

FRUIT DEVELOPMENT IN NEPAL: PAST EFFORTS, PRESENT STATUS AND FUTURE NEEDS/WAY FORWARD

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EXECUTIVE SUMMARY

Nepal is a country of diversities in terms of geographical and climatic situations providing diverse opportunities and strengths for fruit development. The unique agro-ecological zones favored by altitudes, topography, and aspect within the country offer an immense opportunity for growing different types of fruit crops. Although the pace of fruit development in the past has not gained the desired momentum compared to other sub-sectors of agriculture, the efforts in retrospect show that majority of them were designed to harness the potential for fruit development as offered by the resource endowments of the country.

This paper tries to get insight of the previous efforts and approaches to fruit development in Nepal, analyses the present status, identifies the constraints and explores the course of actions to be taken in the future. For this purpose, a review of the documented literature in this regard is made and a few experiences of the past are briefly presented.

HISTORICAL BACKGROUND AND EFFORTS

- Majority of Nepalese has sentimental relation with fruits in terms of custom, culture, and religion e.g. lemon, pumello, areca nut, coconut, and so on.
- Nepal is believed to be the homeland of some traditional fruits, especially some citrus species.
- Fruits are grown in Nepal since ancient time in the form of homestead garden; household without few fruit trees is considered incomplete.
- The historical efforts in fruit development in Nepal could be divided into four segments as follow.

Fruit Development Efforts during Rana Period

- The credit for the first time introduction of some exotic fruits in Nepal goes to the Rana Prime minister, Janga Bahadur Rana who is believed to introduce some saplings of fruits and ornamental plants from UK and France in around 1850 (1907 BS).
- Ranas, the autocratic rulers of Nepal, introduced many exotic varieties of mango, litchi, persimmon, pomegranate, guava, pummelo, fig, etc. and planted in and around their places.
- Ranas also established first systematic and laid out large-scale orchards in Nepal. They set up various mango orchards in the river valleys around Kathmandu like Jalbire (Kavre), Bhimtar (Sindhupalchowk), Dhunibesi (Dhading), Kichet, and Gandakhar (Nuwakot).
- Systematic horticulture development activities started only after the creation of agriculture council in 1937 (1994 BS).
- Fruit development activities started with the establishment of fruit nursery cum trial orchard in Chhauni, Godawari and Balaju in 1947 (2004 BS).

Fruit Development Efforts during 1950 to 1970 (2007 to 2027 BS)

- 1951 (2008 BS)-Establishment of Plant Introduction Unit (PIU) in Putali Bagaincha, Singdurbar.
- Establishment of trial orchard in Kakani which later on converted to Kakani Fruit Station.

- Nepal first time received the assistance from USAID for horticulture development under point four programs. Some saplings of warm temperate fruits were imported and planted in Kakani Horticulture farm. This bilateral assistance from the USA continued until 1963.

- 1955 (2012 BS) In restructuring of the Department of agriculture, Horticultural Section was established in Putali Bagaincha, Singa Durbar for the first time to launch horticultural program in the country (Chief was Mr. Satya Lal Ranjitkar).

- **1960 (2017 BS)** The Indian cooperation mission submitted a preliminary report for development in Nepal and both government signed in the agreement. horticulture
- The second agreement with Government of India was signed on 1963 (2020 BS), the period extended until 1973 (2030 BS). The commendable achievements in fruit development projects made in this period of 13 years were establishment of 14 horticulture farms/stations among others.
- **1966 (2023 BS)**-Establishment of Department of Horticulture (Phaludhyan Bibhag) among 5 departments after DoA dissolved (Director- Shambhu Man Singh)
- **1969 (2026 BS)**-Intensive fruit development program launched in 16 districts. About one lakh saplings of different fruits were distributed.

During 1970 to 1990 (2027 to 2047 BS)

- **1972 (2029 BS)**-Unfortunately, all the departments created in 2023 BS were amalgamated into one department i.e. Department of Agriculture.
- The following national level two sections and two programs were created under Department of Agriculture
 - Fruit Development Section- responsible for the fruits other than citrus
 - Vegetable Development Section for vegetable development
 - National citrus Development Program-for citrus development
 - National Potato Development Program – for potato development activities.
 - Enforcement of Plant Protection Act.
- **1975 (2032 BS)**-Nepal celebrated Agriculture Year
- ❖ Campaign in fruit development started
- ❖ More than two lakhs saplings of apple and other temperate fruits were imported from Himanchal Pradesh of India and distributed in Karnali zone.
- ❖ Production of fruit saplings started in private nursery as well.
- ❖ National Citrus Development Program shifted to Dhankuta from Pokhara.

This period also remained important from the view of establishing horticulture farms.

