

# Present Status, Prospects and Challenges in Fruit Development in Nepal

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## Abstract

*Nepal can accommodate all the important fruits of the world due to its varied topography and geographic location however; import of fruits is increasing resulting highly trade deficit in fruits. Apple, grapes, mandarin, oranges, lime, banana and pomegranate are the important fruits that are imported in spite of the country's high potentiality of growing them. Area and production of fruits are increasing steadily, but the rate of increase in fruits is lesser than the rate of increase in demand of fruits in the country. Nepal government has brought many programs, such as apple self-reliant program, citrus rejuvenation program, lime mission program but just for a shorter period of time than that were aimed for. Though these programs have contributed to some extent, they were not able to bring required impacts and not able to reduce the imports of fruits. More and more land in the rural area is being abandoned due to migration of working force in search of job. This challenge has to be converted to an opportunity by bringing the abandoned lands to large scale fruit cultivation and linking them to value chain including market and attract foreign returnee youths to be involved. Research, education and development partners have to work together at all levels (federal, provincial and local) for the development of fruit crops in the country for the import substitution and export promotion of fruits.*

**Keywords:** fruit production, imports, programs

## 1. Introduction

The contribution of agriculture on National GDP is 27.6% (MOF 2018) and the horticulture sector contributes 16.75% of Agriculture GDP, Fruit sector contributes nearly half of this. Nepal has different types of climates due to its geographic location and physiography; therefore all the important fruits of the world can be grown in our country. There are more than 55 types of fruits grown in Nepal, out of which 25 are grown in commercial scale. There is an increasing trend in area coverage and production of fruits over the years however, the rate of increase of production is minimal and not able to meet the increasing demand of fruits in the country. Neighboring countries have progressed well in fruit development, while Nepal has experienced more of trade deficit in fruits in spite of

the country's high potentiality. Because of the low productivity, high prices of production inputs, poor rural infrastructures, high transportation costs, high marketing costs and poor cultivation and postharvest technologies, Nepalese produce are less competitive even in the domestic markets.

Agriculture is facing shortage of human labor due to out-migration in search of better jobs and rural agriculture lands are being abandoned. This challenge has to be undertaken as an opportunity and thus utilize the comparative advantage by fruit plantation and required processes in fruit development. In recent years, Nepal government has announced the BS 2075 i.e. 2018/19 as the fruit year and the year 2016/17 to 2025/26 (BS 2073/74 to 2082/73) as the fruit decade.

## 2. Policy in Fruit Crops

The Government of Nepal has developed and implemented several policies to promote horticulture development in the country. Agriculture Perspective Plan (1995-2015) has included apples as a high value crop for high hills and Mandarins as high value crop for mid hills. Other plans and policies include National Agriculture Policy (2004), Agribusiness Policy (2007), Agro biodiversity Policy (2006), Land Use Policy (2012) and different 3-5 yearly periodic plans. 20-year Horticulture Master Plan which was prepared in 1991 with an assistance of Asian Development Bank, was not approved by the government, but has been used as a guiding document by horticulture planners.

In recent years, the government has approved and implemented Agriculture Development Strategy (ADS, 2015). ADS expects to guide agricultural sector for the 20 years and mentions that horticulture has a larger role to play, and points out increasing trend of deficit trade due to import of fruits; however, it does not prioritize fruit development activities. Fruit is not even listed in top 15 value chain ranking (FDD 2017).

## 3. Developmental Programs on Fruit Crops

### 3.1 Developmental Programs on Fruit Crops by FDD/NCFD

In spite of immense potentiality of fruit production, the quantity and value of importation of fruits is increasing in recent years due to the slow rate of increase of production as compared to the rate of increasing demand of fruits in the country. Apple, citrus, grape and mango are the major fruits that are imported to Nepal. Various developmental programs have been implemented by the Fruit Development Directorate (FDD)/National Centre for Fruit Development (NCFD) in order to reduce importation and promote exportation and address trade deficit in fruit crops.

#### 3.1.1 Lime mission (2007/08 - 2013/14)

In order to address the issue of increasing import of lime in the country, lime mission program was implemented from the fiscal year 2007/08 till 2013/14 in different districts (Terhathum, Dhankuta, Bhojpur and Makawanpur) in different phases with an objective of import substitution.

