Contribution of Horticulture Sector in National Economy

M.B. Thapa[1*], H.B. KC[2], G.D. Subedi[3], S. Dhimal[4] and R.K. Regmi[5]

Former Deputy Director General, Department of Agriculture, Lalitpur

[2] Chief, National Centre for Potato, Vegetable and Spice Crops Development, Lalitpur

[3] Senior Scientist, Horticulture Research Division, Khumaltar, Lalitpur

[4] Horticulture Development Officer, Spice Crops Development Center, Panchkhal, Kavre

[5] Senior Statistics Officer, Ministry of Agriculture and Livestock Development, Kathmandu

*Corresponding email: mbthapa2009@gmail.com

Abstract

Agriculture sector generates about 60% employment in the country, the major part of which is coming from horticulture sub-sector. It contributes 27.6% in national GDP where horticulture is the major part of it contributing 9.68%. Diverse and unique agro-climatic zones of Nepal offer an immense opportunity for cultivation of different fruits, vegetables, spices, flowers and plantation crops. Horticulture sub-sector shares 38.59% in AGDP, the major share is coming from vegetable (20.48%), potato (10.51%), fruits (5.13%) and spice crops (2.37%). After establishment of Department of Horticulture in 1960, several horticulture farms/stations were established at different agro-ecological domains in Nepal. Since then, research and extension programs on horticultural crops were lunched effectively that has brought the momentum throughout the nation. Most of the horticultural commodities are high value commodities, and are commercialized, thus these are the important source of income to Nepalese farmers. Due to inadequate marketing infra-structure and technical know-how; horticulture development could not gain momentum as anticipated although suitable pockets for production of fruits, vegetables and other high value commodities have been identified. Nepalese farmers cannot afford commercial farming, marketing and processing aspects due to poor economic condition although they know the comparative advantages and diversified products of horticultural crops. Present situation revealed that the government of Nepal has to increase investment on research, extension, and education in the horticulture field to raise the contribution of this sector.

Keywords: *Horticulture, GDP, high value commodities, commercial production, marketing.*

1. Background

The unique agro-ecological zones of Nepal favored by altitudes and topography offer an immense opportunity for growing different types of fruits, vegetables, flowers, spices and plantation crops. Nepal is the land of wonder with agro-climatic variability. Almost all types of world climate and a wide range of bio-diversity exist in Nepal due to which wild plants of mandarin in Mangtewa, custard

apple in Dhankuta in the east while *Amla* plants in Jasbire way to Indrawati, wild citron in mid hill of central part and wild olive plants are found in Humla and Kalikot, the western part of Nepal. Likewise, Broad Leaf Mustard (Rayo), Pyuthane Radish, Pumpkin, Colocasia, Yams, Large Cardamom and some species of orchid flowers are native to Nepal. Three distinct seasons experienced in Nepal: hot and dry season from March to mid-June, wet summer from mid-June to September, and dry and cold season from October to February offer varieties of agricultural production feasible and due to the narrow span of settlement, fresh products can flow easily thereby supporting produce in domestic market. Although there is huge potentialities, horticulture was limited to growing indigenous fruits and vegetables before 1950 in the private sector, while collection and growing of fancy plants existed in the palaces of Rana Prime Ministers and their families. After establishment of Department of Horticulture in 1960, several horticulture farms/stations were established at different agro-ecological domains. Since then, research and extension programs on horticultural crops were lunched effectively that has brought the momentum throughout the nation. Most of the horticultural commodities are high value commodities, and are commercialized, thus these are the important source of income as well as important nutrition contributor.

Based on the latest population census, about 60% of the people are engaged in agriculture occupation and horticulture holds dominance. Though agriculture share in national GDP is gradually declining over the years, yet it is the highest contributing sector. Based on fiscal year 2017/18's estimates, agriculture sector bears 27.6% in national value addition out of which horticulture alone contributes 9.7%. Among the major sub-sector in horticulture, the major share is coming from vegetable sector (20.48%), potato (10.51%), fruits (5.13%) and 2.37% from spice crops. The present situation revealed that Nepalese farmers are unable to invest in machineries and others to translate this sector as a financially beneficial. Likewise, weak affordability hinders to improve processing and better linkages to markets. Addressing these constrains, can be instrumental to raise the level of production significantly much than current one.