- Thirteen additional horticulture farms and stations were established giving total number of 26 farms specializing in fruits (Temperate-8, Warm temperate-4, citrus- 4, and tropical-10).
- **1978 (2035 BS)**-Commercial farming of coffee started in Gulmi, Palpa and Argakhachi.
 - HADP (Hill Agriculture Development Project) (2034-2037 BS)-funded by FAO started works on planting various types of fruits in different horticulture farms and strengthening the horticulture station at Kirtipur and Jumla.
 - **1981 (2038 BS)**-Launching of the **Special Junar Program** by the government in Sindhuli and Ramechhap.
 - **1982 (2039 BS)**-Realizing the importance of horticulture in Nepal, a post of Assistant Minister in the Ministry of Agriculture and a DDG in the Department of Agriculture were established to look after horticulture.
 - **1985 (2042 BS)**-Announcement of Sindhuli and Ramechhap as Junar district.
 - Government launched citrus priority program in 5 districts (Dhankuta, Sindhuli, Ramechhap, Kaski, Dailekh)
 - First phase of Horticulture Development Project (HDP) 1985-1987 with the technical and financial support by JICA started. Establishment of Kalimati Fruit and Vegetables Wholesale Market.
 - **1987 (2044 BS)**-Launching of the Hill Fruit Development Project/HFDP, (1987-1995) under the loan assistance of ADB in the hills and mountain districts of Eastern Development Region.
 - **1990 (2047 BS)**-Creation of the Department of Horticulture as an institution responsible for horticultural activities in the country. The Department received the ownership of 33 horticulture farms/centers and Horticulture Development Sections were established in 26 districts (DG-Hari Pd Gurung).
 - Preparation of Master Plan for Horticulture Development (MPHD) for 20 years, with the concept of agro-ecological zonation for specific 12 core fruit crops {1 tropical-(up to 1000 m) for banana, mango and pineapple, 2 subtropical- (1000 -1500m) for mandarin orange, sweet orange and lime, 3 warm temperate-(1500- 2000 m) for peach, plum and 4 temperate-(2000 – 3000 m) for apple, pear and walnut}
 - MPHD was expected to serve as the framework for the short, medium, and long term development of horticulture sub-sector but not brought into implementation.

1990 (2047 BS) on wards

- 1991(2048 BS)-NARSC created in 1987 converted to NARC as autonomous body responsible for agricultural research works and received some horticultural farms (Pokhara, Dhankuta, Dailekh and Jumla etc).
- 1992(2049 BS)-Amalgamation of 5 department including Department of Horticulture into Department of Agriculture Development with the concept of single umbrella service delivery approach.
- Creation of the Program Director to look after horticulture sector under Director General of Department of Agriculture.
- Conversion of Fruit Development Section and Vegetable Development Section into Divisions
- Formation of Tea and Coffee Development Act/Board and Floriculture Association Nepal (FAN).
- 1993 (2050 BS)-Lease out of five horticulture farms (Panchkhal, Darma, Sindhupalchock, Dhunibesi and Janakpur) in FY 2049/50 BS. These farms returned to the Government in 2051 BS (Panchkhal), 2052 BS (Humla) and 2062 (Sindhupalchock, Dhunibesi and Janakpur)
- Four Horticulture Farms handed over to other agencies (Rasuwa to Wildlife, Kakani to Tourism, Dhunibesi to Mulberry, and Yagyapuri to Cancer Hospital).
- 1994 (2051 BS)-Formation of Kalimati Fruit and Vegetable Wholesale Market Committee.
- 1997 (2054 BS)-Launching of APP with fruits such as apple and citrus as high value commodities
- 2000 (2057 BS)-In restructuring of Ministry of Agriculture, Fruit Development Division and Vegetable Development Division were upgraded into separate two Directorate.
- National Tea policy approved.
- Launching of Karnali zone special Agriculture Development Project with major thrust on temperate fruits like apple and others.
- 2002 (2059 BS)-Starting of PhD program including horticulture in IAAS.
- 2003 (2060 BS)-Enforcement of National Coffee Policy.
- Double Tract System of farm management started from FY 2060/61 in 3 public farms including Horticulture farm in Sarlahi.
- 2006 (2063 BS)-The concept of One Village One Product (OVOP) approach came into implementation from FY 2063/64 in partnership with FNCCI in some districts (Lapsi-Bhaktapur, Junar-Sindhuli and Ramechhap, Bel-Bardiya and Siraha).
- 2007 (2064 BS)-Launching of Lime Mission Program from FY 064/65 in 3 eastern districts (Terathum, Dhankuta and Bhojpur).
- 2007 (2064/65 BS)-Start of the fruit nursery registration in District Cottage Industry Office.
- Amendment and enforcement of Plant Protection Act in 2064.
- 2010 (2067 BS)-Launching of HVAP in 10 districts (9-mid western region and 1-far western region) with major focus on apple and other fruits as high value commodities with the financial assistance of IFAD.

Some External Supports on Fruit Development

In the process of horticulture development in Nepal, very little external support was available. However, some of the assistance that were made available to horticulture development with emphasis on fruits in the form of loan or grant are briefly discussed hereunder.

1. **USAID (1951-52) 2008 BS-** It was the first foreign assistance to Nepal for fruit development. Nepal received this assistance under point four program for the establishment of apple trial orchard in kakani which later converted into Kakani Fruit Station. Some imported saplings of cool temperate and warm temperate such as apple, pear, peach, plum were planted in the station.
2. **Indian Cooperation Mission (1960-1970)/(2017-2030 BS) –**
 - Second foreign support in horticulture development was provided by ICM in sixties. The mission submitted a preliminary report for horticulture development and both the government signed on agreement in 1960 (2017 BS).
 - The second agreement was signed on 1963 (2020 BS). The project period extended until 1973 (2030 BS).
 - The commendable achievements in fruit development made in this period of 13 years among others were the establishment of following 14 horticultural farm/stations in different ecological zone.
 - Horticulture Research Station Kirtipur, Dhankuta and Pokhara (2018 BS)
 - Horticulture farm, Janakpur (2021 BS), Daman, Trisuli, Baitadi, Humla (2028 BS), Helambu and Jumla (2025 BS).