#### 3.1.2 Citrus orchard rejuvenation program (2013/14-2016/17)

Citrus rejuvenation program was implemented from the FY 2013/14 (2070/71 BS) to the FY 2016/17 (2073/74) with an objective of rejuvenating old and declining citrus orchards of main producing districts (Dhading, Gorkha, Lamjung, Tanahun, Kaski, Syangja, Parbat and Myagdi district).

### 3.1.3 Apple self-reliant program (2011/12 to 2016/17)

Apple is the high value fruit emphasized by agriculture perspective plan. In order to address the increasing import of apples in the country, apple self-reliant program has been implemented from 2011/12 AD (2068/69 BS) to 2016/17 AD (2073/74 BS) in high hill districts (Mustang, Manang, Jumla, Humla, Dolpa, Kalikot and Mugu) with an objective of Import substitution.

### 3.1.4 Fruit Decade (2016/17 to 2025/26) and Fruit Year 2075 B.S (2018/19)

As mentioned above, various programs have been implemented aiming at reducing trade deficit in fruits, but these programs were not implemented for the period as envisaged, rather run for short terms. Fruit crops require more than five years to come to production and show impacts. Recently, the Nepal government has announced the years B.S.2073/74 to 2082/73 as the fruit decade and the B.S. 2075 as the fruit year. Two guidelines had been approved by the ministry in the FY 2073/74 B.S.; (i) Fruit Decade Implementation Guideline 2016 (2073 B.S.) and (ii) Fruit Sapling Production Infrastructure Development Guideline,2016 (2073 B.S.).

Fruit Decade Implementation Guideline has envisaged the development program for the next ten years. Under the provision of these guidelines, capital subsidy program for additional sapling production infrastructure (Tissue culture lab, net house, shed house, green house) had been proposed and expected to avail quality fruit saplings for the Fruit (Plantation) year starting from 2075 B.S. During first five years of fruit decade will be emphasized on quality saplings production for the expansion of fruit orchards as short term strategy and next five years will be emphasized for new technology transfer and post-harvest handling and processing industries development. In FY 2073/74 B.S, the programs were implemented through the District Agriculture Development Offices (10 districts for temperate fruits, 10 districts for warm temperate fruits, 20 districts for citrus fruits and 10 districts for tropical fruits) and in the FY 2074/75 B.S, the program was implemented through the Farms/Centres under the Fruit Development Directorate to establish and strengthen nurseries in their commend districts.

### 3.1.5 Fruit Plantation Area Expansion in Public and Private Lands

In the process of implementation of fruit decade program, a guideline has been approved by the Ministry of Agriculture and Livestock Development on Fruit Plantation Area Expansion in Public and Private Lands, 2018 (2075 B.S.). This program has been implemented through the National Centre for Fruit Development (NCFD). Major objectives are as follows: (i) Enhance ecology and land use through fruit plantation on public abandoned lands. (ii) Import substitution and export promotion through commercial fruit cultivation expansion in private lands. Proposals had been called from 15 districts (as shown in table 1) for plantation in private lands, area of plantation should be at least in 10 hectares in a block. For this year, fruit crops; lime, mandarin, kiwi, mango, litchi, and pomegranate have been chosen for plantation in private lands. This program will be continued in coming years in additional districts and crops based on its performance.

**Table 1.** Districts and fruit crops for the year 2018/19 (2075/76 B.S).

S.N.	Districts	Crops
1	Okhaldhunga	Pomegranate
2	Kapilbastu, Rauthat, Sarlahi, Mahottari	Mango, Litchi
3	Arghakhanchi, Bhojpur, Sunsari	Lime

4	Ramechhap, Solukhumbu, Rukum west, Makawanpur	Kiwi
5	Kailali, Tanahu, Parbat	Mandarin

### 3.1.6 Guiding Document for Fruit Development

Guiding document (FDD, 2017) for Fruit Development has been prepared by the FDD through the consultative service in 2016/17. The general objective of the project document is to guide program planning in fruit development and research so that Nepal becomes self-sufficient in fruit supply from its own production in next 10 years' time. This document has recommended short term (5 years), mid-term (10 years) and long term (20 years) recommendations categorically for temperate, warm temperate, subtropical, and tropical fruit crops. The document made a basis on the following strategic pillars.

