Identifying the Trade Deficit Reduction Strategies in Fresh Vegetables in Nepal

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Sincerely yours,
Rupesh Tha,
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Abstract

Nepal is a fundamentally agrarian nation, with agricultural production serving as one of the pillars of the economy. Fresh vegetables are perhaps the most significant sector among Nepalese's agricultural pursuits, in terms of providing an honourable livelihood to millions of Nepalese farmers, ensuring household food security. Moreover, as certain crops offer high economic returns per hectare of land, the fresh vegetable sector has the potential to improve the economic conditions of producers, particularly small scale producers. Considering the labour-intensive nature of vegetable production, the sector can also provide gainful employment to young men and women and reduce the trade deficit in fresh vegetables while contributing to poverty alleviation.

Nepal is always presented as an agricultural country where agriculture is taken as the people's main occupation. However, the growing dependency on other countries for agricultural products, as painted by the statistics of import of fresh vegetables, paints a different picture. The probable workforce for agriculture – youth – have been largely migrating abroad in search of jobs. Even those at home prefer to reside in urban and city areas to seek opportunities in the labour market other than the agricultural sector. Arable land in villages and the Terai area have turned into a barren zone. As such, Nepal is importing fresh vegetables worth billions of rupees to meet the demand of the people. On one side, the government is generating revenue through import, on the other side, import is climbing sharply in the fresh vegetable sector. Nine five-year and five three-year plans have been implemented so far in Nepal during Nepal's six decades of planned development. In the 15th five-year plan running currently, the country has invested thousands of billions of rupees in the agricultural sector for its development, alleviated the country's poverty, implemented several agricultural policies, projects, and programs but still, we are importing a huge quantity of vegetables daily.

Nepalese agricultural growth is embarrassed by poor infrastructures, weak institutions, inadequate technical support for commercialization and supply chain development, low productivity, poor market access, high post-harvest losses, and low revenue. Thus, it is necessary to develop strategic goals to reduce and manage the import of vegetables, increase domestic production, and smoothly run the domestic supply chain. The present study is an attempt to identify the potential strategies to reduce the import of fresh vegetables and to find out problems in the supply chain management.

The main finding of the study indicates a lack of production of vegetables to meet the demand. The import of potato and onion is high in comparison to other vegetables. There is a lack of high-value seeds, and absence of collection centres and warehouses. To address these constraints in fresh vegetables, the government should focus on increasing production with the promotion of off-seasonal vegetables and planting high-value seeds. The government needs to formulate favourable policies in favour of all actors involved in the vegetable sub

sector at the central level while they can provide required support and services, monitor, supervise, and follow up the vegetable production program at the field level.

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Abbreviations

COVID-19	Coronavirus Disease Of 2019
B.S	Bikram Sambat
CASA	Commercial Agriculture for Smallholder and Agribusiness
DFID	Department for International Development
DFTQC	Department of Food Technology and Quality Control
GDP	Gross Domestic product
Ha	Hectare
ILO	International Labour Organization
KFVMDB	Kalimati Fruits & Vegetable Market Development Board
Kg	Kilogram
MOAC	Ministry of Agriculture and Cooperatives
MOAD	Ministry of Agriculture and Livestock Development
MOALD	Ministry of Agriculture and Livestock Development
MOF	Ministry of Finance
MOICS	Minister of Industry, Commerce and Supplies
MT	Metric Ton/Tonne
NARC	National Agricultural Research Centre
NAST	Nepal Academy of Science and Technology
NPDP	National Potato Development Program
NPR	Nepalese Rupee
PMAMP	Prime minister's agricultural modernization program
R&D	Research and Development
SAWTEE	South Asia Watch on Trade, Economics and Environment
USAID	United States Agency for International Development

Introduction

The continuous increase of imports and decrease of exports has resulted in a trade deficit in Nepal. Over the years and due to the pandemic, export has almost stagnated while import has skyrocketed. The situation of the fresh vegetable trade is not different from the national status of the trade deficit. The pandemic has exploited the country's national economy and agriculture sector. The COVID-19 pandemic has heavily impacted the marginal and small farmers in Nepal, affecting the production, marketing, and food supply system in the country.

The disruption in the agriculture sector is caused by the global pandemic which has affected production, consumption, domestic supply, import, and export of vegetables. Agricultural workers have not been able to reach farms and as a result, there is a shortage of labour significantly impacting agriculture operations.

Vegetable crops are an integral part of the farming system in Nepal and the sector has been growing rapidly in recent years. The Nepalese farming system is primarily subsistence-oriented. Vegetable farming with its higher farm-gate values and productivity stands as an important sector in agribusiness (Mariyono, 2018). Vegetable farming has become an important part of agriculture in the surrounding cities (De Zeeuw et al., 2011). It has supported the livelihood of farmers through household subsistence farming to a commercial scale.

The economic progress of Nepal is connected to its natural resources. Although it only comprises some 21 percent of the land area, agricultural land is the major determinant of economic activities and it provides employment opportunities to 66 percent of the total population and contributes roughly 36 percent to GDP (Agriculture Sector, n.d.). It is estimated that over 3.2 million households are cultivating vegetables, of which 17 percent are headed by women. The sector contributes 9.7 percent of the country’s GDP and is dominated by small-scale subsistence production units, micro-to-small collection, processing units, and a limited number of large-scale industrial processing units (DFID, 2020).

In Nepal, the most widely grown vegetables are pumpkin, tomatoes, chilli, cauliflower, bitter gourd, eggplant, cabbage, broccoli, sweet pepper, cucumber, and kohlrabi, and the ones most typically grown for commercial purposes are cauliflower, tomato, cabbage, radish, and asparagus beans. Smallholders account for almost all vegetable production in Nepal, producing 3.2 million metric tons of vegetables which is equivalent to 69 percent of all Nepalese households (ILO, 2019). The annual production of fresh vegetables is estimated at 3.58 million tons which are grown on 266,937 hectares (MOAD, 2015). 90 percent of these smallholders cultivate 0.5 hectares of land and grow mainly for subsistence. Among them, 18 percent of fresh vegetables were sold into the market.

The important agricultural commodities (off-season vegetables) of Nepal (cabbage, cauliflower, cucumber, tomato, onion, and chilli) have been identified as some of the most promising value chains for increasing incomes of smallholder farmers through improved production and marketing. The increase in the number of vegetable farmers indicates that there is an opportunity to improve farmer incomes and vegetable production. The major drivers of the agricultural commercialization sector are favourable climatic growing conditions, road access, increasing involvement of the private sector and cooperatives, greater government interest, resilient domestic demand, and increasing competitiveness against imports.

Statement of Problem

Nepal is a fresh vegetable importer country despite increasing vegetable production and cultivated land every year. The country produces around four million tonnes of vegetables annually and imports around three million tonnes. This provides significant scope for market actors and smallholders to step up. Nepalese agricultural growth is embarrassed by poor infrastructures, weak institutions, and inadequate technical support for commercialization and supply chain development. In general, the prevailing weak agricultural growth is not sufficient to boost overall per capita income enabling economic transformation in the country.

On the supply side, the major constraints were found to be low productivity, poor market access, high post-harvest losses (estimated at 25 percent at producer level), and low revenue from the sale of vegetables. Due to a lack of timely market information and limited avenues to sell, farmer products are beyond the market. There is a lack of research and development in fresh vegetable seeds/crops that can grow in large quantities with limited resources. Likewise, the Government fails to import technology, knowledge to increase vegetable production within the nation. The government should provide a high emphasis on commercial farming.

Farmers need easy access to markets to drive growth, benefit from better prices and reduce post-harvest losses. On the one side, intermediaries bridge the gap between farmers and markets without adding value, leaving very little for farmers and overcharging consumers on the other. The unorganized supply chain is characterized by inefficiencies in logistics and storage, resulting in food losses at the post-harvest stage. Farmers have limited information on demand, leading to frequent oversupply or shortages, which impact prices and exacerbate crop wastage. Post-harvest management is also poor, as the layers of small intermediaries in the supply chain invest very little in quality storage, packaging, and transportation infrastructure.

On the market side, central impediments to the commercialization of the sector are the lack of storage facilities in market centres and cooperatives, weak farmer organizations, limited access to finance, and the limited ability of small and medium enterprises to innovate and diversify. More investment is required to develop modern supply chains and logistics services to handle high-value commodities, such as cold chains, reefer vans, and warehouses (DFID, 2020).

Objectives

- To identify the cause of trade deficit in fresh vegetables in recent years
- To find the problems in domestic production and supply management
- To explore the ways for import reduction

Research Question

1. How can we reduce the trade deficit in fresh vegetables?
2. What strategies can be used for a smooth running of supply chain management to sell fresh vegetables in the market?
3. How can fresh vegetable production increase within the country?
4. What are government policies to reduce the trade deficit in fresh vegetables and effective supply chain management?
5. How can the logistics of the fresh vegetable improve?

Methodology

The following procedure is followed to conduct the research:

Desk review

To assess the potential strategies to reduce the trade deficit for fresh vegetables, an extensive literature review has been carried out. Potential challenges and opportunities relevant to the trade deficit for fresh vegetables in the context of Nepal have been assessed. For this assessment, official data, relevant documents, and studies published by the government, regional and international organizations, and other relevant institutions have been reviewed. In addition, relevant past and existing policies have been reviewed and their relevance, effectiveness, impact, and sustainability have been be identified.

Secondary data

The secondary data is used to analyze and interpret the status, import, and export of fresh vegetables. The data is collected from the Ministry of Agriculture and Livestock, Department of Agriculture, trade, export promotion center, and other published journals & articles. Through the telephone, the price of vegetables was asked to staff of different agriculture markets across the country.