2. Production Status of Horticultural Crops

Vegetables

Basic vegetable production status over the last 20 years in Nepal is presented in Table 1. Area, production, and productivity show rising trend. Area has increased by about 85% from 149,979 in 1997-98 to 277,393 hectares in 2016-17 whereas the production has increased by about 159% from 1,449,472 mt in 1997-98 to 3,749,802 mt in 2016-17. Likewise, productivity has remarkably improved from 9.66 mt per hectare in 1997/98 to 13.52 mt per hectare in 2016-17.

Table No. 1: Area, Production and Productivity of Vegetables in Nepal

Year	Area (ha)	Production (mt)	Productivity (mt/ha)
1997/98	149979	1449472	9.66
2002/03	165988	1799973	10.84
2007/08	208108	2538904	12.20
2012/13	246392	3301684	13.40
2016/17	277393	3749802	13.52

Source: MOALD, 2018

Fruits

Table 2 show that during the last 15 years, productive area of fruits has increased by about 117% from 51,016 in 2002-03 to 110,502 ha in 2016-17 whereas the production has gone up by about 96% from 518,864 mt in 2002-03 to 1,018,307 mt in 2016-17.

Table No. 2: Area, Production and Productivity of Fruits in Nepal

Year	Total area (ha)	Productive area (ha)	Production (mt)	Productivity (mt/ha)
2002/03	80426	51016	518864	10.17
2006/07	94901	57595	575095	9.99
2010/11	117932	79184	794164	10.03
2014/15	150387	110802	992703	8.96
2016/17	162660	110502	1018307	9.22

Source: MOALD, 2018

Potatoes

Table 3 shows area, production, and corresponding productivity of potato in Nepal during the past 20 years. Data revealed that area went up about 60 percent from 116,290 in 1997-98 to 185,879 ha in 2016-17 whereas the production has increased by about 167% from 971,680 mt in 1997-98 to 2,591,686 mt in 2016-17.

Table No. 3: Area, Production and Productivity of Potatoes in Nepal

Year	Area (ha)	Production (mt)	Productivity (mt/ha)
1997/98	116290	971680	8.36
2002/03	140171	1531315	10.92
2007/08	156737	2054817	13.11
2012/13	197234	2690421	13.64
2016/17	185879	2591686	13.94

Source: MOALD, 2018

Spices

During last decades, area of spices has increased by about 73% from 38,980 in 2007-08 to 67,300 ha in 2016-17 whereas the production has increased by about 95% from 243,210 mt in 2007-08 to 474,000 mt in 2016-17 as shown in table 04.

Table No. 4: Area, Production and Productivity of Spices in Nepal

Year	Area (ha)	Production (mt)	Productivity (mt/ha)
2007/08	38,980	243,210	6.24
2010/11	47,867	323,870	6.77
2013/14	57,639	429,709	7.46
2014/15	58,960	404,420	6.86
2016/17	67,300	474,000	7.04

Source: MOALD, 2018

Tea

During the last 5 years, area of tea has increased by about 50% from 19,036 in 2012-13 to 28,522 ha in 2016-17 whereas the production has increased by about 20% from 20,588 mt in 2012-13 to 24,653 mt in 2016-17 as shown in table 05 and fig. 05.

Table No. 5: Area, Production and Productivity of Tea in Nepal

Year	Area (ha)	Production (mt)	Productivity (mt/ha)
2012/13	19036	20588	1.08
2013/14	19271	21394	1.11
2014/15	19509	22232	1.14
2015/16	20747	23821	1.15
2016/17	28522	24653	0.86

Source: MOALD, 2018

Coffee

During the last 5 years, area of coffee has increased by about 51% from 1,750 in 2012-13 to 2,646 ha in 2016-17 whereas the production (green beans) has increased by about 27% from 366 mt in 2012-13 to 466 mt in 2016-17 as shown in table 6.

Table No. 6: Area, Production and Productivity of Coffee (Green Beans) in Nepal

Year	Area (ha)	Production (mt)	Productivity (mt/ha)
2012/13	1750	366	0.21
2013/14	1911	429	0.22
2014/15	2381	464	0.19
2015/16	2618	532	0.20
2016/17	2646	466	0.18

Source: MOALD, 2018

Flowers

During the last five years, area of flower has increased by about 12% from 137 in 2012-13 to 153 ha in 2016-17 whereas the production has increased by about 22% from 115,570 thousand pieces in 2012-13 to 141,539 thousand pieces in 2016-17 (MoAILD 2017) as shown in table 07.