- Production increase through increased area under production
- Productivity increase through better management practices
- Postharvest loss decrease through improved postharvest handling including packaging, transportation and storage
- Infrastructural support for quality planting material production and post-harvest handling
- Institutional strengthening for research, production and marketing
- Access to finance and mortgaging

### 3.1.7 Fruit germplasm collected by DOA farms/centres

There were 13 horticulture farms under the FDD and 10 under the Vegetable Development Directorate. The fruit genetic resources available in these farms are compiled by Bhandari et.al. (2017).

## 3.2 Fruit Related Programs Run by other sectors under the DOA

Other directorates and centres such as Plant protection Directorate, Soil Management directorates, Post-Harvest management Directorates, Agriculture Marketing directorates had been implementing respective programs on fruits.

## 3.3. Programs by other projects under the Agricultural Ministry

### 3.3.1 Programs by Prime minister Agriculture Modernization Project

The Ministry of Agricultural Development (MoAD) has executed the Prime Minister Agriculture Modernization Project (PMAMP) from the fiscal year 2016/17 (2073/74 B.S.). The project is run with government resources, where the government will actively coordinate and cooperate with the private and cooperative sector to implement the project effectively. Under the project, the government has classified the agriculture production sector into pockets (10 Ha), blocks (100 Ha), zones (500 Ha) and super zones (1000 Ha.).

The super zones and zones are run by separate offices while the pocket and block were run by the DADOs for the first year, while now they are run by the Provincial govt through Agriculture Knowledge Kendra (AKC) . In the first year 2016/17, the project had executed seven super zones (one super zone per a province) 30 zones, 150 blocks, and 2,100 pockets across the country, in this fiscal year 2018/19, the number has gone up to 14 super zones, 69 zones, 336 blocks and 2776 pockets; of them, 4 super zones (apple in Jumla, Mandarin in Syanja, and Junar in Sindhuli), 18 zones, 37 blocks and 131 pockets for fruits.



### **3.3.2 High Value Agriculture Project (HVAP) (2010-2018)**

HVAP was implemented from 2010 in 10 districts of in hill and mountain areas of the Mid and Far Western Development Region and has been focusing on value chain of seven major commodities including apple fruit.

### **3.3.3 The High Mountain Agribusiness and Livelihood Improvement Project (HIMALI) project (2011-2017)**

This project was launched with the aim to strengthen selected district facilities by improving their capacities to meet demands for improved crop and livestock breeding, post-harvest quality services, climate adaptive community forestry, rangeland management and technology demonstrations through public-private partnerships. Fruits were also covered among the commodities supported by the project.

### **3.4 One Village One Product program by Other Ministry through FNCCI (2006-2017)**

Inspired by the success of OVOP program in various countries, Nepal had launched One Village One Product (OVOP) in the fiscal year 2006/07 as a public private partnership program. Many fruits were included such as Kiwi in Illam and Makawanpur, Mango in Saptari, Arecanut in Jhapa, Junar in Ramechhap and Sindhuli, Hug plum in Bhaktapur and Parbat, Banana in Chitwan and Kanchanpur, Coffee in Syanja, Bel fruit in Bardiya, Olive in Bajhang.

### **3.5 Programs run by Provincial Local Level**

As the country has adopted the federal system, agriculture related ministry, agriculture development directorate are established in every province and 51 Agriculture knowledge centres are established throughout the country. Horticulture programs including on fruit development have been proposed and implemented based on their strength of man power. Federal guidelines of fruit development programs have been used as guiding document for the preparation of their own guidelines. Local level bodies (Municipalities) also have agriculture sections with limited man power, they are also conducting fruit development programs based on their perceived importance and priority set by the municipality.

### **3.6 Private Nurseries**

Private nurseries are contributing almost 99% of the total sapling production in case of citrus, 90% of saplings in case of tropical fruits, but lesser in extent , i.e. 67% saplings in case of temperate fruits (FDD, 2072). The NCFD has updated the nursery listing on the provincial basis.

### **3.7 Fruit Producers Associations**

Producers' associations have been formed in different fruits in districts for the welfare of the fruit producers. Many of District Orange Producers' Association (DOPA) formed during citrus rejuvenation program implementation have become ineffective now, but have been replaced by PMAMP implementation committee in the districts/Block/pockets. In recent years, associations have been formed for banana growers, and kiwi growers.