Literature Review

The growing and continued mismatch between imports and exports have resulted in an alarming level of trade deficit in Nepal. Over the years, export has almost stagnated, and import skyrocketed. Nepal's import is now 9 times bigger than export. Available statistics show that the total export, which used to be 9.4 percent of the Gross Domestic Product (GDP) a decade ago, has squeezed to 5.2 percent, whereas import has swelled to almost 40 percent GDP- in the fiscal year 2004/05 it was 35 percent (Ghimire, n.d.).

The agriculture sector still (self- and wage-) employs around 66 percent of the population and its contribution to GDP has steadily declined, from 49 percent in 1990 to 27 percent in 2017. During this period, poverty rates in Nepal have also declined from 42 percent in the mid-'90s to 25 percent in 2010/11 (ILO, 2019).

Fresh vegetables are considered a high-value selection of crops by smallholders, but most farmers are hesitant to invest more in fresh vegetables due to unstable pricing. This is caused by the seasonal peaks and troughs of harvesting seasons together with weak coordination along the supply chain as the markets become over- and under- supplied throughout the year. As a result, prices can be as much as 9 times higher at one point versus another depending on the season and the supply.

There is an opportunity and constraint in the fresh vegetable sector like other agricultural sectors. Vegetable farming can help farmers generate cash even from a small area of land in a short time and help farmers to improve their livelihood (Gurung et al., 2016)

For the development of fresh vegetable farming, it is necessary to identify the opportunity and constraints of fresh vegetable farming. Constraints indicate the hindering issues related to vegetable farming and suggest the designing and implementation of appropriate interventions that address the constraints (Ruel & Levin, 2002). Similarly, opportunities help to find the potential market and areas where the poor farmers can participate as vegetable entrepreneurs (Emana & Gebremedhin, 2007).

Vegetable production contributes to employment generation with the increase in GDP activities and helps to reduce poverty (Pokhrel, 2010). Commercial vegetable farming is an essential part of livelihood as it presumably supports food provision, income generation, and employment (Asongwe et al., 2014; Bhatta & Doppler, 2010). The migration from different parts of the country has also changed agricultural land use (Paudel et al., 2016, 2019).

Marketing management systems have been a major problem for vegetable farmers (Pokhrel, 2010; Thapa & Dhimal, 2017). However, the 2015 Agricultural Development Policy of the Nepalese government prioritized agriculture roads, collection centres, and market infrastructure to spur economic growth, improve livelihood, and enhance food security (Thapa & Dhimal, 2017). The government should also place more emphasis on monitoring and evaluating the vegetable market to protect farmers from prospective parasitic middlemen

in the vegetable markets. Furthermore, government subsidies on marketing should be provided to encourage farmers to continue their agricultural practices (Bhatta & Doppler, 2010).

Vegetable Production Status in Nepal

Every year the population grows, the demand for vegetables also increases. Economic activities are increasing in the country after the peace agreement between the government and Maoists. The increase in remittance has resulted in the spending power of the low and middle class growing. The emerging middle class is demanding fresher and healthier foods. Per-capita vegetable consumption has increased to 114 kg per year from 60 kg over the last two decades (MOALD, n.d.).

Nepalese consume approximately 200 plant species as vegetables. Vegetables are valuable sources of energy and micronutrients and a major source of income for farmers. The most common vegetables in Nepal include potato, cauliflower, cabbage, broccoli, tomato, brinjal, onion, garlic, bitter gourd, okra, hot pepper/chilli, sweet pepper, cucumber, pumpkin, sweet potato, peas, cowpeas, radish, cucurbit crops, beans and rayo (MOICS, 2019).

According to the Department of Agriculture and cooperation, in the year 2005/06, total fresh vegetable production excluding potato was 2,190,000 metric tons, which increased to 3,929,034 metric tons in 2015/16. Similarly, the land used for vegetable cultivation also increased, by 48 percent from 189,832 ha in 2005/06 to 280,807 ha in 2015/16 (MOF, 2017). The productivity increased by 21 percent, which is 11,537 kg/ha in 2005/06 to 13,992 kg/ha in 2015/16. Of the total 4,123,120 ha of cultivated agricultural land in Nepal, 7.35 percent is used to grow fresh vegetables (MOALD, 2019). Out of total production, it is estimated that 40 percent is used for household consumption, and the rest 60 percent is sold in markets (CBS and MoAC, 2009/10). The Terai, Mid-hill, and High-Hills regions contribute 55 percent, 40 percent, and 5 percent respectively to national vegetable production.

Vegetable farming is appealing because it ensures cash revenue within a short period, even from small plots of land. There are an estimated 3,243,521 households involved in vegetable cultivation, of which 17 percent are women-headed households (DFID, 2020). An average household has 1.8 parcels used for vegetable farming.

According to the National Sample Census of Agriculture 2011/12, most farmers (97 percent) cultivate vegetables on their land, while the remainder cultivates on rented land. Furthermore, around 78 percent of households cultivate on less than one hectare of land, with higher proportions (53 percent) cultivating on land ranging in size from 0.2 to 0.5 hectares. Some 27.4 percent cultivate on 0.5 to 1 hectare (DFID, 2020).

Table 1 Statistics on Vegetables for the last ten years

Statistics on Vegetable for the Last Twelve Years [Area in Ha., Production in Mt.]			
Year	Area	Prod.	Yield
2008/09	225,154	2,754,406	12,233

2009/10	235,098	3,003,821	12,777
2010/11	244,102	3,203,563	13,124
2011/12	245,037	3,298,816	13,463
2012/13	246,392	3,301,684	13,400
2013/14	254,932	3,421,035	13,419
2014/15	266,937	3,580,085	13,412
2015/16	280,807	3,929,034	13,992
2016/17	277,393	3,749,802	13,518
2017/18	286,864	3,958,230	13,798
2018/19	297,195	4,271,270	14.37
2019/20	281,132	3,962,383	14.09

Source: MOALD, 2021

As of the fiscal year 2019/20, Nepal cultivated vegetables in 281,132 hectares of land which yielded 3,962,383 MT of vegetables. The productivity per hectare is 14.09 MT. Both the cultivation area and yield have increased over the last 20 years.

Fresh vegetable production has been continuously increasing since 2008/09. There is also an increase in the cultivation area of vegetable land every year since 2008/09 data. However, the production of vegetables is increasing at a faster rate than the increment in area. Production increases are attributed to the favourable climatic condition, availability of seed and fertilizers, irrigation, improved management practices, mechanization in vegetables farming along area expansion. The percentage increase in area and production of vegetables in 2019/20 compared to 2008/09 is 24.86 percent and 43 percent respectively.

Due to the pandemic last year, 5.40 percent area and 7.23 percent production of vegetables decreased compared to 2018/19. A nationwide lockdown imposed by the government also impacted the fresh vegetable sector. In the year 2018/19, 3.60 percent of the fresh vegetable cultivation area and 7.90 percent of production had increased compared to 2017/18. Likewise, 31.72 percent of the area and 55.07 percent of production has been increased in 2018/19 as compared to 2008/09. Similarly, the population has also been increasing, and people's purchasing power has also increased.

Table 2 Fresh vegetables by province wise

[Area in Ha., Production in Mt.]				
Province	**Area 2019/20**	**Area 2017/18**	**Production 2019/20**	**Production 2017/18**
Province 1	48,608	60,220	771,156	840,310

Province 2	82,727	79,016	1,176,793	1,081,553
Bagmati Province	49,692	58,149	717,089	701,608
Gandaki Province	23,980	24,260	301,220	295,988
Lumbini Province	37,276	37,506	500,719	556,991
Karnali Province	12,998	12,304	145,375	136,645
Province Sudurpachi Province	25,850	25,409	350,031	345,135

Source: MOALD, 2021

The above table presents that province 2 has the potential to produce fresh vegetables on a large scale. In terms of cultivated area and volume of production, the top five vegetable crops are cauliflower, cabbage, onions, radishes, and tomatoes. The above table provides information on vegetable production in metric tons and cultivation in hector in Nepal. Among the seven provinces, Province 2 produces the highest vegetable and cultivates on a large scale which is followed by Province 1. However, in terms of productivity, Province 3 is the top-ranked, followed by Provinces 1 and 5. Some of the major commercial vegetable growing areas of Nepal are located close to the Kathmandu Valley, as it has the highest consumer population. Government should encourage youth to engage in fresh vegetable cultivation and strengthen the logistic infrastructure which is a need in this sector to meet the demand of the country. Such policies not only reduce imports but also help in domestic production and improvement in value chain infrastructure.