Table No. 7: Area, Production and Productivity of Flowers in Nepal

Year	Area (ha)	Production ('000 Pcs.)	Productivity ('000 Pcs./ha)
2012/13	137	115570	843.58
2013/14	141	127750	906.03
2014/15	147	134138	912.50
2015/16	148	136116	919.70
2016/17	153	141539	925.09

Source: MOALD, 2018

3. Strength of Horticultural Crops

Export and Import Scenario of Vegetables

Table 08 and 09 demonstrate trade status of vegetables in the last three years. Amongst the exported vegetables category in three years, share of fresh and dried vegetables is high in comparison to potatoes by values. Similarly, among the imported vegetables category, share of fresh vegetables and potatoes is high by volume. The export and import of dried vegetables has been increased significantly by volume and values in this period. In comparison to 2014-15, the export of vegetables has been decreased by 39% by volume but increased by 300% by values while import of vegetables has been increased by 17% and 35% by volume and values, respectively.

Table No. 8: Export of Vegetables

Vegetables	2014/15		2015/16		2016/17	
	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)
Fresh Vegetables	18174	182121	13650	131784	5717	75699
Dried Vegetables	50	60697	2521	469806	6730	1052927
Potatoes	2426	39945	309	6102	119	2074
Total	**20650**	**282763**	**16481**	**607692**	**12565**	**1130700**

Source: MOALD, 2016-2018

Table No. 9: Import of Vegetables

Vegetables	2014/15		2015/16		2016/17	
	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)
Fresh Vegetables	151848	4065784	143166	3679926	169159	4582429
Dried Vegetables	55768	3311806	51723	3670014	100044	6788731
Potatoes	241719	5127904	219098	4704700	256149	5507690
Total	**449335**	**12505495**	**413987**	**12054640**	**525352**	**16878850**

Source: MOALD, 2016-2018

Export and Import Scenario of Fruits

Table 10 and 11 illustrate the situation of fruit trade in three years. Among the exported fruit category, the share of summer fruit and citrus fruit are high in comparison to winter fruit by volume and values except in the year 2015-16 where winter fruit share 36% and 7% by volume and values. However, in import, summer fruit and winter fruit share much more than citrus fruit by volume and values. In

terms of volume and values, the export of fruit has been decreased by almost 100 percent while import of fruit has been increased by 4% and 7% respectively in comparison to 2014-15 (MoALD 2016).

Table No. 10: Export of Fruits

Fruits	2014/15		2015/16		2016/17	
	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)
Summer fruits	15824	2841629	991	170639	84	6991
Citrus Fruits	452	5273	19	1097	830	16995
Winter Fruits	146	3502	577	13657	27	5205
Total	**16422**	**2850404**	**1588**	**185393**	**940**	**29191**

Source: MOALD, 2016-2018

Table No. 11: Import of Fruits

Fruits	2014/15		2015/16		2016/17	
	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)
Summer fruits	110765	6879595	72261	3927867	73788	3672570
Citrus Fruits	30242	1406894	27994	1321125	29456	1370177
Winter Fruits	48151	2243149	90724	5570237	93029	6196588
Total	**189158**	**10529639**	**190979**	**10819229**	**196273**	**11239336**

Source: MOALD, 2016-2018

Export and Import Scenario of Spices

Table 12 and 13 explains the trade status of major and other spices in three years. In comparison to 2014-155, the export of spices has been decreased by 66% (mostly that of ginger) and 4% by volume and values respectively while import of spices has been increased by 36% and 72% by volume and values respectively. Among the category of five major spices, share of ginger is 79%, 76% and 41% followed by large cardamom (9%, 9% and 32%) by volume while by values big cardamom covered 84%, 82% and 89% followed by ginger (10%, 11% and 5%) in total export. The export item of other spices are cinnamon, fenugreek, coriander, pepper, nutmeg, small cardamom, cumin and saffron of which cinnamon stand third in position by volume and values. Similarly, in total import, share of garlic is the most i.e. 28%, 25% and 15% followed by pepper, cumin, coriander and chilies by volume while by values pepper stand the first followed by cumin, garlic, coriander and chilies. The import item of other spices are cinnamon, fenugreek, coriander, pepper, nutmeg, small cardamom, cumin, saffron, cloves, fennel, and vanilla. In total export and import of spices there is trade surplus in large cardamom (Approx. 100%) and ginger (>60%).