3. **IHDP (1975–1985)** – Integrated Hill Development Project was one of the project funded by Swiss Government in Dolakha and Sindhupalchowk with the programs of fruit development among others.
4. **HADP (1977–1980/2034–2037 BS)**– A FAO funded project that imported number of germplasm and planted at horticulture farm (Kirtipur, Jumla, Marpha, Dhunibeshi, Trhuli, Palpa and Pokhara). This project also supported in strengthening horticulture station Kirtipur and Jumla.
5. **JADP–JICA** funded project supported mainly for junar production program in Sindhuli and Ramechhap. This project also imported some improved germplasm of grapes and strengthened horticulture farm Sindhuli.
6. **HDP (1985 -1997/204 -2054 BS)**
 - Horticulture Development Project funded by Japan through JICA did a commendable work on fruit development in Nepal.
 - It established an excellent research and training facilities at Kirtipur and helped develop the production of Junar in Sindhuli and Ramechhap, chestnut and grapes in Kathmandu and Nuwakot and grapes in Banke and Bardiya during its first phase (1985 – 1990).
 - During the second phase (1992 – 97) main focus was on the promotion of Junar, Mandarin Orange, Japanese pear, grapes, persimom and chestnut through research, development and extension including demo-farm establishment in 6 districts (Kathmandu, Lalitpur, Bhaktapur, Kavre, Sindhuli and Ramechhap).
7. **HFDP(1987–1995/2044–2052)**–Hill Fruit Development Project was implemented in 11 districts of eastern hills with the loan assistance of ADB. The main components of the project were on-farm development, strengthening of horticulture farm in project area, marketing and processing support at three assembly points and training in different aspects of fruit production, processing marketing.
8. **Other projects/agencies** – LAC, PAC and KHARDEP funded by US and many other IRDPs included fruit as an important component and have directly or indirectly contributed in the promotion of fruit industry in Nepal.
9. **Olive Project (2006 – 2009)** – Project for the promotion of olive production and consumption in Nepal, an Italian funded FAO project launched in Kolti, Bajura during the 1st phase (2006 – 2009). Two pilot/mother plant orchards one in Kirtipur and another in Kolti, Bajura set up.
 - Different 28 cultivars imported from Italy and 674 olive saplings including 36 mother plants and 38 boarder plants.
 - Nurseries with green house and shade house were set up in all 3 project sites at Kirtipur, Kolti and Jupal.

Synopsis of Past Efforts

- ✦ In spite of immense potentiality, fruit development seems to have received the priority only from the beginning of the Fifth Development Plan.
- ✦ Until the devolution of agriculture extension service in FY 2058/59, the planning was almost a top down model for fixing the target of area and production of fruit crops.
- ✦ Formulation and implementation of fruit programs used to be mainly of three categories viz. priority program and special program for commercial orchards and the general program for homestead gardens.
- ✦ Road corridor approach especially in the hills seems to have been followed for fruit development.
- ✦ Frequent change in organizational structure created instabilities and uncertainties which brought setbacks and caused the horticulture sector to lag far behind compared to other sectors. However, the year 2023 BS and 2047 BS were found notable for the creation of the Department of Horticulture and the years 2029 BS and 2049 BS found discouraging for detopping them.
- ✦ Majority of Horticulture farms established during 2017 to 2027 BS with the help of Indian Cooperation Mission and during 2027 to 2037 BS.
- ✦ The initial period of Eighth Five Year plan (FY 2049/50 BS) was realized bitter for the wrong and suicidal decision of farm privatization.
- ✦ Many efforts have been made to harness the potential production of apple in Mustang and Jumla, Mandarin in Dhading, Dhankuta, Kaski, Syanjya and Dailekh and Sweet orange in Sindhuli and Ramechhap and were found as a few successful stories.
- ✦ As a whole, in spite of tremendous potential, the program could not expand as expected, the development potential yet remained largely untapped because of the lack of demand driven, and market led fruit production program.
- ✦ The future efforts need to learn from these past experiences and lessons.

Present Status of Fruit Development in Nepal

1. Present strategy/ approach

- 1) Pocket package strategy- for commercialization (Mainly road-corridor approach) leading to growth center development
 - Size of the pocket: terai 150 ha, mid hill 60 ha, and high hill 40 ha.
 - Focussed fruits- apple, pear, walnut, citrus, mango, litchi, banana, pineapple, papaya, coffee, etc. (25-50% subsidies)
- 2) General/homestead garden: especially to promote the nutritional requirement of marginalized people

2. Current major programs on Fruits

1. Commercial fruit development program
2. General/homestead fruit development program
3. Citrus mission (lime): Since FY 064/65 in 4 districts (Terathum, Dhankuta, Bhojpur and Makawanpur) especially for import substitution
4. OVOP in partnership with FNCCI: Lapsi(Bhaktapur), Junar (Sindhuli and Ramechhap), Bel (Bardiya and Siraha), Horti-tourism (Mandarin orange and coffee) in Lekhnath, Kaski and Coffee (Syangja)
5. Apple self sufficiency program: Since FY 068/69 in 7 districts(Karnali zone-5 , Mustang and Manang)
6. Karnali zone special agric-program: mainly focused on apple and walnut

3. Newly Emerging Fruits and Resource Center Development

1. Kiwi fruits-Boach farm
2. Pomogranate-Trishuli
3. Almond, Hazelnut and Chestnut-Marpha and Baitadi
4. Kinnow-Palpa, Trishuli

4. Present Strategic Interventions for Fruit Development

- Pocket area and value chain development
- Horti. Tourism: Road Corridor
- One Village One Product Program
- Biodiversity program
- Research and Development
- School Horticulture
- Peri-urban horticulture
- Healthy Sapling Production: Quarantine, Bud wood Certification, Screen house
- Quality Sapling Production: Through fruits sapling production guidelines
- High Density Planting: Citrus Decline
- Tissue Culture Program: Banana, Straw berry, Ornamental, Ornamental plants production
- Irrigation in fruits orchards: Drip irrigation, Sprinkle irrigation, Plastic pond, rainwater harvest etc.
- Quality fruit production and export promotion
- Environment Protection: Use of organic pesticides, land use, IPM etc.
- Fruit data management: Area, Production and Productivity and market management
- Effective Monitoring and Supervision