Table 3 Fresh vegetables produce in Nepal

Fresh vegetables Produce in Nepal, 2076/77 (2019/20)				
[Area in Ha., Production in Mt., and Yield in Mt./ha.]				
S.N.	**Commodity/Districts**	**Nepal Total**		
		Area	**Production**	**Yield**
1	Cauliflower	33,685	501,457	14.89
2	Cabbage	28,530	469,726	16.46
3	Broccoli	2,446	27,942	11.42
4	Tomato	21,747	413,761	19.03
5	Radish	16,808	257,335	15.31
6	Broad Leaf Mustard	11,717	160,374	13.69
7	Carrot	2,846	31,066	10.92
8	Turnip	352	4,248	12.08
9	Capsicum	1,470	15,301	10.41
10	Peas	7,398	68,182	9.22
11	French Beans	2,487	24,647	9.91
12	French Beans -Pole Type	4,331	47,032	10.86
13	French Beans -BushType	1,372	12,915	9.41
14	French Beans - Sword Type	1,283	11,778	9.18
15	Broad Beans	1,252	8,489	6.78

16	Asparagus Beans	4,184	42,896	10.25
17	Cowpea	3,521	32,535	9.24
18	Other (Legumes)	2,025	17,437	8.61
19	Asparagus	162	1,152	7.12
20	Tree tomato	109	1,043	9.6
21	Chilli Akabare	968	7,230	7.47
22	Chilli	9,195	95,398	10.37
23	Okra	9,337	103,353	11.07
24	Brinjal	8,621	120,303	13.95
25	Onion	20,424	284,926	13.95
26	Cucumber	10,216	158,688	15.53
27	Pumpkin	7,391	112,093	15.17
28	Squash	1,709	25,848	15.12
29	Bitter Gourd	10,336	145,271	14.06
30	Pointed Gourd	3,349	43,558	13
31	Sponge Gourd	7,197	96,126	13.36
32	Ridge Gourd	1,019	12,574	12.33
33	Snake Gourd	1,395	16,567	11.87
34	Bottle Gourd	8,265	127,484	15.43
35	Ash Gourd	709	9,825	13.85
36	Balsam Gourd	293	2,824	9.63
37	Kakari	434	6,195	14.27
38	Kundru	77	631	8.23
39	Chayote	1,683	29,186	17.35
40	Watermelon	2,390	50,843	21.27
41	Other (Cucurbits)	1,008	11,829	11.74
42	Drumsticks	114	2,228	19.62
43	Lettuce	100	741	7.43
44	Fennel Leaf	94	740	7.84
45	Coriander Leaf	2,050	20,513	10
46	Spinach	2,184	20,546	9.41
47	Cress	1,471	14,844	10.09
48	Amaranthus	1,807	19,182	10.62
49	Fenugreek Leaf	1,132	11,756	10.38
50	Swisschard	662	8,955	13.52
51	Others (Leafy Veg.)	1,604	18,912	11.79
52	Colocasia	4,797	55,456	11.56
53	Yam	1,401	20,160	14.39
54	Elephant Foot Yam	804	15,624	19.44
55	Other (Tubers)	733	8,774	11.96
56	Others(veg.)	7,995	129,230	16.16
	Total (Nepal)	**281,132**	**3,962,383**	**14.09**

Source: MOALD, 2021

In the fiscal year 2019/20, 3,962,383 metric tons of vegetables were produced in Nepal where 281,132 hector land were cultivated which yielded a production of 14.09 mt/ha. Cauliflower, cabbage, tomato, onion, radish, board leaf mustard, cucumber, bitter gourd, bottle gourd, and brinjal were the most produced vegetables in Nepal in the fiscal year 2019/20. Among them, cabbage is the most exported vegetable of Nepal. Tomato and onion are the most produced vegetables in Nepal however, these two vegetables are the most imported too. Onion was cultivated in 20,424 hector land only where its yield production was 13.95 mt/ha. It was cultivated in 7.26 percent of total cultivated land. Nepal imported 98982.819 metric tons of onion last year. However, Nepal imports a large number of fresh vegetables from India every day.

Cauliflower and cabbage are potential vegetables that grow in Nepalese farms. Government should focus on these vegetables to grow on a large scale not only to manage the domestic demand also to keep in priority to export to India. Farmers should provide training and necessary material to improve seeds and crops to cultivate and grow all kinds of vegetables on a commercial and economic scale to meet the demand of people.

Table 4 Fresh Vegetables by districts

Fresh Vegetables by Districts, Fiscal Year 2019/20			
[Area in Ha., Production in Mt., and Yield in Mt./ha.]			
District	**Production**	**Area in hector**	**Yield**
Saptari	232,596	15,809	14.71
Bara	204,920	11,992	17.09
Kailali sudurpaschim	190,470	12, 638	15.07
Jhapa	162,648	8,940	18.19
Kavrepalanchowk bagmati	159,627	9,966	16.02
Sarlahi	155,747	12,649	12.31
Rautahat	145,875	11,027	13.23
Morang	144,679	9711	14.90
Parsa	139,964	9,126	15.34
Dhankuta	133,457	5983	22.31

Source: MOALD, 2021

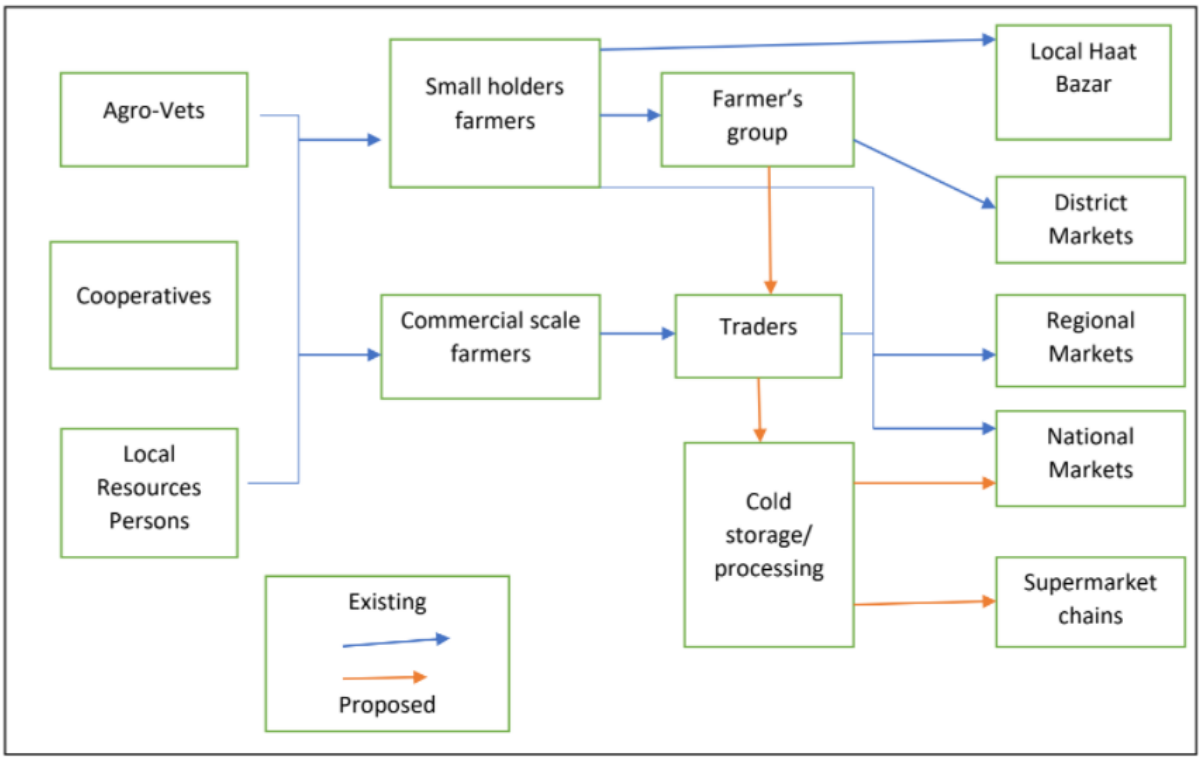
Table 4 shows the top ten districts of Nepal that produce fresh vegetables. Saptari district produces 26,711 metric tons of cabbage and 25,387 metric tonnes of cauliflower. This district produces the highest amount of fresh vegetables and vegetables cultivation land area is highest among these ten districts. On other hand, Dhankuta ranked 10th position in producing fresh vegetables with the highest yield (mt/ha) even though its cultivated area is one-third of the Saptari district. Thus, it can be concluded that Dhankuta is adopting commercial farming and using modern technology more than others.

Similarly, Cauliflower production in the Bara district is 28, 823 metric tons and 22,275 metric tons of bitter gourd. Kailali district produces 13,777 metric tons of chill and 11,889 tons of

brinjal and 10, 512 metric tons of brinjal in the fiscal year 2019/20. Dhankuta district has produced 54,000 metric tons of tomato and 39,258 metric tons of cabbage in the year 2019/20. Saptari, Bara, Kailali, and Sarlahi districts have cultivated area (ha) more than double of Dhankuta but in comparison to the production of fresh vegetables, their production is not high. If this district keeps in priority and provides modern tools and techniques for farming fresh vegetables, production could increase which can substitute import of fresh vegetables. Government institutions should implement more vegetable cultivation programs and projects in these potential districts and provide access to market, finance, built logistics, warehouses, and cold storage. The agricultural extension officer should provide modern agricultural training, provide high-value seeds and tools, and techniques to small and medium farmers. Such policy will improve the ability to bring improvement in the supply chain of the vegetables. The unemployed youth of these districts should also be mobilized in vegetable farming thus converting barren land to arable land and increasing production.

Market Overview

Figure 1 Fresh Vegetable supply chain map



Source: ILO, 2019

There is no systematic market channel in Nepal for the sale of vegetables. The common marketing channel is the middlemen and retailers. There is an absence of a well-organized marketing channel in Nepal for fresh vegetables. However, some farmers sell their vegetables

to the buyers at the agricultural farm. Local resources people or middlemen collect vegetables from direct smallholder farmers or commercial farmers. These middlemen distribute vegetables to retailers. Likewise, trader or farmer groups collect vegetables from smallholder farmers or commercial scale farmers and they are distributed to the regional markets, national markets, supermarkets, or retailer.