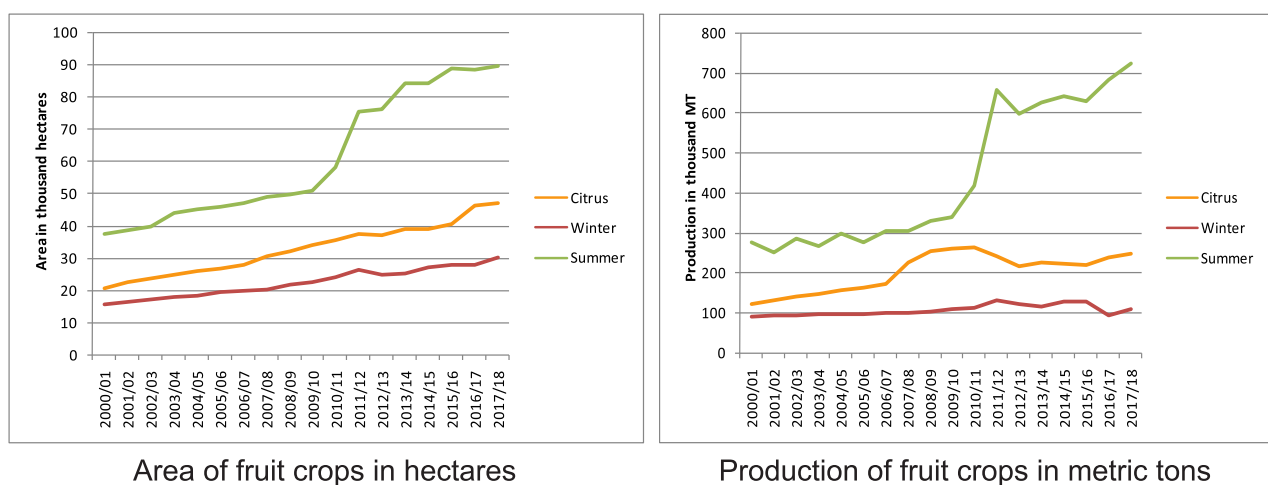
## 4. Organizational Set-ups

Frequent change in organizational structure created instabilities and uncertainties which brought setbacks and caused the horticulture sector to lagging behind. Majority of Horticulture farms were established during the period from 1960 to 1973. Department of Horticulture was in existence two times once between 1967-1972 and the second time from 1990-1992. Fruit Development Division and National Citrus Development Program were established in the year 1972; Fruit Development Division was renamed to Fruit Development Directorate (FDD) in the year 2000. There were 13 horticulture farms located in different geographic locations, one section (Coffee and Tea Development Section) and one national program (National Citrus Development Program) under the FDD. With the federalization, the organizational set ups have been changed again, with merging of three offices; Fruit Development Directorate, National Citrus Development Program, and the Coffee and Tea Development section into National Centre of Fruit Development, and only five federal farms under this centre (1. Temperate Horticulture Development Centre, Marpha, Mustang, 2. Warm Temperate Horticulture Centre, Kirtipur, Kathmandu, 3. Tropical Horticulture Centre, Nawalpur, Sarlahi, 4. Citrus Fruit Development Centre, Tansen, Palpa, and 5. Coffee Development Centre, Aapchaur, Gulmi), rest of the farms were moved under the Provincial level.

## 5. Area and Production of Fruits

Fruits are generally grouped into three categories; summer, citrus and winter fruits. The summer fruits include mango, banana, litchi, guava, arecanut, papaya and pineapple; they are grown in the southern belt of Nepal. The major citrus species are mandarin, lime and junar (sweet orange), mainly grown in the mid hills of Nepal. The major winter fruit crops are apple, pear, walnut, peach and plums, grown in mid to high hill regions. In recent years, strawberry, kiwifruit and pomegranate are emerging as the potential crops in warm temperate areas of eastern and central regions and olive is doing the same in drier mid western and far western hilly regions of the country.

Figure 1 shows the area of these three categories of fruit crops since 2000/01 to 2017/18. It revealed that the area and production of all these crops are increasing, however, the rate of increase in area and production is faster for summer fruit crops in recent years (after 2009/10).