5. Total Area, Productive Area, Production and Production rate of fruit crops in FY 2011/012 (068/69)

Fruits	Area (ha)	Productive area (ha)	Production (mt)	Production rate(mt/ha)
Tropical	75315 (54%)	61057 (60%)	658207 (64%)	10.78
Citrus	37565 (27%)	24089 (24%)	240793 (24%)	10.00
Temperate	26442 (19%)	16087 (16%)	130754 (12 %)	8.13
Total	139321	101233	1029754	10.17

- Area covered by fruits- 3.38% of total cultivated area
- Per capita production of fruits in FY 2065/069-38 kg
- Contribution of horticulture in AGDP-23% (ADS)

6. Status of Fruit Nurseries and Sapling production/requirements

A. Status of private fruit nurseries (2068/69)

Categories	Winter	Rainy	Citrus	Mixed	Coffee	Total
Registered	161	53	32	16	10	272
Non registered	-	-	139	32	27	198
Total	161	53	171	48	37	470

Source: FDD, 2068/69

B. Rainy Season and Winter Season Fruit Sapling Distribution

Rainy Season					Winter Season				
S.N.	Name of the Fruit	Farm center	Private Nursery	Total	S.N.	Name of the Fruit	Farm center	Private Nursey	Total
1	Mango	14500	85000	99500	1	Pear	13090	16380	29470
2	Litchi	8975	22900	31875	2	Apple	42659	421613	464272
3	Bananna	1400	114550	115950	3	Peach	9904	5300	15204
4	Jackfruit	1500	760	2260	4	Plum	6296	3520	9816
5	Guava	275	3325	3600	5	Walnut	17585	18990	36575
6	Pineapple	5000	3000	8000	6	Persimmon	5600	7955	13555
7	Pomegranate	300	1850	2150	7	Khurpani	1300	100	1400
8	Papaya	5100	4500	9600	8	Chest nut (katus)	500		500
9	Coconut	600	200	800	9	Grapes	1600		1600
10	Area nut		7000	7000	10	Hog plum	26041		26041
11	Avocado	800	1000	1800	11	Picanut	2500		2500
12	Macademia nut	500		500	12	Kiwi	300		300
13	Custard apple	500		500	13	Almond	100		100
					14	Anjir	200		200
Total		39450 (14%)	244085 (86%)	283535	Total		127675 (21%)	473858 (79%)	601533