Table No. 12: Export of Spices in volume (mt) and value (NRs.'000)						
Fruits	**2014/15**		**2015/16**		**2016/17**	
	Volume	**Values**	**Volume**	**Values**	**Volume**	**Values**
Large Cardamom	2930	3839811	3438	4614612	3457	3905034
Ginger	24549	464921	28347	642823	4385	241750
Garlic	287	23431	2071	133784	1.11	584
Turmeric	4.26	690	9.24	6568	28.52	8513
Chilies	24.16	5290	2.28	88	4.04	645
Other spices	3344	239779	3426	262355	2849	250842
Total	**31139**	**4573922**	**37294**	**5660230**	**10724**	**4407368**

Source: MOALD, 2016-2018

Table No. 13: Import of Spices volume (mt) and value (NRs.'000)						
Fruits	**2014/15**		**2015/16**		**2016/17**	
	Volume	**Values**	**Volume**	**Values**	**Volume**	**Values**
Large Cardamom	11	8599	8	4137	0.71	452
Ginger	248	86951	3907	329824	1989	159792
Garlic	8440	599134	9431	706066	6277	768026
Turmeric	379	50806	453	65845	1368	169760
Chilies	5666	625237	1152	14072	1710	21287
Other spices	15487	3348448	23160	4751981	29891	6974568
Total	**30231**	**4719175**	**38112**	**5871925**	**41234**	**8093885**

Source: MOALD, 2016-2018

Export and Import Scenario of Coffee

Nepal exports green beans coffee whereas coffee powder is imported in the country. In the export and import point of view the share of both types of coffee is almost same by volume while by the values green beans coffee covers more than 60% in export in comparison to import of general coffee according to the table 14 listed below which is a sign of encouragement in the coffee sub-sector.

Table No. 14: Export and import scenario of Coffee volume (mt) and values (NRs. '000).						
Description	**2014/15**		**2015/16**		**2016/17**	
	Volume	**Values**	**Volume**	**Values**	**Volume**	**Values**
Export	100	99304	111	107901	95	84539
Import	111	56456	105	55541	99	50402

Source: MOALD, 2016-2018

Export and Import Scenario of Tea

Table 15 shows the export and import status of tea in three years. In comparison to 2014-15 (MoALD 2016), the export of tea has been increased by 7% and 26% by volume and values respectively while import of tea has been decreased by 3% by volume and values respectively. Tea is being exported and imported in two categories i.e. black tea and green tea. As far as trade balance is concerned, there is a trade surplus in black tea (above 95 percent in volume and values) and in green tea (above 90 percent in volume and values). The export of tea by volume and values is more than the import which reflects the positive sign for the development of tea sub-sector.

Table No. 15: Export and import scenario of Tea volume (mt) and values (NRs. '000)

Description	2014/15		2015/16		2016/17	
	Volume	Values	Volume	Values	Volume	Values
Black Tea export	11120	1993530	13134	2328197	11756	2463565
Green Tea export	22	13347	153	70768	110	70320
Total export	**11142**	**2006877**	**13287**	**2398965**	**11867**	**2533885**
Black Tea import	374	92761	289	64413	350	83494
Green Tea import	2	1002	15	3579	13	7155
Total import	**376**	**93763**	**303**	**67992**	**363**	**90648**

Source: MOALD, 2016-2018

Export and Import Scenario of Flowers

Table 16 shows trade status in the last three years. Among the exported flower category in three years, share of live plants is kept about 91%, 12% and 52% followed by cut flowers 9%, 88% and 48% respectively taken volume as measure. The same when considered in terms of values; live plants cover 80%, 95% and 91% followed by cut flowers 20%, 5% and 9% respectively. On the other hand, regarding import, share of live plants are 77%, 65% and 73% followed by cut flowers 23%, 35% and 27% by volume while by values live plants cover 93%, 75% and 82% followed by cut flowers 7%, 25% and 18%. In terms of volume and values, the export of flowers has been increased by 35% and 36% while import of flowers has been decreased by 5% and 4% respectively in comparison to 2014-15 (MoALD 2016).