**Figure 1:** Area and production of three categories of fruit crops since the FY 2000/01

Source: NCFD, 2018

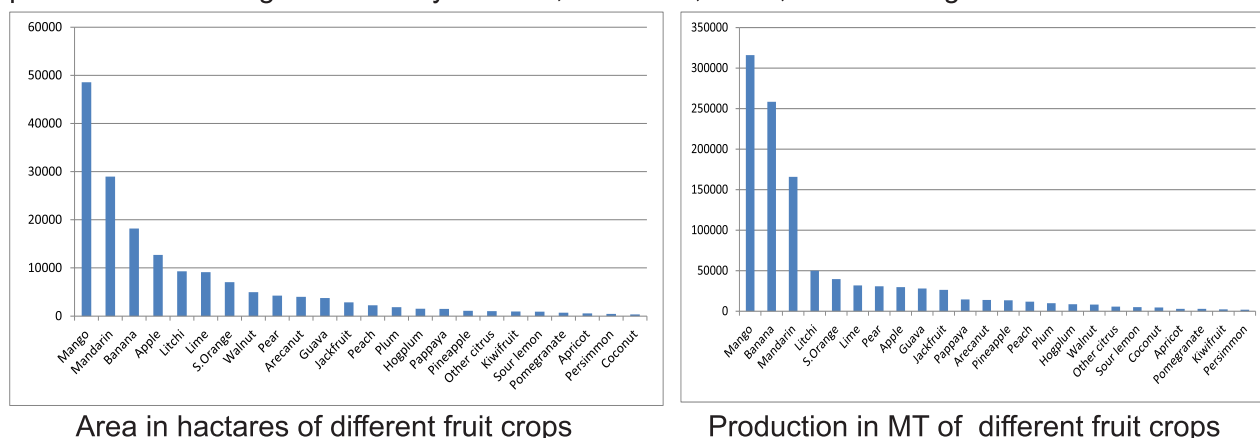
Despite more than six decades of effort with the given strength and opportunities in the fruit development in Nepal, the productivity of fruit has remained low i.e. around 9 metric ton per hectare. This can be raised up to 15 metric ton per hectare with increased access to information, modern production technology and inputs (high quality saplings, fertilizers, credit and water). The lower productivity of fruits are mainly because of the following reasons (FDD, 2017):

- The orchards established during the past decades (late 20th century) have become old and senile, and need rejuvenation with better management and replanting with quality saplings.
- Citrus decline, Mango malformation, fruit drops and other pests along with poor management of orchards have been emerging as new challenges and requires renovation
- Fruit researches during recent past are not getting priority from the Govt. and other organizations as it has long gestation period for fruiting
- Mechanization, post-harvest technology and value chain development activities in fruits have been in low key
- Donor’s funding is almost nil in fruit research and development, and government investment is also not up to the level expected
- Coordination, collaboration and co-working among DOA, NARC, University system and private stakeholders are very inadequate.

The total area of fruits in the FY 2017/18 is 166815 ha and productive area is 114122 ha. which is producing 1082398 mt of fruits with the resulting productivity of 9.48 mt/ha (Table 2). Area wise, summer (or tropical) fruits cover 54% followed by citrus (28%) and winter (or temperate/warm temperate) fruits at 18% in the FY 2017/18.

Fruits	Area (ha)	Productive area (ha)	Production (mt)	Productivity (mt/ha)
Tropical	89582	71493	725244	10.14
Citrus	47051	27469	248027	9.03
Temperate	30182	15160	109128	7.20
<b>Total</b>	<b>166815</b>	<b>114122</b>	<b>1082398</b>	<b>9.48</b>

Figure 2 show the area and production of different fruit crops in Nepal in the fiscal year 2017/18. Mango is the number one crop on the basis of area and production, followed by Mandarin, Banana, Apple, Litchi and Lime and Sweet orange in terms of area, while slightly a different order on production i.e. Mango followed by Banana, Mandarin, Litchi, Sweet orange and Lime.