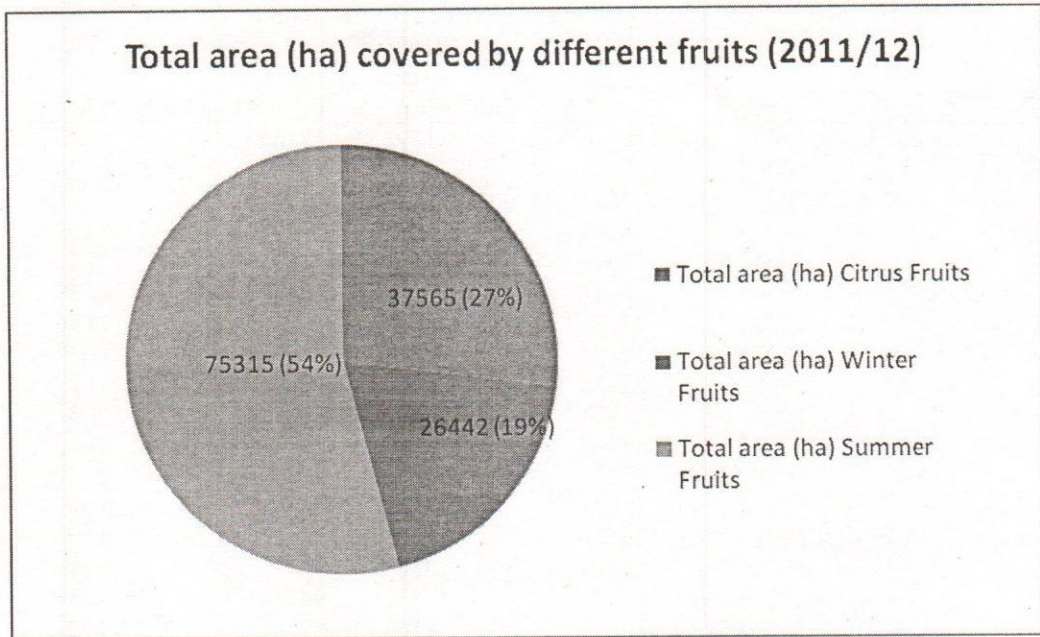
Source: Balance Sheet, FDD, 2068/69

7. Comparative Scenario of Area and Production of Fruits in the last 12 years

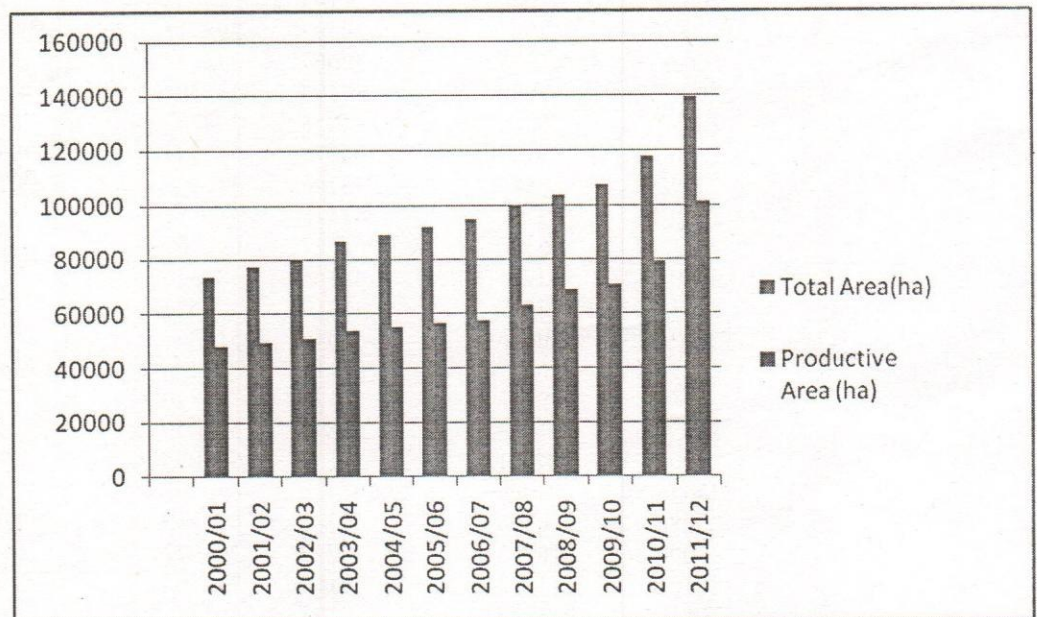
AREA, PRODUCTION AND YIELD OF FRUITS IN NEPAL					
Types	Year	Total Area(ha)	Prodv	Production (mt)	Yield (mt/ha)
			Area		
A. Citrus	2000/01	20673	11892	121665	10.23
	2001/02	22423	12615	130928	10.38
	2002/03	23663	13312	139110	10.45
	2003/04	24799	13931	148010	10.62
	2004/05	25910	14606	156956	10.75
	2005/06	26681	15206	164075	10.79
	2006/07	27980	15832	171875	10.86
	2007/08	30790	19915	226404	11.37
	2008/09	32322	22482	253766	11.29
	2009/10	33898	22903	259191	11.3
	2010/11	35576	23607	263710	11.2
	2011/12	37565	24089	240793	10.00
B. Winter (Decidious)	2000/01	15696	10429	89502	8.58
	2001/02	16511	10653	91585	8.60
	2002/03	17123	10800	92985	8.61
	2003/04	17869	10983	94988	8.65
	2004/05	18500	11150	97208	8.72
	2005/06	19345	11336	96240	8.49
	2006/07	19891	11465	97716	8.52
	2007/08	20443	11659	99776	8.56
	2008/09	21620	12025	103103	8.57
	2009/10	22535	12573	107582	8.6
	2010/11	24058	14059	111882	8.0
	2011/12	26442	16087	130754	8.13
C. Summer (Tropical)	2000/01	37406	25846	276159	10.68
	2001/02	38603	26512	251108	9.47
	2002/03	39641	26905	286769	10.66
	2003/04	44040	29198	268408	9.19
	2004/05	44903	29593	298715	10.09
	2005/06	45898	30007	275135	9.17
	2006/07	47030	30298	305504	10.08
	2007/08	48866	31858	304383	9.55
	2008/09	49709	34278	329344	9.61
	2009/10	50889	35246	340199	9.7
	2010/11	58299	41518	418572	11.0
	2011/12	75315	61057	658207	10.78
D. Total (Fruits)	2000/01	73775	48166	487326	10.12
	2001/02	77537	49780	473621	9.51
	2002/03	80426	51016	518864	10.17
	2003/04	86707	54111	511406	9.45
	2004/05	89312	55348	552879	9.99
	2005/06	91923	56549	535449	9.47
	2006/07	94901	57595	575095	9.99
	2007/08	100099	63432	630563	9.94
	2008/09	103651	68785	686213	9.98
	2009/10	107322	70722	706972	10.00
	2010/11	117932	79184	794164	10.03
	2011/12	139321	101233	1029754	10.17

Source: FDD, 2068/69

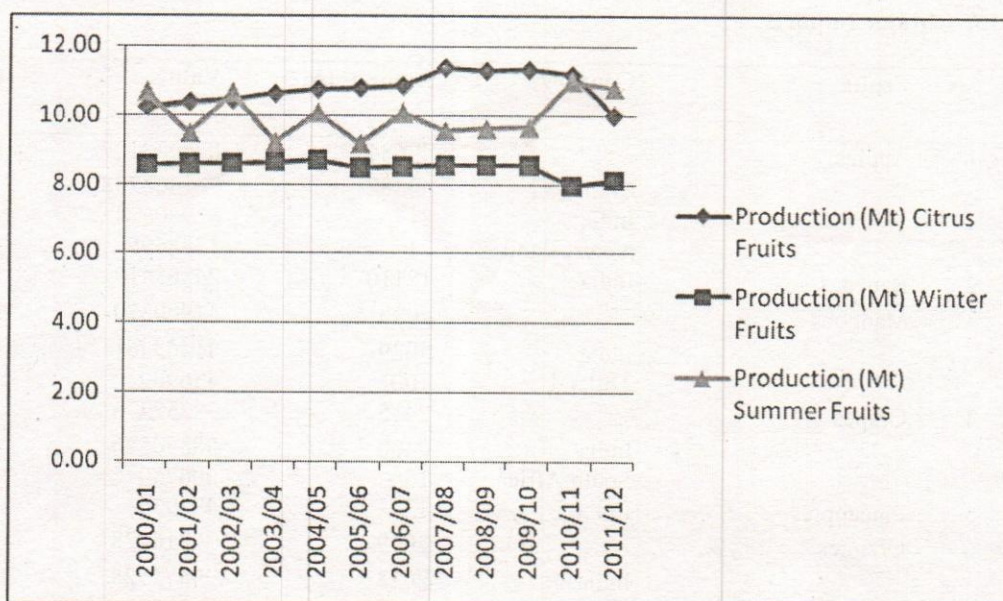
8. Area comparison of summer, winter and citrus fruits.