Middlemen collect products from different producers and sell them to retailers to consumers who provide employment and income to both producers and the middleman. In areas where there is no strong cooperative network and road access to farms is limited, middlemen are key to bringing the product into the marketplace. Similarly, farmer cooperatives also collect through collection centres which are managed by farmer marketing groups. The government does not have a proper and systematic channel to collect agricultural production. Therefore, the middleman plays a leading role in fixing prices, and farmers always complain that they get less price in comparison to the market.

In Nepal, middle marketers (cooperatives, farmer groups, or middle man) are engaged in collecting the products from different places and delivering the products to the wholesale market. The products from wholesale markets are then supplied to retailers/vegetable shop owners and then to consumers. The distribution of costs and gross income at different levels is important in the business of vegetables. The fresh vegetables are highly biodegradable so it requires more attention during harvesting, packaging, and transporting from production to the final market. The marketing cost of the vegetables mainly involves the cost of post-harvest activities incurred before reaching the consumer (USAID, 2011).

Vegetable Market in Nepal

The vegetable market in Nepal is suffering from an undersupply of domestic vegetables. There are several agricultural markets in Nepal from the government and private sector. All of these markets work informally. Systematic and well-facilitated infrastructure should be developed to run it smoothly and scientifically under the government rules, regulations without hampering the economic, and health status of people. Under the department of agriculture, there are ten agricultural markets including the Kalimati vegetable market. Kalimati and Pokhara vegetable market provide better communication of price list compared to others. Both of these markets publish wholesale and retail prices daily on its website, whereas Kalimati publishes it in daily newspapers too.

The government has prioritized working in input markets but has done so without real emphasis on output markets, so results have often been unsustainable. There is a mismatch between the input and output market as the government has prioritized working in input markets with fewer preferences to the output market. The supply of agricultural products is limited and the output market should be effectively run and managed by domestic and internally produced vegetables.

Both the government and private sector run the fresh vegetable market but there is a lack of a systematic and well-facilitated market. There are ten vegetable markets and management all

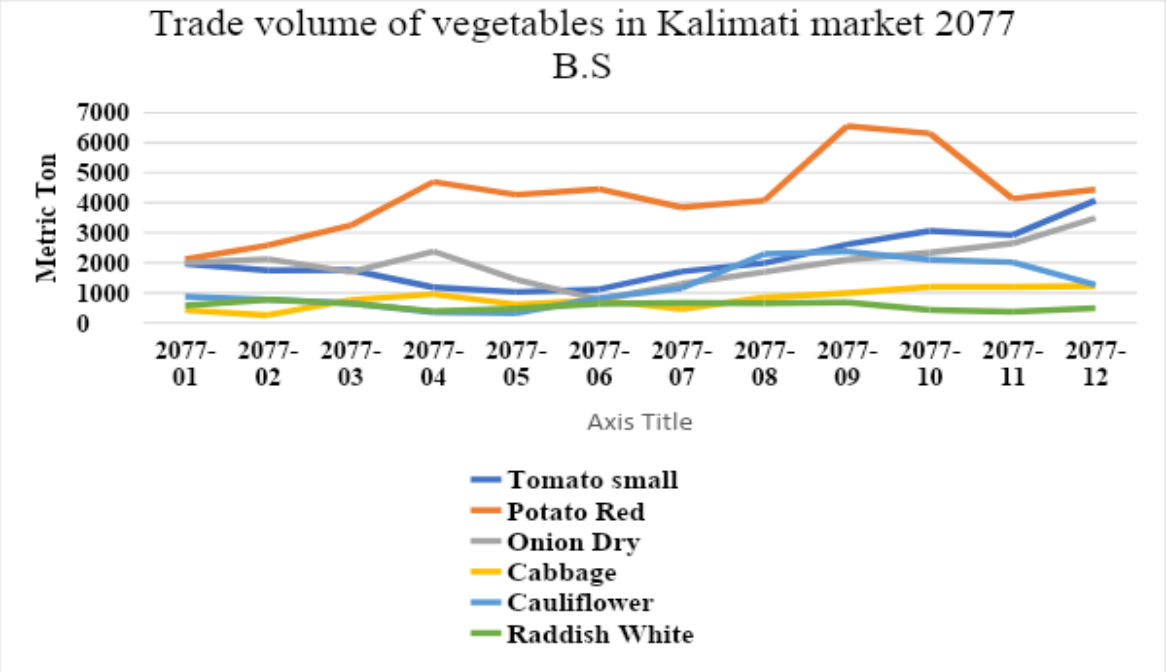
over Nepal owned by the government which monitors the price of vegetables. However, the CASA-2020 vegetable sector strategy – Nepal report stated that there are a total of 74 wholesale markets (local, regional and national level) for trading agricultural products, and vegetables comprise the major traded products in these markets. Among the 74 wholesale markets, 13 are major wholesale markets, which are considered national level markets (one in the former Far-Western Development Region, two in the Mid-Western, three in the Western, five in the Central, and two in the Eastern).

Kalimati Fruit and Vegetables Market Development Board

The Kalimati Fruits and Vegetable Wholesale Market is the leading terminal wholesale market in Nepal, where retailers, institutional consumers, and other bulk consumers procure their supplies of commodities. The Kalimati Market was established in 1986 by the Department of Food and Agriculture Marketing Services under the Ministry of Agriculture, to provide some organization for the marketing of agricultural produce, especially fruits and vegetables in Kathmandu valley. Kalimati vegetable markets in Kathmandu is one of the busiest vegetable markets in the country. In the fiscal year 2018/19, 246139.63 mt of vegetables were traded in this market. In the Kalimati vegetable market, 88625.449 mt vegetables were imported from India in the fiscal year 2018/19, which covered 36.01 percent of the total trade of the Kalimati vegetable market.

Monthly Trade Volume of the Fresh Vegetables in Kalimati Market

Figure 2 Monthly trade volume of the fresh vegetables in Kalimati market



Source: Kalimati fruit and vegetables market development board 2021

The trade volume of vegetables fluctuates each month. Red potato is the highest traded vegetable in the Kalimati vegetable market. In the year 2077 B.S, 50719.87 metric tons of red potato were traded. Similarly, small tomato and cauliflower were traded 25151.6 mt and 14999.99 mt respectively. A total of 217409.13 metric tons of vegetables were traded in the Kalimati vegetable market (KFVMDB, 2020). For cauliflower, May to September is the off-season period, while for tomatoes the off-season months range from July to October. Similarly, for cabbage and onion, the months of October and November are the off-season. The period of December to March is the off-season period for cucumber (USAID, 2011).

Dharan agricultural market is one of the largest wholesale vegetable markets in the eastern region of Nepal. For this market, the vegetables are collected from the eastern districts of Dhankuta, Bhojpur, Sunsari, Terathum, and Sankhuwashawa. Tomato, chilli, cabbage, cucumber, and cauliflower are the major vegetables traded in this market.

- Birtamod Agricultural Market Management committee
- Sindhuli Agricultural produce market
- Surket Agricultural market management committee
- Dharan Agricultural market management committee
- Butwal Agricultural produce wholesale market centre
- Pokhara Agricultural produce market
- Lalbandi Agricultural produce wholesale market, Sarlahi
- Kohalpur Agricultural produce market
- Dhalkebar Agricultural market management committee

Price of Vegetable across the Country

Table 5 Price of Fresh Vegetables on September 2021

	Kalimati	Dhalkebar	Pokhara	Birtamod	Butwal	Dharan	Total average
	Price Per Kg						
Commodity	**Average**	**Average**	**Average**	**Average**	**Average**	**Average**	**Average**
Bitter Gourd	80	60	90	70	28	55	63.83
Bottle Gourd	45	26		50	25		36.5
Cabbage	40	32.4	55	19	27.2	16	31.6
Cauliflower	90	88.4	110	95		97.5	96.18
Christophine	12.5	35	37.5	11	23	15	22.33
Potato Red	57	26.6	39	25.5	25.6	27.5	33.53
Potato White	41.5	24.6	40	22	22		30.02
Pumpkin	42.5	25.6	45	22	27	45	34.51
Radish White	35	42.6	47.5		32.2		39.32
Smooth Gourd	45	21	90	75	12.8		48.76
Okara	55	32.6	70	42.4	27.2	55	47.03
Tomato Big(Indian)	55	70	40	33.2	23.4	26.5	41.35

Tomato Small(Local)	10	60	39			32.5	35.37
Brinjal Round	65	62.6	70		32.2		57.45
Chilli Dry	310	295		330		332	316.75
Chilli Green	55	61	135	110	80	62.5	83.91
Chilli Green(Akbare)	175		300	270		290	258.75
Coriander Green	425		450	270	228		343.25
Garlic Dry Nepali	165	140		150	170	155	156
Onion Dry	40.5	35.6	46	41	41	44	41.35
Carrot	145		125	90	127	80	113.4
Arum	45	28.6		50	40		
Brd Leaf Mustard	175	110		45			