Table No. 16: Export and import scenario of flowers

Flowers	2014/15		2015/16		2016/17	
	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)	Volume (mt)	Values (NRs. '000)
Live plants export	62530	2023	16228	12170	48400	3137
Cut flowers export	6112	517	124643	679	44139	324
Total export	**68642**	**2540**	**140871**	**12849**	**92539**	**3461**
Live Plants import	1939920	93098	1287284	44067	1740106	79403
Cut flowers import	579418	7352	686626	14738	655961	17306
Total import	**2519338**	**100450**	**1973910**	**58805**	**2396067**	**96709**

Source: MOALD, 2016-2018

4. Processing Business in Horticultural Sector

Processing of fruits, vegetables, potatoes, spices, tea, coffee and even flowers has been done for a long time. According to the Department of Cottage and Small Industries (DOCSI) there are 354 horticulture-based companies/firms registered up to 2018 (Table 20) whereas 119 firms have been registered under different offices and in total there are 473 processing firms are functioning in the country. Among 473 companies, according to the Department of Food Technology and Quality Control (DFTQC), 252 companies have been processing fruits and vegetables, 188 spices and remaining 33 teas and coffee (Table 17).

Table No. 17: Registered Horticulture-based Companies/Firms in Nepal

Districts	No. of Companies	Districts	No. of Companies
Syangja, Bhojpur, Parsa, Baglung, Kailali, Banke, Ramechhap, Gulmi, Terhathum, Palpa, Taplejung, Dadeldhura, Bajura (1 each)	13	Dhankuta	10
Rupandehi	2	Kaski	15
Solukhumbu, Nawalparasi, Dhading, Sindhuli, Tanahun, Lamjung (3 Each)	18	Ilam	20
Panchthar, Sunsari (4 Each)	8	Kavre	26
Bhaktpur, Gorkha (5 Each)	10	Jhapa	46
Makwanpur	6	Lalitpur	62
Morang, Chitwan (7 Each)	14	Kathmandu	96
Nuwakot	8	Nepal	354

Source: DOCSI, 2018

The processed products of fruits are lapsi candy, orange squash, jam, jelly, juice, canned lapsi, canned pear, canned pineapple, *kimchi achar, chuk amilo*, non-dairy whitener etc. Likewise, processed products of vegetables including potatoes are pickles, *maseura, pau,* tomato sauce, tomato ketchup, potato chips, wafer, *sisno* powder, moringa powder etc. Similarly, processed products of spices are powder of turmeric, chilly, cumin, coriander pepper, ginger and paste of garlic and ginger, ginger candy, mixed condiments etc. In the same way the processed products of tea are black and green tea whereas the processed products of coffee are green and roasted beans. The major categories of investment are in processing of tea, coffee, ginger, turmeric, cardamom, fruits and vegetables, cold storages, organic farming, etc (Table 18).

According to the DOCSI, total capital around NRs. 14 billion have been recorded in small to medium size processing companies/firms as far as the investment is concerned where fixed capital is around 13 billion and working capital is around 1 billion which has ultimately generated 28,595 employments in this field (Table 19).

Table No. 18: Commodity wise processing firms in Nepal				
Districts	Numbers of Companies/Firms			
	Fruits and Vegetables	Spices	Tea and Coffee	Total
Kathmandu	150	128	23	301
Lalitpur	48	30	9	87
Bhaktapur	22	17	-	39
Ramechhap	10	9	-	19
Kavre	6	-	-	6
Bara	4	-	-	4
Sindhupalchowk	3	-	-	3
Other districts	9	4	1	14
Total	**252**	**188**	**33**	**473**

Source: DFTQC, 2018

Table No. 19: Investment in small and medium size companies/firms (in NRs.)					
Total Number	Total Capital	Fixed Capital	Working Capital	Employment	Scale
354	14,366,205,885	13,191,069,022	1,293,136,863	28,595	Small to medium

Source: DOCSI, 2018

5. Share of Horticulture Commodities in National AGDP

Table 20 shows the share of horticulture commodities (vegetables, fruits, potatoes, spices, tea and coffee) in national AGDP in various fiscal years. It makes clear that amongst horticulture commodities, vegetables' share is the foremost. Thereafter, potatoes come in the second place followed by fruits, spices, tea and coffee in the third, fourth and fifth place respectively.

According to the data, in comparison to the year 2008/09 in the year 2017/18, the sharing of vegetables, potatoes, spices has been increased by 19.21%, 36.85% and 8.72% respectively whereas sharing of fruits has been decreased by 11.70% and as far as tea and coffee are concerned their sharing remain the same. Such kind of situation states that much more steps to be taken forward for flourishing the fruits, tea and coffee sub-sector.