9. Productive Area (ha) with respect to Total Area (ha) covered by different fruits

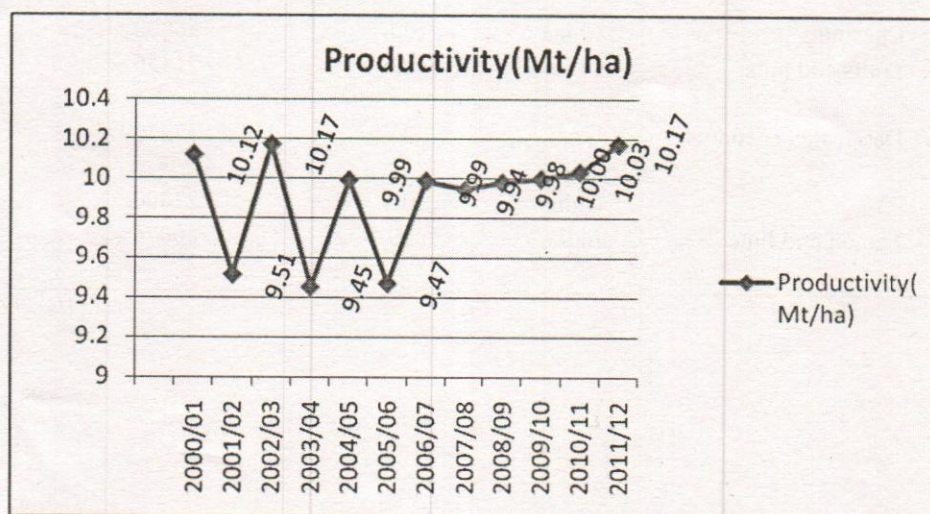


10. Productivity Comparison of Different Fruits



- The productivity of citrus seems increasing from 10 mt/ha (2000/01) to 11.37 (2007/08) then decreasing continuously i.e. 10 mt/ha (2011/12).
- Low level of productivity was noticed in winter fruits. The lowest (8mt/ha) was recorded in 2010/11 while the highest (8.72 mt/ha) was recorded in 2004/05 but the trend was some how linear.
- The most fluctuating trends of productivity was noticed in summer fruits in last 12 years. In the year (2011/12), the highest productivity i.e. 10.78 mt/ha was recorded in summer fruits followed by citrus (10 mt/ha).

11. Total Productivity Trends of Fruits (2000/01 to 2011/12)



- The total productivity of fruits was fluctuating very much in initial 7/8 years from 2000/01 (10.12 mt/ha) to 2007/08 (9.94 mt/ha) but then after it was recorded increasing in increasing rate i.e. 9.98 mt/ha (2008/09), 10 mt/ha (2009/10), 10.03mt/ha(2010/11) and 10.17mt/ha(2011/12).

12. Major Import and Export Scenario of Fruits in 2010/11(2067/68)

A. Major Imports

SN	Fruits	Country	Amount (Mt)	Value	Remarks
1	Apples		43684	876038107	I st
		China	40487	791468788	
		India	3176	82980624	
		Newzealand	21	1588695	
2	Bananas	India	12110	24805419	II nd
3	Mangoes		4030	41900370	III rd
		India	4029	41463461	
		Thiland	100	436909	
4	Grapes		2415	39237276	
		India	2400	38330526	
		South Africa	15	906750	
5	Pineapples	India	124	494934	
6	Oranges		2049	30316428	
		India	2023	29472528	
		Egypt	26	843900	
7	Lemon and lime	India	1340	24625924	
8	Papayas	India	1172	904240	
9	Strawberry	India	120	3467127	

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B. Major Exports

SN	Fruits	Country	Amount (Mt)	Value	Remarks
1	Almonds (shelled)	UAE	16.8	6010507	I st
2	Apples	India	283	4671797	II nd
3	Bananas	India	43	707000	III rd
4	Oranges	India	39	326497	
5	Chestnuts	China	0.8	56000	
6	Fruits and nuts	China	1.6	71456	
7	Dessicated coconuts	UAE	23.9	1724097	
8		China	0.4	22400	
9	Lemon and lime	India	10	80076	

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13. Prioritized Districts for Commercial Fruit Production in Nepal