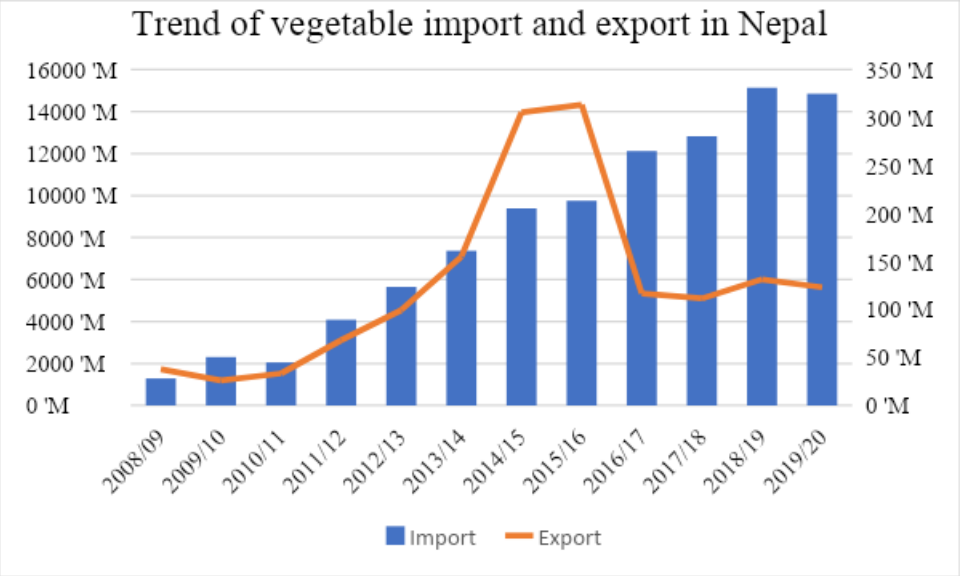
There is a dearth of the uniform price of fresh vegetables all over the country. The vegetables grown domestically and internationally have different prices. The Indian imported vegetables are cheaper than domestically grown vegetables. The seasonal and off-seasonal vegetables also determines the price. Fluctuations in market arrival largely contribute to the price instability of major agricultural commodities. Therefore, there is a need to have a perfect understanding of the market arrival and price behaviour over time and space. The efficient marketing system plays an important role in economic development as it stimulates production, avoids unnecessary fluctuation in output and prices, reduces the unfair share of consumers' prices, and contributes to price stability (Khalon and George, 1985).

The variation of the price depends on whether the vegetable is a domestic product or has been imported. Many factors determine the price of domestic products. Some imported vegetables are cheaper than domestic products. The off-seasonal vegetables are sold at a higher price. Nepalese-grown vegetables are expensive in comparison to Indian imported vegetables. Through the above table, we can see that the price of vegetables in Butwal is cheaper than in other places. The Butwal vegetable market is near the Indian border area. The imported vegetables in this market are cheaper because it saves the transportation costs. Similarly, the vegetable is grown in province 2 and Lumbini is easily transported to Butwal, Dhalkebar market. Kalimati vegetable market is more expensive than others. Kalimati vegetable market is a major place for trading of vegetables in Kathmandu and thus domestically produced vegetables as well as imported vegetables have to transport in this market, thereby raising the price of vegetables.

The market imperfections are also providing a disincentive to the growers in increasing vegetable production. The availability of information about market arrivals and existing prices in different markets help the farmers in adjusting their cropping pattern in such a way that they could sell their produce at a time when the prices are reasonably high in the market (Mishra & Kumar, 2014).

Vegetables: Imports and Exports

Figure 3 Trend of vegetable import and export in Nepal



Source: TEPC Nepal 2021

Observing the pattern of the graphs in the figure, it would appear that there is a significant difference in the trends of the import and export of fresh vegetables (bar diagram-import, line dark yellow-export). While the import bar diagram raises continuously, the export graph raises for a short period and falls after 2015/16. In the year 2015, Nepal had an earthquake where all economic and social activities were stuck for some months. This could be a reason why Nepal lost the international market leading to the downfall of export. The increasing trend of the bar graph illustrates that import is increasing year by year and export does not meet a minimum level of import. In the year 2008/9, NPR 1287 million vegetables were imported and NPR 2306 million vegetables were imported in 2009/10 and it incessantly grew every year. In the year 2016/17 NPR 12124 million vegetables were imported and the most prominent rate of growth was recorded in 2018/19 with NPR of 15131 million which is 12 percent more than in the year 2008/9. Previous year in 2019/20, due to the global pandemic, the number of imports decreased to NPR 14846 million. Overall, potato imports continue to indicate a strong increase.

Nepal's vegetable imports have increased over the decades, while exports have decreased. Imports comprised around 70 percent of the total vegetable trade in 2011/12. Most of Nepal's vegetable trade is with India. This indicates that production had not grown fast enough to meet the rapidly increasing demand for vegetables in Nepal, which points to an opportunity for further commercialization of Nepal's vegetable sector. The failure to implement plans and programs to become self-sufficient in vegetables has increased the dependency of Nepali vegetable market on imports.

Table 6 Import of fresh vegetables by Nepal Value in NPR

Import of Fresh Vegetables by Nepal Values in NPR (million)										
Commodities	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20
Potatoes seed	27 M	4 M	50 M	2 M	1 M	0 M	0 M	10 M	7 M	0 M
Potatoes, fresh or chilled	1080 M	2145 M	3071 M	4141 M	5096 M	4533 M	5312 M	5558 M	5814 M	6329 M
Tomatoes, fresh or chilled	12 M	48 M	73 M	107 M	157 M	168 M	247 M	293 M	527 M	532 M
Onions and shallots	390 M	1174 M	1854 M	2197 M	3008 M	3186 M	4352 M	4581 M	5270 M	2977 M
Garlic	396 M	487 M	209 M	397 M	446 M	537 M	393 M	614 M	372 M	315 M
Leeks and other alliaceous vegetables	2 M	1 M	2 M	1 M	0 M	2 M	0 M	2 M	0 M	1 M
Cauliflowers and headed broccoli	0 M	1 M	1 M	1 M	0 M	3 M	5 M	7 M	5 M	2 M
Pumpkins, squash, and gourds (Cucurbita spp.)	0 M	0 M	0 M	1 M	3 M	1 M	1 M	3 M	4 M	13 M
Vegetables, fresh or chilled	0 M	0 M	0 M	112 M	168 M	131 M	53 M	406 M	591 M	459 M
Potatoes	15 M	2 M	37 M	75 M	31 M	550 M	779 M	604 M	1505 M	1964 M
Vegetables: mixtures of vegetables	1 M	3 M	3 M	20 M	15 M	50 M	43 M	38 M	2 M	4 M
Onions, dried	10 M	19 M	10 M	11 M	10 M	77 M	236 M	187 M	353 M	1248 M
Dry Garlic, neither crushed nor ground	0 M	0 M	0 M	39 M	66 M	94 M	159 M	83 M	335 M	324 M
Dry Garlic, crushed or ground	0 M	0 M	0 M	16 M	68 M	53 M	187 M	69 M	81 M	115 M
Dry Garilic	0 M	0 M	0 M	12 M	20 M	23 M	29 M	41 M	45 M	340 M

Source: TEPC Nepal 2021

The import of potato and onion is increasing more rapidly compared to other vegetables. 6329 million rupees of fresh potato imported and 1248 million rupees of dry online have been imported in the year 2020. In the year 2008/09, NPR 1287 million vegetables were imported. Likewise, in the year 2018/19, NPR 15131 million vegetables were imported which is 12 times more than 2008/9. The statistics display the demand for vegetables in a market. Since 2008/9, the domestic production of vegetables increased 43 percent by 2019/20, and the area of production increased by 24.86. All kinds of vegetables were imported and it is increasing every year. The potato and onion are the two largest import vegetables in Nepal. Out of total imports, 82 percent are potatoes and onions.

Table 7 Export of fresh vegetables by Nepal

Export of fresh vegetables by Nepal Value in NPR									
	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
Potatoes seed	-	-	-	6,000	151,776	6,433	772,376	4,733,550	1,165,099
Potatoes, fresh or chilled	323,875	1,507,600	7,547,420	9,401,047	39,530,498	6,043,646	1,170,800	183,400	28,680
Tomatoes, fresh or chilled	-	196,675	5,403,041	1,169,211	17,569,719	5,322,774	5,341,240	5,590,568	5,992,991
Onions and shallots	-	23,124	448,520	10,000	-	23,040	77,537	1,463,070	2,122,814
Garlic	19,100,160	-	-	12,492	20,155,185	133,782,819	571,260	723,510	1,038,310
Leeks and other alliaccous vegetables	-	-	94,689	700,106	6,242,100	2,303,574	4,164,823	3,128,100	570,000
Cauliflowers and headed broccoli	38,446	767,848	8,073,111	23,602,700	31,767,975	29,102,980	35,499,146	64,700	312,910
Cabbage	76,748	9,149,576	344,800	86,130	14,054,166	-	-	-	-
Cauliflowers, kohlrabi, kale and similar edible brassicas, fresh or chilled	317,103	3,990,478	33,016,600	36,119,910	30,740,041	33,274,600	10,174,987	12,050,032	57,981,858
Cabbage lettuce (head lettuce)	473,556	6,038,128	7,060,785	26,013,431	37,802,366	42,799,506	12,935,561	296,058	120,000
Lettuce (Lactucasativa)	-	4,400	-	48,000	-	-	-	-	-
Witloof chicory (Cichorium intybus var. foliosum)	-	-	-	-	-	-	-	54,409	-
Lettuce (Lactuca sativa) and chicory	-	-	-	-	-	-	-	-	6,000
Carrots and turnips	-	1,000	70,000	-	21,000	-	-	185,020	48,000
Edible roots	-	-	10,000	438,790	438,826	-	-	-	162,000
Cucumbers and gherkins, fresh or chilled	-	-	-	-	-	12,000	23,123	99,600	64,477
Fresh peas	-	5,600	1,352,100	391,852	522,570	-	-	-	25,170
Beans (Vigna spp., phaseolus spp.)	-	6,000	-	6,400	996,010	7,040	-	-	33,195
Leguminous vegetable shelled or unshelled	-	493,450	1,103,900	6,379,797	10,606,970	167,050	1,061,448	51,830	177,885
Fresh mushrooms	-	-	-	8,880	226,008	17,865,513	14,831,517	17,791,772	8,749,399
Mushrooms and truffles	209,000	2,112,750	173,341	1,150,115	389,200	24,800	-	-	-