Table No. 20: Share of Horticulture Commodities in AGDP						
Fiscal Years	Vegetable	Fruits	Potato	Spices	Tea and Coffee	Total
2008/09	17.18	5.81	7.68	2.18	0.10	32.95
2009/10	19.96	6.87	9.48	2.95	0.07	39.33
2010/11	19.09	7.45	10.12	3.99	0.07	40.72
2011/12	19.43	6.26	9.89	2.80	0.08	38.46
2012/13	19.48	5.70	10.35	2.77	0.08	38.38
2013/14	18.81	5.34	10.16	2.85	0.08	37.24

2014/15	18.86	5.30	9.52	3.02	0.09	36.79
2015/16	19.45	5.38	9.69	2.83	0.10	37.45
2016/17	19.44	5.26	8.63	2.53	0.10	35.96
2017/18	20.48	5.13	10.51	2.37	0.10	38.59

Source: MOALD, 2017/18

6. Nutritional Aspect of Fruits, Nuts and Vegetables on Human Health

Fruits, nuts and vegetables are rich source of dietary fiber, vitamins, minerals, especially electrolytes; and more recently phyto-chemicals especially antioxidants. Various reviews have indicated that low intake of fruits and vegetables are associated with chronic diseases such as cardiovascular diseases, blood pressure, hypercholesterolemia, osteoporosis, many cancers, chronic obstructive pulmonary diseases, respiratory problems as well as mental health. Despite an increasing focus on the health benefits of fruits, nuts and vegetables; their consumption in most of the developing countries is below the recommended intake (400 g/day/person). Fruits, nuts, and vegetables play a significant role in human nutrition, especially as sources of vitamins (A, C, E, B6, thiamine, niacin), minerals, and dietary fiber. Nuts are a good source of essential fatty acids, fibre, vitamin E, and minerals (Table 21). Other important nutrients supplied by fruits and vegetables include folacin, riboflavin, zinc, calcium, potassium, and phosphorus.

USDA Dietary Guidelines (USDA, 2000) has encouraged consumers to enjoy five servings a day, i.e., eat at least 2 servings of fruits and at least three servings of vegetables each day; choose a variety of colors and kinds; choose dark green leafy vegetables, orange fruits and vegetables, dry beans and peas.

Table No. 21: Positive Impact of Fruits and Vegetables on Human Health

Constituents		Sources	Impacted human diseases
Antioxidants	Vitamin C	Broccoli, cabbage, cantaloupe, citrus fruits, guava, kiwi fruit, leafy greens, pepper, pineapple, potato, strawberry, tomato	Cancer, cataracts, heart disease, stroke
	Vitamin A (Carotenoids)	Dark green vegetables (collards, spinach and turnip greens), orange vegetables (carrots, pumpkin and sweet potato), orange colored flesh fruits (apricot, cantaloupe, mango, nectarine, orange, papaya, peach, persimmon, pineapple), tomato	
	Vitamin E	Nuts (Almonds, cashew nuts, filberts, macadamias, pecans, pistachios, walnuts)	
	Flavonoids	Red, blue and purple colored fruits (apple, blackberry, blueberry, cranberry, grape, nectarine, peach, plum and prune, pomegranate, raspberry, strawberry)	
Fibre		Most fresh fruits and vegetables, nuts, dry beans and peas	Diabetes, heart disease

Folate	Dark green leafy vegetables (spinach, mustard greens, lettuce), legumes (dry beans, peas, green peas), oranges	Birth defects, heart disease, cancer
Potassium	Potato, sweet potato, banana, plantain, dry beans, green peas, dried fruits (apricots, prunes), squash	Hypertension, stroke

Source: USDA, 2000

7. Way Forward

The national economy can be increased by manifolds with the contribution of horticulture sector if the public and private sectors focus on following recommendations:

Sustainable Commercial Production:

- Increase production by area expansion through leasehold farming and land consolidation
- Develop hybrid varieties in public and private sectors to distribute quality seed and saplings in commercial production areas
- Immediate release of pipeline varieties of horticulture crops for commercial production
- Use degraded forest, public and abandoned land to horticulture sector to retain youth migration, revive hill horticulture and carbon sequestration purposes
- Encourage tissue culture sapling production of horticulture crops especially cardamom and citrus
- Develop and disseminate the cost effective and user friendly high density plantation technology especially in apple, citrus and mango
- Provide subsidies or soft loan for commercial farming of horticultural crops and to clear-out declined orchard or rejuvenate them
- Bud wood certification, nursery management and orchard management practices should be followed strictly by three levels of government to control citrus decline
- Promote protected horticulture development technology for producing vegetable seedlings / fruit saplings and year round production and supply of vegetables
- Encourage the production of orthodox tea and specialty coffee for export purpose.