Source: FDD, 2068/69

Fruits	Development Region	Potential Districts	Total
Citrus	Eastern	Taplejung, Panchthar, Terhathum, Sankhuwasabha, Dhankuta, Khotang, Bhojpur, Okhaldhunga, Udayapur, Solukhumbu and Illam (11)	42
	Central	Kabhre, Sindhuli, Dolkha, Dhading, Sindhupalchok, Ramechhap, Kathmandu, Lalitpur, Bhaktapur, Makawanpur, Nuwakot (11)	
	Western	Gorkha, Lamjung, Tanahun, Kaski, Syangja, Parbat, Baglung, Myagdi, Palpa, Gulmi, Arghakhanchi (11)	
	Mid-Western	Sallyan, Rolpa, Rukum, Dailekh, Pyuthan (5)	
Apple	Far-Western	Achham, Doti, Baitadi, Dadeldhura (4)	12
	Western	Mustang (1)	
	Mid-Western	Dolpa, Humla, Jumla, Mugu, Kalikot, Rolpa, Rukum (7)	
	Far-Western	Baitadi, Bajhang, Bajura, Darchula (4)	
Mango and Litchi	Eastern	Siraha, Saptari, Udaypur (3)	19
	Central	Mahottari, Sarlahi, Dhanusha, Bara, Parsa, Rautahat, Dhading (7)	
	Western	Nawalparasi, Kapilvastu, Rupendehi (3)	
	Mid-Western	Dang, Banke, Bardia, Surkhet (4)	
Coffee	Far-Western	Kailali, Kanchanpur (2)	10
	Central	Sindhupalchok, Lalitpur, Kavre (3)	
	Western	Lamjung, Tanahun, Syangja, Palpa, Gulmi, Arghakhanchi, Gorkha (7)	
Walnut	Western	Mustang (1)	10
	Mid-Western	Humla, Jumla, Dolpa, Mugu, Kalikot (5)	
	Far-Western	Baitadi, Bajhang, Bajura, Darchula (4)	
	Eastern	Morang, Saptari, Udaypur (3)	
Banana	Central	Sarlahi, Chitwan, Nuwakot (3)	12
	Western	Nawalparasi, Rupendehi (2)	
	Mid-Western	Banke, Bardia (2)	
	Far-Western	Kailali, Kanchanpur (2)	
Papaya	Central	Sarlahi, Chitwan, Nuwakot (3)	8
	Western	Nawalparasi, Gorkha (2)	
	Mid-Western	Banke, Dang (2)	
Pineapple	Far-Western	Kailali (1)	5
	Eastern	Morang, Udaypur (2)	
	Central	Chitwan, Nuwakot, Dhading (3)	
Pear	Eastern	Panchthar, Terathum, Dhankuta (3)	13
	Central	Kathmandu, Bhaktapur, Lalitpur, Kavre, Dhading and Makawanpur (6)	
	Western	Gorkha, Tanahun, Sangya, Palpa (4)	
Arecanut	Eastern	Jhapa, Morang and Sunsari (3)	3

Major Constraints to Fruit Development in Nepal

Despite bestowed with favourable geographic and climatic factors for growing varieties of fruits, fruit industry in Nepal is constrained by a number of factors that have limited the scope for its commercialization. Some of them are discussed here:

1. Bio-physical and Environmental Constraints:

- Vivid physiography and topography/ difficult terrain- rugged landscape,
- Monsoon rains during the period of fruit development and maturation,
- Uneven distribution of rainfall,
- Dry springs and winters,
- Spring frosts and winds,
- Hailstones during fruit development and ripening.

2. Infrastructural Constraints

- Inadequate transport network,
- Inadequate storage and processing facilities,
- Underdeveloped marketing channels,
- Lack of appropriate facilities to handle these perishables,
- Difficulties in transportation of inputs and farm produce in hilly areas.

3. Agronomic Constraints

- Low inherent fertility and lack of supplementary manures and fertilizers in fruit orchards,
- Lack of superior (genuine and desirable) planting materials,
- Incidence of economically important insects pests such as wooly aphids and sanjose scale of apple, stone weevil of mango, mites of litchi; and diseases like scab, powdery mildew and papery bark of apple, pear decline, peach leaf curl, greening CTV and phytophthora of citrus, anthracnose and malformation of mango, panama wilt of banana etc.,
- Insufficient and untimely availability of production inputs,
- Alternate bearing, unfruitfulness and fruit dropping in mango, apple and citrus,
- Long gestation period (5-10 years),
- Poor cultivation practices, neglected orchards.
- Inappropriate intercropping.

4. Technical Support Constraints

- Low priority to fruit research,
- Weak extension system,
- Lack of specialized technology and trainings,
- Inadequate trained manpower,
- Lack of awareness about comparative advantages of fruits compared to cereals,
- Poor allocation of fiscal resources,
- Inadequate information and reliable statistical data,
- Insufficient specialized technicians to meet the demand of technical support for newly emerging fruits,
- Poor quality control system.

5. Socio-Economic Constraints

- Social customs/culture retarding commercialization,
- Land tenure system,
- Small land holdings and poor economic status of farmers, risk aversion of the small holders,
- Fragmented and scattered land,
- Rapid growth of population and normal family separation decrease land size,
- Subsistant farming,
- Food habits and consumers ignorance,
- Traditional fear of food security.

6. Institutional Constraints

- Weak national horticultural network in terms of both research and development,
- Absence of apex institution (department) to deal in horticulture nationally and internationally,
- Weak and frequent change in organizational structure,
- Frequent transfer and inappropriate placement of farm staff,
- Lack of good governance, reward and punishment,
- Repair and maintenance of old farm structures and other physical facilities.

Future Needs/Way Forward

I. Policy Needs

- Priority to horticulture sub-sector in plan and in resource allocation for research and development,
- Change in the dilution of horticulture with the rhetoric cereal crops dominant century-old extension system of Nepal,
- Recognize horticulture at an equal footing with the livestock sector in terms of institutional development considering its contribution to AGDP,
- Concentration of commercial fruits and nuts production and processing industries in hills and high hills and grain production in the terai,

- Favorable and friendly policy with business plan to attract rural youth and private sector on horticulture and to minimize out-migration from hilly areas,
- Redefine the area of commercial orchard to receive the subsidies (at least 10 ropani),
- Formulation and enforcement of nursery act to produce quality planting materials. Plant protection act 2064 may not be enough for promoting horticultural nursery industry,
- Registration of nursery at Fruit Development Directorate in recommendation of the DADOs,
- Production of mother plants and saplings in screen house to be mandatory especially for citrus,
- Enforcement of internal quarantine and bud wood certification for producing healthy seedling/sapling of citrus,
- Policy to locate fruit trees on favorable sites rather than on marginal land,
- Horticulture farms/centers are living schools. Eliminate the wrong concept of privatizing them. Favourable policy for their rejuvenation in the form of campaign is an urgent need to make them real resource centres,
- Role of women as primary fruit producer, budders and grafters etc. to be considered,
- Emphasis on dry nuts and oily fruits in remote areas,
- Compensation for the uprooting of declined citrus trees,
- Review of the air transport of apple in subsidies, other venue of public interventions like subsidies in packaging materials and other post-harvest handling to be explored,
- Considering the long gestation period of fruits, soft loan and subsidies in import duties for horticultural tools, machineries and others,
- Policy reformation to compete with changed global scenario,
- Export-friendly policy based on types and quantity of market demand,
- Policy to attract private sector investment for the development of infrastructures related to fruit industries,
- Operation of abandoned/unused farms like Jaubari and their development in the form of resource centres.