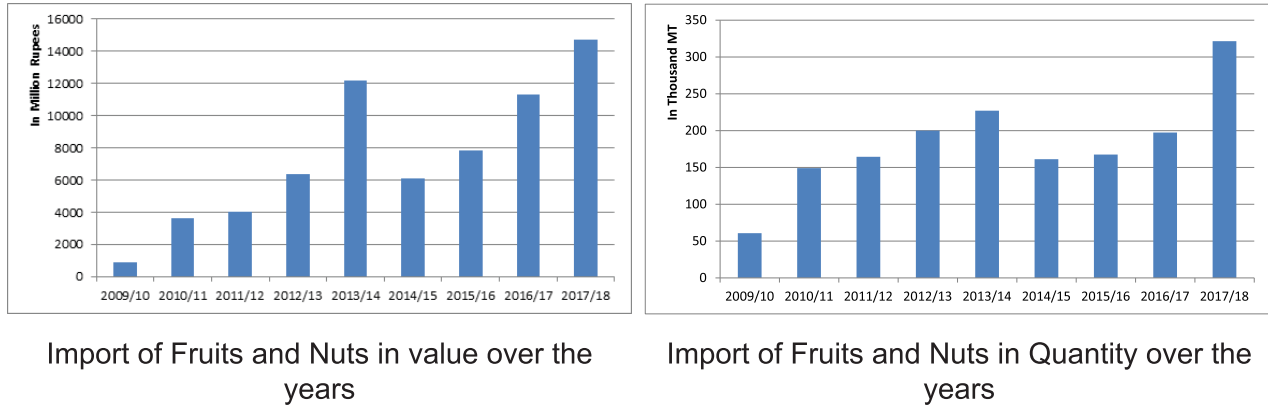


**Figure 2:** Area and Production of different types of fruits in Nepal in FY 2017/18

Source: Data from NCFD, 2019

## 6. Import and Export of Fruits in Nepal

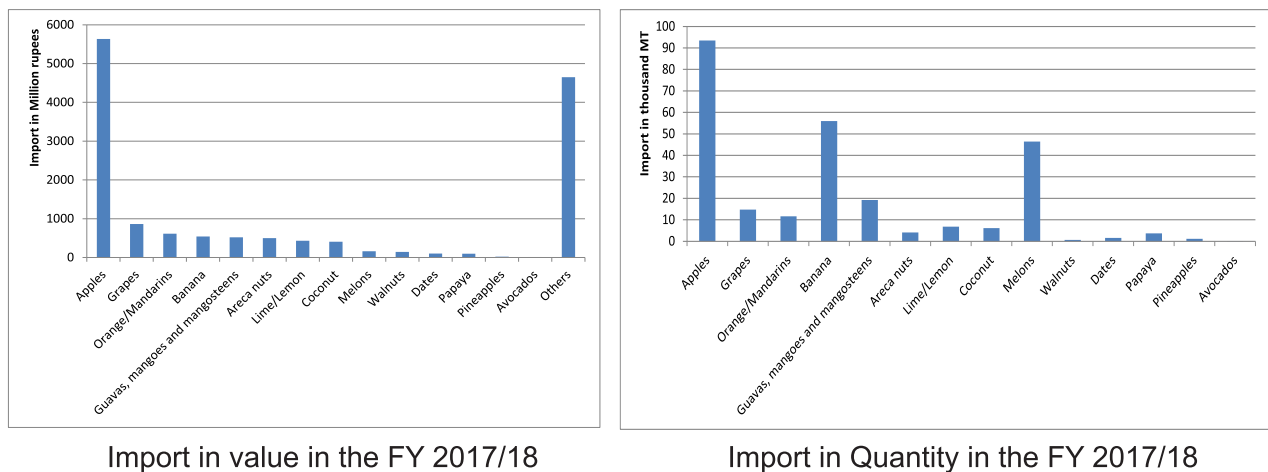
Due to the slow rate of increase of production as compared to the rate of increasing demand of fruits in the country, the quantity and value of importation is increasing in recent years. In the fiscal year 2009/10, the import value was 907 million rupees and import quantity was 61 thousand MT, while by the year 2017/18, this has increased to 14.7 billion rupees in value and 321,000 MT in quantity (Fig 3), i.e. approximately 16 times in value and 5 times in quantity.