Fruits of genus capsicum or genus pimento	-	251,728	7,200	13,000	3,200	88,200	645,400	-	626,493
Pumpkins, squash, and gourds (Cucurbita spp.)	-	-	-	108,877	10,000	173,200	-	-	38,179
Vegetables, fresh or chilled	-	-	-	5,329,404	25,728,830	19,313,440	10,459,251	21,212,640	18,452,300
Potatoes	-	56,780	12,000	133,000	263,160	51,829	-	1,727,900	3,047,223
Peas (Pisum sativum)	-	4,800	-	81,444	13,200	948,080	-	-	-
Beans (Vigna spp., phaseolus spp.)	-	-	-	-	-	-	-	-	651,472
Leguminous vegetables	-	460,000	8,880	1,593,923	324,584	6,000	-	-	-
Vegetables	-	618,700	828,040	1,367,420	170,862	252,500	-	2,329,983	-
Fresh green vegetable	189,185	393,350	18,600	369,000	461,396	92,240	5,000	-	-
Vegetables: mixtures of vegetables	-	222,000	1,868,950	1,435,540	3,469,148	44,800	54,470	6,450	-
Onions, dried	4,872,399	11,400,760	12,148,270	11,212,216	16,762,253	21,354,005	16,167,860	22,298,000	16,850,000
Dried mushrooms truffles	7,677,962	18,443,543	11,220,608	-	-	34,500	-	-	25,418
Dried truffles	-	524,500	-	22,716	43,747,350	23,428	-	10,838,440	7,081,844

Source: TEPC Nepal,2021

India is the largest export destination for Nepalese vegetables. The bilateral trade treaty between Nepal and India allows duty-free market access to primary and agricultural products on a reciprocal basis. Bangladesh offers opportunities for the export of fresh vegetables and fruits, but their tariffs are higher: as high as 25 percent for tomato, cabbage, lettuce, carrot, and all other green vegetables. There are other non-tariff barriers, beyond the connectivity problems. The prospects for vegetable export to Bhutan seem very bleak due to the small market size. Nepal imports potatoes from Bhutan but there is no agricultural export to that country (SAWTEE, 2016).

Nepal exports NPR 69 million of cauliflower, NPR 5 million of garlic, NPR 8 million of dry truffles, NPR 6 million of tomato, NPR 16 million of dry onion, and NPR 1.3 million of fresh pumpkin in the year 2020. Nepal exports NPR 123 million vegetables in the year 2019/20, NPR 131 million vegetables exported in the year 2018/19 and NPR 112 million have exported in the year 2017/18. 117 million in 2016/17, NPR 313 million in 2015/16 NPR, 306 million in 2014/15.

In the year 2008/9, the export of fresh vegetables was NPR 38 million and in the year 2015/16, it was NPR 313 million which is 8.5 times more than in the year 2008/9. But after

2015/16, again it decreased. Due to the earthquake in 2014 and the global pandemic, vegetable production and export have decreased even more.

Fresh vegetables are exported to India informally in small amounts. The quantity is not sufficiently large to be trucked and there are no collection and storage facilities in Nepal to warrant commercial consignments. Also, quarantine and food safety formalities are very time-consuming. Only a few items like radish, cabbage, cauliflower, squashes, and green peas are exported in bulk (SAWTEE, 2016). Farmers are heavily dependent on the middle person for the export of fresh vegetables in eastern regions. Farmers who produce the vegetables are the last people to receive benefits from the export proceeds. Farmers have incurred net losses on account of the low prices they receive. The lack of commercialization and industrialization in agriculture are the main reason for less production within the country. Similarly, the less utilization of productive areas and the changing demand of consumers are the reason for the increase of imports of fresh vegetables.

Why is the Import of Fresh Vegetables high?

Through the status of vegetable production and cultivation area, it can be said that there is growing production as well as cultivation every year. Despite, growth of vegetable production, the fresh vegetable market failed to meet the demand of people, and imports became necessary for smooth supply and to meet the demand. The previous study and research show that three million metric tons of vegetables were imported every year in the Nepalese market to meet the demand but Trade and Export Promotion Center data show that almost 1 million metric tons have been exported every year since 2017/18. We can also not disagree with the previous study and research conducted by an expert, think tank, and research institutes because there is lots of informal trade between Nepal and India due to the open border. There is a huge informal trade of fresh vegetables through Kakarvitta of eastern Nepal and other parts of Nepal. Small vehicles were used to trade fresh vegetables for informal trade which is not counted in national data. In the terai area, the whole border is open so there is a high chance of informal trade, so the government does not have exact data of informal trade.

Table 8 Highest produce vegetable in Nepal

Commodity	2014/15	2015/16	2016/17	2017/2018	2018/19	2019/20
	[Production in Mt..]					
Potato	2,586,287	2,805,582	2,591,686	3,088,000	3,112,947	3,131,830
Cauliflower	494765	550044.8	-	535007.50	574795	501,457
Cabbage	453600	484036.8	-	485,782	519061	469,726
Tomato	331736	386824.6	-	410,721	406434	413,761
Onion	248584	238590.7	-	239,024	291,538	284,926
Radish	263215	268119.6	-	271,053	287,200	257,335

Broad Mustard Leaf	159205	151774.6	-	162,179	186,897	160,374

Source: TEPC Nepal 2021

The total production area in the year 2019/20 was 281,132 hectares where 3962,383 metric ton of vegetable was produced excluding potato. Potato is one of the favourites and compulsory vegetables in the Nepalese kitchen. So the demand for potatoes is high in comparison to other vegetables. The potato is one of the highest produced vegetables in Nepal, with 3.1 million metric tons of vegetables produced in the year 2019/20. Cauliflower and cabbages are other highly produced vegetables in Nepal. Similarly, Cauliflower is one of the highly exported vegetables by Nepal. This is a single vegetable that is exported more than others, 7.1 metric tons of vegetables were exported in the year 2019/20 and 6.6 metric tons of vegetables were exported in the year 2018/19. The ability to produce cauliflower and cabbage should increase by engaging all farmers in 77 districts and keeping priority in policy, program, and project, so production and export can be increased. Other potential vegetables are tomato, onion, radish, and broad mustard leaf which can cultivate and produce on a large scale. The production of these vegetables is increasing yearly, however, there is a huge quantity of onion imported every year like a potato. The government should focus on all kinds of vegetables to grow on a commercial scale by identifying the place, zone, and farmers. The Prime minister's agricultural modernization program (PMAMP) and other projects should be implemented in all districts for an increment of vegetable production.

Table 9 Status of Potato production, import, and export

Potato		**[Area in Ha., Production in Mt., and Yield in Mt./ha. Import/Export in Mt]**					
Year	**Area**	**Production**	**Yield**	**Import**	**Export**	**Import (value NPR)**	**Export (value in NPR)**
2008/09	181,900	2,424,048	13,326	55,156.53	236	431,694,444	2,018,744
2009/10	185,342	2,517,696	13,584	96,160.90	-	1,025,194,509	-
2010/11	182,600	2,508,044	13,735	83,739.05	38	1,094,399,177	323,875
2011/12	190,250	2,584,301	13,584	163,221.93	160	2,146,828,502	1,564,380
2012/13	197,234	2,690,421	13,641	228,312.80	646	3,108,219,963	7,559,420
2013/14	205,725	2,817,512	13,696	218,436.12	1,048	4,215,588,032	9,534,047
2014/15	197,037	2,586,287	13,126	241,667.69	2,422	5,126,760,895	39,793,658

2015/16	199,971	2,805,582	14,030	238,082.30	309	5,082,704,368	6,095,475
2016/17	185,879	2,591,686	13,943	285,497.30	59	6,091,128,265	1,170,800
2017/18	195,268	3,088,000	15.81	377,305.72	184	6,161,775,757	1,911,300
2018/19	193,997	3,112,947	16.05	346,956.93	356	7,318,947,551	3,075,903
2019/20	188,098	3,131,830	16.65	331,996.67	182	8,292,472,417	2,365,850

Source: TEPC Nepal 2021, MOALD 2021

Potatoes are one of the highest cash crop vegetables produced in Nepal. The production area and production of potatoes are increasing every year. The above table represents the statistics of potato production, area, and import and export. Despite most growing and producing vegetables in Nepal. It is one of the highest imported vegetables in Nepal. Out of total imports, the import of potato alone covered 40 percent. The figure illustrates the demand for potatoes in the Nepalese market. On the one hand, the trend of potato cultivation area production is increasing yearly. Despite increasing, the domestic product fails to meet the Nepalese market. Likewise, potatoes domestically produced are more expensive than imported. This is another reason behind the high import of potatoes in the Nepalese market. Nepali potatoes are expensive due to many reasons like expensive labour, limited land, expensive fertilizer, and seeds. Indian and Bhutanese potatoes are cheap in comparison to Nepali potatoes. The NPR 8265 million of potato imports in Nepal in the year 2019/20. The production also increases and import also increases but export is very few in comparison to production and import. Government should take an important step to reduce imports and increase production. Is all these 3.1 million tons of produced potato easily get to the Nepalese market? The farmer should facilitate easy access to the market, transportation, and collection centre for a smooth supply chain to farmers.