Strengthen Resource Centres:

- Revise the functions of horticulture farm/centres whether they belong to Nepal Agricultural Research Council or Depatment of Agriculture; allow them to carryout research, varietal maintenance and all stages of seed and saplings production and develop them as the centre of excellence
- Establish indigenous germplasm maintenance block as well as demonstration site in the farm to demonstrate production technology
- Develop resource centres as a practical training centre for field level technicians, seed producers, orchard owners, nurserymen to transfer modern production and post-harvest technology
- Start collaborative research between government institutions and private sectors to solve some pertaining issues overlooked by government researchers

Human Resource Management:

- Develop experts' team consisting of horticulture, plant protection, soil and crop nutrition, post-harvest and marketing specialist in farm/centres and provide expert services at province, municipality and rural municipality level
- Keep B.Sc. Ag or B. Sc. horticulture expert in municipality and rural municipality with assured link to research, outreach and training institutions
- Develop and manage horticulture technicians at ward level to run horticulture resource centre and sell imbedded service to the clients in commercial pockets
- Provide on the job scholarship to the technicians of farm/centres to continue their higher studies on specific horticultural crops to develop expertise and retain for longer period

Support to Infrastructural Development:

- Support to the infrastructure for quality planting material production and post-harvest handling
- Establish modern processing plant, big storage house, pack house, ware house and seed laboratory facilities at provincial level
- Establish accredited laboratory facilities of international standard for export purposes
- Develop well equipped research centres and export production zones based on selected commodity and declare horticulture crop zones
- A well-equipped scientific lab for testing of products should be installed at various suitable places in order to confirm to the set norms and entrance quality of product
- Efforts should also be made to get accreditation from internationally recognized certification agencies like NASA to undertake certification jobs in Nepal itself

Post-harvest Management:

- Minimize postharvest losses through development and dissemination of appropriate postharvest handling technologies on harvesting, packaging, transportation and storage (Thapa and Dhimal 2017)
- Establish big storage houses in market sites with the facilities of cleaning, grading, sorting, fumigation, waxing and other packing house operations to increase export quality of the horticultural products
- Establish packing houses in production sites for pre-cooling, cleaning, sorting, trimming, grading, dis-infestation, colouring, waxing, fumigations and packaging purpose
- Establish controlled atmospheric storage facilities in the production sites and establish cold chain facilities for transportation of horticultural commodities
- Establish and maintain processing plants for value addition in horticultural crops
- Establish distilleries and small processing units in production zones which enhances production and support to utilize low quality horticultural crops

Market Management:

- Develop market infrastructure in pocket areas and market centres
- Develop and disseminate price information system
- Inform the demand and supply status of market to the producers through proper information channel
- Promote contract farming with proper market linkages to farmers
- Address the value chain issues of horticulture crops with holistic and participatory approach

Export Promotion:

- Produce safe, hygienic and nutritious fruits and vegetables of seasonal niches to fulfil the demand of developed countries especially targeting aging population
- Strengthen the bilateral negotiation efforts for the export of horticultural crops (Thapa and Dhimal 2017)
- Tariff exemption for high value commodities of planting, processing, packaging materials, machineries and other allied equipment
- Review and improve current quality standards for export markets and the compliance manual for the implementation of the quality standard

Quality and Safety Assurance:

- Develop horticulture crops standard at the equal level of SAARC countries (India, Bangladesh and Sri-Lanka) and other developed countries
- Enforce quality assurance and management systems which include GAP, GMP, HACCP, segregation, identity preservation, and traceability among other tools
- Harmonize national food quality systems with international standards
- Exercise sanitary and phyto-sanitary standard (SPS) measures (Thapa and Dhimal 2017)
- Follow the proper quarantine system of bud-wood certification especially production of fruit saplings in public and private sector
- Develop and implement horticultural programs through value chain approach

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