**Figure 3:** Import and export of Fruits and Nuts in value and in quantity over the years

Source: Data from TEPC, 2018

Apple, grapes, mandarins, banana, guava are the major fruits imported to Nepal. Apple alone was imported 93 thousand MT in quantity and 5.63 billion rupees in value in the year 2017/18 (TEPC, 2018). Similarly, 615 million rupees worth Mandarin and Sweet oranges and 540 million rupees worth banana were imported in the same fiscal year (Fig 4)

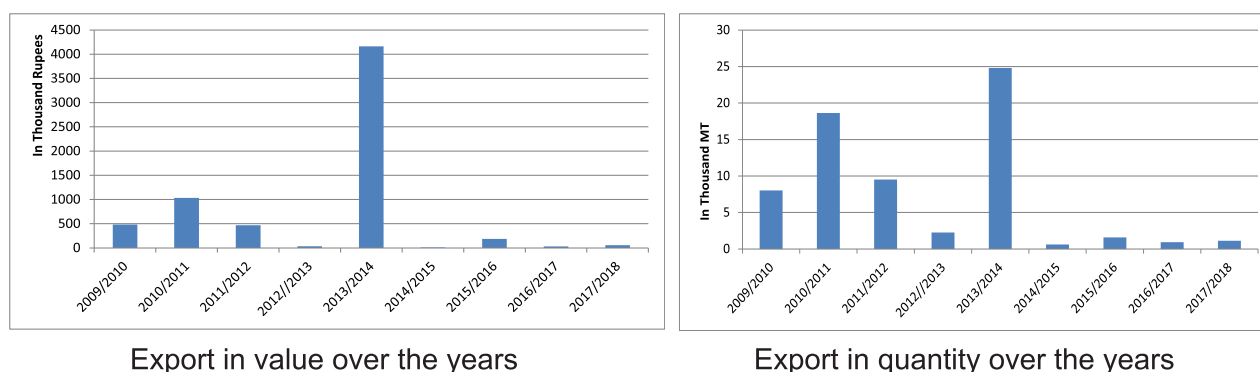


**Figure 4:** Import of Fruits and Nuts in value and in quantity in the FY 2017/18

Source: Data from TEPC, 2018

When we look at the trend of export, export of fruits are found to decrease in recent years (Fig 5). Some of the fruit commodities exported are citrus, banana, kiwi, coconuts.





**Figure 5:** Export of Fruits in value and in quantity over the years

Source: Data from TEPC, 2018

Registered Cultivars: Fruit crops are given low key in NARC research. Fruit crops generally require many years of research to show outputs, scientists working in fruit sectors are disadvantaged in their career achievements, thus lesser number of scientists are involved in the fruit research. Very few varieties of fruits are registered/released (Table 3).

**Table 3.** Registered varieties of fruit crops.

Crop	Variety	Year	Recommended domain
Lime	Sun Kagati 1	2070 BS	Terai and inner Terai, River basins
	Sun Kagati 2	2070BS	Terai and inner Terai, River basins
	Terhathum Local	2075 BS	Eastern Hills from 1000-1600m altitude
Mandarin	Khoku Local	2075 BS	Eastern Hills from 1000-1600m altitude

## 7. Prospects

### 7.1 Geographic Condition:

Four distinct agro-ecological zones – cool temperate, warm temperate, sub-tropical and tropical zones have been identified in the country. Due to extreme variation in altitude and climatic conditions in a short distance each districts in the country may fall under different agro-ecological zones. For this reason, climatic conditions of a small country like Nepal offer for growing of one or more of tropical, sub-tropical, warm temperate and cool temperate fruit crops in the country.

### 7.2 Comparative Advantage:

Generally fruit crops are considered as high value crops as compared to cereals. Their productivity and profitability are higher than the cereals crops. Different studies have shown that mango cultivation gives about 5 times, mandarin 24 times and banana 36 times higher income than cereals (Thapa, 2009). Because of better economic return attraction of youth and educated people and business houses towards horticulture enterprises is rapidly increasing in Nepal.

In precision fruit farming where modern/high technology and crop management practices are used, in such situation the productivity and profitability would be very high.

### 7.3 Export Promotion and Import Substitution:

Nepal's trade balance is negative and trade deficit is increasing year after year. Fruit sub-sector in Nepalese agriculture possesses high prospect/potential for export promotion and import substitution for fresh and processed fruit products.

### 7.4 Nutritional Prospects:

There is growing need of more nutritious food than cereals. Fruit contains high amount of vitamins, minerals and have adequate nutritional values. Thus they are not only helpful to fight against malnutrition but also important in building a healthier nation.