It is one of the important cash crops to address food insecurity and reduce poverty among smallholder farmers in developing countries like Nepal. Therefore, the National Potato Development Program (NPDP) was established in 1972 as a national organization for potato development in Nepal. Similarly, there is a National Center for Potato, vegetables, and Spice crop Development for the holistic development of fresh vegetables. Notwithstanding these organizations, Out of total imports, among them, 40 percent is a potato with millions of rupees. Hence, all agricultural-related government institutions should be mobilized and functionalized to meet the vegetable demand of people at the best price. The government and

stakeholders should set up a strong top-level government mechanism for a smooth run of the supply chain domestically produced vegetables in a market.

Table 10 Status of Onion production, import, and export

Onion	[Area in Ha., Production in Mt., and Yield in Mt./ha. Import/Export in Mt]				
Year	Production	Import	Export	Import (value NPR)	Export (value in NPR)
2008/09	-	48,672	5.26	510,131,804	2,069,337
2009/10	-	62,571	11.52	717,252,619	5,207,567
2010/11	-	39,296	10.23	399,895,579	4,872,399
2011/12	-	84,050	19.67	1,193,386,834	11,423,884
2012/13	-	95,706	44.82	1,863,209,802	12,596,790
2013/14	-	83,151	19.50	2,207,867,839	11,222,216
2014/15	248,584	96,331	28.00	3,017,239,862	16,762,253
2015/16	238,590	102,667	35.23	3,262,972,476	21,377,045
2016/17	-	143,154	28.40	4,587,723,827	16,245,397
2017/18	239,024	316,559	58.07	4,767,702,706	23,761,070
2018/19	291,538	178,491	88.70	5,623,279,299	18,972,814
2019/20	284,926	106,835	33.58	4,224,658,075	15,859,685

Source: TEPC Nepal 2021, MOALD 2021

Another highly imported vegetable is onion. Per capita consumption of onion in Nepal is 7.7 kg, which is far below the world average of 10.8 kg. Even then the domestic production is not sufficient to meet the demand of the country resulting in unavoidable imports (Kaini, 2020). In the year 2018/19, NPR 5623 million vegetables were imported, which is 37 percent out of total vegetables imported. Correspondingly, NPR 4225 million vegetables were imported in the year 2019/20 which is 28 percent out of total vegetables imported. The production of onions is also increasing every year and there is an increase in imports also. However, very few quantities are only exported in comparison to imports and production. The reason behind the high import of onions is also similar to a potato. The imported Indian onion is cheaper in comparison to the domestically grown onion. Similarly, traders import a large quantity of onion from India at a cheap price and store it in warehouses and distribute it

in the off-season in the Nepalese market which indicates there is a high import of onion in data.

There are many constraints like high cost of cultivation, labour shortage, unavailability of suitable cultivars and seed, and weak research and extension support so there is a lack of increase in production. Similarly, the storage of onion bulbs for a long duration in ordinary conditions poses a problem due to high humidity and high temperature from June to September. However, the off-season onion production technique is an effective tool to meet the demand for onion in the lean season. The diverse climatic conditions found in different parts of the country provide comparative advantages for off-season onion production. Exploiting agro-climatic diversity can help a lot. For example, in high mountains, onion bulbs are produced in Bhadra (August-Sept) as a normal season crop which is off-season for mid-hills and terai. The second option is to produce onion bulbs by planting sets during June-July. The sets are produced by sowing seeds in a normal season. (Kaini, 2020).

Problem in a Fresh Vegetable Market in Nepal

The main problem is the shortage of commercial farming of fresh vegetables and low productivity. The lack of knowledge about seeds, and modern techniques of agriculture and limited information about the use of different tools, techniques, and agriculture-related chemical fertilizer is another problem in fresh vegetables. Many smallholders do not have market access or they live far from the market and the government has failed to build the road and other necessary infrastructures for easy transportation of fresh vegetables to the market. Therefore, middlemen dominate the fresh vegetable market in Nepal where farmers get low pay and profit is enjoyed by middlemen. Likewise, there is no problem with fresh vegetable imports from India to Nepal but it is hard to mobilize domestic products from farmers to market.

Trade through Informal channel

Vegetables are mostly traded informally in the border area. Cross-border trade is generally carried out on smaller vehicles. Such movement does not involve any proper recording, quarantine, and customs clearance processes. There are also groups of people owning bicycles and pull carts providing cross-border transportation services between exporters and importers on both sides of the border. The field survey revealed that an almost equal volume of informal trade occurs in vegetables and fruits as the formal one. Vegetables and fruits that are not exported in bulk enter the other side in a very informal way (SAWTEE, 2016).

Lack of cold storages

The government does not have exact data of cold storage available in Nepal. Cold storages help to store fresh vegetables and off-seasonal vegetables for a long time. Government should take an immediate step to set up cold storage in every district to store large quantities of fresh vegetables for a long time (at least 2-4 days). Such cold storages help to manage import

vegetables sustainably. However, according to the Products of Nepal book published by MoICS, it is stated that there are 15 warehouses established for the storage of seeds in different locations such as Kathmandu, Hetauda, Itahari, Janakpur, Bhairahawa, Nepalgunj, Dhangadhi, Jhumka, and Nawalpur. The capacity of seed storage in all these 15 warehouses is 92,000 MT. These warehouses should have access to domestic vegetables and the priority should be domestically produces vegetables rather than import vegetables.

Lack of integrated vegetables collection centre

There are more smallholder farmers in Nepal whose main occupation is agriculture. But due to no market access, their agricultural product fails to reach the market. Therefore, the government should develop an integrated collection centre for easy access to the market from smallholder farmers. It will be more productive and useful if there is one integrated vegetable collection in each local government.

Indian imports are cheaper and more convenient

Indian vegetables import with duty-free in Nepal, Indian government subsidies, and few quarantine checks at the border, so they are cheaper than Nepalese vegetables. They have good packaging, making them attractive. India supplies nearly 40 percent of the total demand of the central vegetable market in Kalimati. Nepal imports three million tons of vegetables from India.

Post-harvest loss

Fresh vegetables are highly perishable and need to be handled with care to avoid substantial post-harvest losses. The 25 percent to 50 percent losses while transporting from producer to retailer and above 30 percent of post-harvest loss occurs when transporting the vegetables from the farm to wholesalers, the losses increase to 50 percent as the products move to consumers (DFID, 2020).

Low access to financing

Lack of capital, skills, and knowledge is the main problem in the Nepalese farmer and agribusiness sector. Even though the government provides agricultural loans and subsidies, it does not reach real farmers and the agribusiness sector. To commercial and economic agricultural farming, smallholder farmers need big capital. Therefore, there needs to be easy access to finance or cooperation with low interest.

Lack of labour and land

Nepal is a hilly and mountainous country. Most of the land is covered by hilly land. Terai is the only place of cultivation of agriculture. There is a lack of land available for farming. Similarly, there is a shortage of skilled labour in Nepal. Even though unskilled labour per day price is high in comparison to India, the domestic vegetable price is high in comparison to the

imported ones. Agriculture has been hit hard by the labour shortage as it is difficult to find and hire labourers for further growth.

Inadequate growing techniques.

To increase fresh vegetable production, the current farming system needs to change in the implementation of new techniques and machinery, irrespective of the types applied. Two other necessary elements here are: 1) the extension of the vegetable season not only by using new cultivars but also using various techniques of implementation (hotbeds, greenhouse and plastic tunnels, etc.); 2) setting up anti-hail nets above orchards and plantations to ensure less vulnerability to weather conditions.

Strategy and Recommendation to Reduce the Trade Deficit in Fresh Vegetables

This strategic objective should be the goal of increasing volumes of production and achieving cost savings through economies of scale and consequently reducing the import of fresh vegetables. In the case of Nepal, most of the land is covered by hilly and mountain areas where the agricultural production are low and terai land needs proper management to cultivate in such a way that yields high productivity using modern tools and techniques. The following points surfaced through the study suggests that we need to focus on increasing the fresh vegetable production within the nation. The government should impose a policy like the "green revolution" to increase agriculture production.

Increase volume of production

To reduce the trade deficit in fresh vegetables, there should be an increase in domestic production. Government should provide a favourable environment for farmers and youth to engage more in the cultivation of fresh vegetables. Similarly, farmers should provide the training to grow fresh vegetables using modern tools and techniques, so there will be an increase in production with cultivation in limited land. The barren land should be utilized to grow fresh vegetables. The government should provide easy access to financing and technical knowledge of agriculture to unemployed youth and mobilize them to cultivate fresh vegetables. Government should strengthen existing commercial farming across the country and support the establishment of new commercial farming which will further support this objective by facilitating access to higher-quality planting materials without high import costs.

To promote off-season organic vegetables:

Government and stakeholders should encourage the farmer to farm off-season vegetables. The government, agricultural institutions, and experts should support polyhouse technology, drip irrigation, and conduct off-season vegetable production training for farmers. Commercialization of off-season vegetables is only possible through the mobilization of large groups of farmers in targeted commodities. Favourable land should be identified in large-scale or zone areas and farmers should grow seasonal vegetables on a large and

economic scale in Nepal. The increase of off-season fresh vegetables can reduce imports from other countries.