II. Infrastructural Needs

- Consider the concept of agric. road from national perspective, not from the local one. Prioritize constructing agri-roads to connect market with area already developed as fruit pocket or areas with commercial fruit production potential,
- Likewise, develop irrigation, electrification and communication facilities in above said areas,
- Development of collection centers in the main fruit production areas, and wholesale and retail markets in the major consumption centers,
- Establishment of wholesale market and multi chambered cold storage at the strategic points in urban centers and their handover to the local municipality for smooth functioning,
- Encourage private sectors in the establishment of domestic medium and large scale fruit processing/preservation industries in appropriate location,
- Establishment of fruit based distilleries to provide market for low quality fruits at local level,
- Project formulation and outsourcing for the repair, maintenance and rejuvenation of farm infrastructures.

III. Educational Needs

- Exercise on forecasting development and utilization of human resource for horticulture sub-sector,
- Higher degree courses in recently established agriculture and forestry university and other academic institutions emphasizing on newly emerging fruits with export potentials in changed context,
- Revision of curricula to meet the global needs and to develop entrepreneurship,
- Internship of horticulture graduates on horticulture farms/centers to further acquire practical skill and knowledge for certain period before awarding the degree,
- Invitation to the experienced experts involved in horticultural research and development as guest resource person by the academic institutions for sharing experiences and latest advances made,
- Launching education, research and extension (ERE) also on horticultural crops including fruits by the AFU and other academic institutions as mandatory.

IV. Research Needs

- Priority in fruit research to improve the situation of low priority accorded till now,
- Identification of production pockets and baseline survey on fruits for authentic and reliable data and improvement in their processing and reporting,
- Germplasm collection, evaluation and maintenance, and technology generation to exploit the indigenous/underutilized fruits in suitable horticulture farms in different agro-ecological zones. Some examples of such fruits could be: Amala- *Emblia officinalis*, Bel-Aegle *marmelos*, Chiuri-

Basia butyacea, *Imali-Tamarindus indica*, *Kafal-Myrica esculanta*, *Kimbu-Morus indica*, *Lapsi-Chorospondias axillaris*, *Mayal-Pyrus parshia*, *Tiju-Diospyrus spp.*

- Conducting farmers' problem based adoptive/applied/collaborative fruit research activities also in appropriate horticulture farms under DoA in collaboration with NARC,
- Launching reasearch and development works on oily fruits like olive and nut fruits without further delay,
- Collection, evaluation and maintenance of exotic fruit varieties in government farms/centers as mother plants both for scions and rootstocks,
- Gradual replacement of low yielding traditional fruit varieties by planting newer ones,
- Gradual involvement of private sector in expanding the base of fruit research,
- Fruit research is not only the responsibility of Horticulture Division of NARC. Other technical divisions eg. Plant Pathology, Entomology, etc., under NARC are to be encouraged to carry out research on related problems of fruit crops,
- As a whole, systematic research on fruits is urgent and should cover,
 - Germplasm collection
 - Varietal evaluation
 - Plant protection
 - Orchard management and
 - Post harvest management

V. Extension Needs

It is widely acknowledged that the transfer of technology and available knowledge to fruit growers is very insufficients in Nepal. Cosidering this reality the following points are suggested to carry out immediately,

- Development and utilization of trained manpower on fruits and trained and utilized VLAW on local paid basis
- Development of horticulture farms/centers as living school and master resource centers including training venue for relevant fruits,
- Effective delivery of technical services on fruits by the farms under NARC to its own command area and outreach sites respectively,
- Horticulture extension to be more closely linked to research,
- Campaign for compulsory rejuvenation of old orchard involving local bodies and VLAW,
- The complementation of extension activities along with timely arrangement of the following is needed,
 - Quality planting materials,
 - Compulsory establishment of at least one fruit nursery in each fruit pocket,
 - Pollinators and pollinizers in the orchard nursery in each fruit pocket,
 - Organic and inorganic manures along with SSM-Practices,
 - Appropriate pesticides for plant protection with emphasis on IPM ,
 - Horti-tools and equipments and reliable irrigation water,
 - Easy arragement of credit needs,
 - Information about each step of fruit value chain.

VI. Institutional Needs

- Considering the tremendous scope and potential of horticultural crops to accelerate nation's economic growth, horticulture sector needs independent growth and development at its own course. To develop this sector, it needs to have its own independent organization. Therefore, a full fledged 'Department of Horticulture' to carryout all horticultural development related activities must be created as soon as possible,
- Likewise, the DoH be accompanied by all other necessary units in changed context of globalization,
- Management of other institutional constraints mentioned above maintaining good governance in horticulture sub sector as a whole.

CONCLUSION

In the past, fruit development plans and programs were no doubt formulated and implemented using internal as well as external resources to harness the potential for fruit development as offered by the resource endowments of the country, but these efforts seem to have coordination problems among the concerned agencies. The instabilities and uncertainties in the part of leading organization responsible for coordination also brought great setbacks and caused the horticulture sector to lag far behind compared to other sectors. Neither post harvest

aspects of fruit industry including storage, processing and marketing received attention nor the private sector could be attracted towards it. Considering all these realities the complementary roles of all the actors/stakeholders involved in the value chain should go hand in hand to maximize the impact and to move the fruit industry smoothly, effectively and competitively ahead in the changed global context.

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