors should be encouraged to establish resource centers for fee based inputs supply as well as technical supports to the fruit growers related to fruit farming.
- Specialized manpower (fruit tree based horticulturists, plant protection officers and soil scientists) should be developed and their technical support should be made within the access of commercial growers.
- Social mobilization part should also be taken into consideration while developing commercial production plan.This aspect should be done through LNGOs/CBOs with government support.
- Fruit database and documentation should also be initiated at fruit growers level and provision of extra incentive package should be made for such type of fruit growers.

CONCLUSION

Despite the suitable climate and expanding market for fresh fruits and processed products, the growth of fruit industry has remained slow in the last six decades. Work on fruit research is inadequate and extension program is very general. NGOs and other development partners are least interested in fruit development as most of the fruit crops take long time to give returns or results. Furthermore, long gestation period of the crops, high initial cost for orchard establishment, and high risks due to mainly lack of reliable weather forecasting system and marketing are discouraging farmers for growing fruit crops. However, most of the fruit crops are environment friendly and some of these crops can be successfully grown even in undulating landscapes and the lands with earthquake-induced cracks. In fact, the adoption of fruit cultivation results in more efficient use of scarce land resources in the country like Nepal. Moreover, fruit trees contribute to carbon sequestration, as are done by forest trees. However, a thorough planning of programs on

research and development is required for growth of fruit industry in Nepal. Fruit industry in Nepal cannot be expanded unless small farmers and entrepreneurs are supported by the government.

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