The dietary recommendation for fruit consumption is 100g. Fruit consumption in the country is low (23.4 kg intake as per FDD, 2017) as compared to world average (74.1 kg). The per capita fruit consumption must be increased to make people healthy.

### 7.5 Environmental Protection:

Fruit trees have heavy green foliage which is active sites of photosynthesis reducing carbon dioxide level in the air. The leaves and green parts of the tree are also biologically active; they give off huge amounts of oxygen during carbon metabolism, thus oxygen is available for the non-green world. Trees are effective in reducing air-pollution. In addition most fruit trees have deep, spreading root system in the soil and hold soil particles firmly, thus, they not only reduce soil erosion but also conserve the soil adequately. Bio aesthetic planning of rural, peri-urban and urban areas including fruits trees planation has good prospects.

### 7.6 Agro-tourism:

Tourism is one of the very important sub-sector for the economic development of the country where agro-tourism can also play a very important role to attract tourists and generate employment and income. Domestic and foreign tourists might be interested to visit farm, experience on farming practice, an opportunity to pick fruits and other farm products. Increasing resort development in tourist trekking areas are good sites for accommodating fruit orchards in their landscape. In addition Fruit pocket areas developed can be tied up for tourist visit or fruit pocket areas can be developed in trekking routes.

## 8. Challenges and Way Forward

Challenges	Way forward
<b>Newly adopted Federal system-</b> As the country has recently moved to the federal system, this has posed problem in the timely collection and compilation of technical information and statistical data and preparation of balance sheet of saplings.	Clear cut roles and responsibilities are to be provided at every level (Local, provincial, Federal).
<b>Discontinuation of prioritized Programs-</b> Rather than solving the problems/issues of the program, many of the important programs were dropped off for eg. Lime mission, Apple Self-relient program, Citrus rejuvenation program.	The programs/projects should be implemented as per the planned project period.

<p><b>Co-ordination</b></p> <ul style="list-style-type: none"> <li>■ Research, educational institutions and Departmental organizations- Linkage among them is very important for suitable technology development and utilization.</li> <li>■ Federal, Provincial and local organization- Horticultural programs are to be implemented in all the three levels, however, due to recent changes, co-ordination is weak.</li> <li>■ Government and private sector- For last many years, PPP has been spelled out, but the co-ordination is still weak.</li> </ul>	<p>Co-ordination committees should be formed and should be functional.</p>
<p><b>Researches- Varieties-</b> Many new fruit types/varieties have been imported, but there is hardly any research done such as in case of dragon fruit, wine variety grapes, blue berry, and almond.</p>	<p>Researches should be demand driven, focused on issues on farmers' fields. Researchers on fruit crops are very weak; they also should be equally prioritized as other crops. Researches should address on following aspects:</p> <ul style="list-style-type: none"> <li>■ Varietal</li> <li>■ Propagation techniques (walnut, tissue culture, Nursery structures)</li> <li>■ Pest and diseases (Fruit fly, citrus greening, crown gall in apple, mango malformation)</li> <li>■ Nutritional management</li> <li>■ Socioeconomic</li> <li>■ Protected cultivation</li> <li>■ Post harvest technology</li> </ul>
<p><b>Weak Value Chain on Fruits</b></p>	<p>Value chain actors need to be capacitated with formulation of programs with budgets.</p>
<p><b>Branding and Tracking back</b></p>	<p>Capacity Development for Branding and tracking back</p>
<p><b>Absence of nursery act and regulation</b> – This hindered legal provision for quality control of fruit saplings.</p>	<p>Provision should be quality sapling distribution (including tissue culture saplings)</p>

## 9. Conclusion

Though Nepal has a high potentiality of growing all the important fruits of the world due to its varied topography and geographic location, import of fruits are increasing and Nepal is highly in trade deficit in fruits. Nepal government has implemented many programs, but the period they run are for a shorter period than they were planned for. Fruit crop research and development generally

require long time devotion compared to annual crops, thus fewer scientists/staffs are attracted towards it. More and more land in the rural area is being abandoned due to migration of working force in search of job. Large scale cultivation of fruits utilizing these rural lands and linking them to the value chain including market is important. Quality sapling production, pest and disease management, mechanization, value chain development are to be focused for development of fruit crops. Research, education and development partners have to put their hands together for the development of fruit crops in the country for the import substitution and export promotion of fruits.

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