Expand the focus area for vegetable production:

The Prime minister agricultural modernization program (PMAMP) has launched different agricultural programs to increase agricultural production. PMAMP has categorized four different areas to grow and increase the agricultural product in the country. Pocket, Block, Zone, and Super zone are four areas where its area have different categories to grow agricultural product

	Area	Target	Progress
Pocket-Small commercial agricultural production centre development program	Minimum 10 hector	15000	6742
Block-Commercial agricultural production centre development program	Minimum 200 hector	1500	1227
Zone-Commercial agricultural production and treatment centre development program	Minimum 500 hector	300	177
Super zone- Large Scale commercial agricultural production and industries centre	Minimum 1000 hector	21	16

Source: PMAMP 2021

There is a need for providing integrated services to those production centres in terms of inputs, extension services transport, and marketing services. Promotion of commercial farming, proper land use planning, the provision of contract farming and collective farming, and irrigation facilities are also required. The government under PMAMP has the policy to build community seed banks, processing, grading, and packing units, marketing infrastructures, laboratories, chemical fertilizer industries, agricultural training centres, irrigation centres, research centres, and other infrastructure for vast development of the whole agriculture of the country. Such policy should be strongly implemented at the ground level so domestic production of fresh vegetables could be increased and less imported.

Introduce Pest Risk Analysis

Department of Food Technology and Quality Control (DFTQC) constantly monitors pesticide residue levels in food products (Koirala, P. and A.S. Tamrakar, 2008). The department of food and quality control (DFQTC) should strongly apply the standard of use of pesticides in fresh vegetables. Likewise, the government should define the standard use of pesticides in consumable vegetables. Nepal government and DFQTC have to strongly implement a policy that uses of high pesticides in fresh vegetables should be banned in importing to the country. The government should limit the use of pesticides in fresh vegetables which are imported. This could help to reduce the sharply increasing import of fresh vegetables in-country and smooth mobilization of domestic vegetables in the country.

Work with farmers groups and encourage forming their cooperatives

Fresh vegetable farmers should have a good nexus and association all over the country to share their ideas and problems. The National Center for potato, vegetable, and spice crop development association is there under the Ministry of Agriculture which provides guide and training to vegetable farmers. Government should mobilize such institutions for more production and smooth run of domestic supply chain management of fresh vegetables. Fresh vegetable growers should be encouraged to form their associations and cooperatives to bring out their collective voices and work together with support agencies within and outside the government. Farmer and farmer groups must become more nimble in responding to market trends, and this can only be accomplished by disseminating market research and promoting market-oriented production. The sector will benefit from improved coordination between the various actors involved in the value chain, including farmers, intermediaries, exporters, and researchers.

Control post-harvest losses:

Fresh vegetables are highly perishable and need to be handled with care to avoid substantial post-harvest losses. The 25 percent to 50 percent losses while transporting from producer to retailer and above 30 percent of post-harvest loss occurs when transporting the vegetables from the farm to wholesalers, the losses increase to 50 percent as the products move to consumers (DFID, 2020). The government should devise specific programs to reduce post-harvest losses by educating producers and harvesters about optimum harvesting time, harvesting techniques, cleaning, handling techniques, packaging, and transportation.

Support for improvement in logistic

Farmers normally use the traditional bamboo baskets and jute sacks for packaging fruits and vegetables. These are prone to damage during handling and transportation. Plastic crates, fiberboards, and other suitable packaging materials are better for the safekeeping of the goods. The government should encourage the setting up of packaging industries in the country with appropriate incentives and tax rebates. Farmers should be made aware of the benefits of improved packaging. This will help in import management without damage.

Provide market information services to farmer

Market information is very important in today's world to keep updating the price of vegetables. Government should fix the price of vegetables for farmers and markets. With the development of the internet and mobile, it is possible to know the prices of products at various stages of the supply chain with little effort. But, this requires supporting the farmers' association or organization and enabling them to be a part of the information collection and dissemination process. Apart from the vegetables, the market should be near residential areas where people have easy access.

Remove barriers of unofficial taxes and collect official charges at a single location:
The central and provincial governments should remove unnecessary taxes on the transporter. Transporters normally do not wish to challenge the illegal charges of paltry amounts and pay such charges silently but unwillingly. Exporters do not object to this as they recover it by including this as a cost in the final export price. But this sort of practice takes a toll on the competitiveness of traded goods.

Government should focus on the development of hybrid varieties:
Government and farmers should focus and research on hybrid varieties where vegetables can grow in large quantities. NARC or private institutions should take initiative to develop a hybrid. Government should implement such a policy to grow fresh vegetables on a large scale.

Support for export promotion and keep priority in National policy:
The government should include and keep priority fresh vegetables in Nepal trade integration strategy and five-year planning. The government should play a vital role to recognize and minimizing the non-tariff barriers to Nepalese vegetables and off-season vegetables for export promotion. The government should keep high priority in national policy and program every year to tackle the trade deficit in fresh vegetables.

Modernize and commercialization of Agriculture
The government should implement its policy like the Prime minister agricultural modernization program (PMAMP) all over the country. Farmers should adopt modern agriculture technology and the government should focus on the commercialization of agriculture. Modernize agriculture to optimize productivity within limited resources. Adopting best farming practices will be crucial for smallholders to attain higher yields. This will be achieved through a combination of policies, including the establishment and expansion of farmer field schools in major agricultural areas of the country.

Adopt modern tools, technology and invest in research to increase fresh vegetable
This strategic objective will also encompass activities aimed at increasing investment in R&D for the vegetable sector. R&D is crucially needed in several areas, such as improvement of crop varieties and methods to extend production seasons. It is necessary to adopt modern tools and technology in the agriculture sector for an increase in productivity with limited resources. The government should invest in research of seed, crop, or hybrid seed that increase the quality and quantity of fresh vegetables. Enhance the quality of vegetables and ensure food safety through improved technology, management, and quality control at a primary production level and in the post-harvest stages of the chain (distribution, logistics, processing).

Quality control / set up national standard quality in fresh vegetables

Nepal should develop national standard use of pesticides and chemicals in fresh vegetables. The excessive use of pesticides and harmful chemicals in fresh vegetables should be banned from importing to Nepal. Such policy should be strongly implemented by the government and all political parties should have a consensus on such policy and ban excessive use of pesticides and chemical vegetables that harm people's health. The Department of Food Technology and Quality Control (DFTQC) should monitor imported fresh vegetables on a regular basis.

Improve domestic Supply chain

There is no mechanism for domestic supply. Government should formulate a secretary-level mechanism to smooth the running of the domestic supply chain as international trade. During a corona pandemic, the fresh vegetables from India easily reached Kathmandu and major cities whereas vegetables from the countryside did not reach the market.

Expanding the domestic market for organic and safe vegetables

Organic vegetables are growing popular in urban areas. Such niche markets have the potential to grow in the urban sector and are less affected by imported vegetables. Bagmati, Gandaki, and Lumbini provinces have organic vegetable cultivation and production. An increase in education and awareness about health has increased the demand for organically cultivated vegetables in urban areas.

Increase investment in fresh vegetable research, development, and Innovation

It is necessary to invest in the research and development of a new variety of seeds, crops that can easily grow in Nepal's favourable environment, climate and soil. NARC and NAST other government institutes should focus on such research and innovation so the country can increase its production. The government should allocate a budget in the R&D of fresh vegetable agriculture or increase such scientific study so that the country will be economically strong.

Establish at least one government collection centre in each ward of a rural municipality to smooth market supply

It is necessary to set up a collection centre in each ward or rural municipality where there is a lack of access to markets and transportation. Farmers prefer to take their produce to market rather than sell it to traders. The visit to the rural centre provides them with the opportunity to know about the demand and supply of vegetables in the market.

Therefore, it is necessary to focus on the regular production of seasonal and off-season vegetables in the areas wherever feasible. All vegetable production plans should be as per the demand of the market. For this, assessment of vegetable market demand such as kind/variety and quantity of vegetables is necessary. The establishment of the vegetable collection centres needs to be at the production site and linkage has to be made with the vegetable traders. Side by side, a daily or weekly haat bazar system has to be developed for the regular supply of

vegetables for the local consumer as well as for local traders. Some arrangement is needed to import vegetables from foreign or neighbouring countries if local production cannot meet the regular demand for the vegetables in the market. Some cold storage structures need to be developed so that vegetables can be stored whenever there is overproduction. Government should focus on infrastructural development programs such as transportation facilities for transporting vegetables from one area to another or one region to other and from hills to Terai and vice versa.

How to Achieve these Strategies

- Implement all government policies, projects all over the country that increase production which helps to reduce the import of fresh vegetables and smooth run of the supply chain.

- Functionalize and make accountable to all the institutions related to agriculture under the Ministry of Agriculture and Livestock and Department of Agriculture.

- Encourage unemployed youth to engage in fresh vegetables agricultural production. The government should provide commercial farming training guidance and confidence in venturing into Agriculture for food security and income generation.

- The government should facilitate importing the new technique and tools for commercial farming and set up the fertilizer and pesticides industries within the country.

- The research institute should innovate the high-value seeds and crops that increase the production of fresh vegetables and easily provide to farmers. Agriculture experts should transfer modern knowledge and way of farming to farmers to increase production.

- Target selected area, Farmer's Groups should grow high valued Crops and should be provided with technical guidance to ensure successful outcomes. The government should organize this, based on their past study, research, and policy.

- Identify the Key actors in the vegetable sub-sector (Input suppliers, Farmers, and output traders) and develop their capacity in such a way that each actor will be able to perform their job effectively and efficiently for the increased production of vegetables.

- Identify functions and relations of those identified actors with a vegetable subsector map. Plan the vegetable production program based on identified opportunities and

constraints.

- Identify major constraints and opportunities in the vegetable sub sector and tap the opportunities and address the constraints for increased production.

Conclusion

Every year there is an increase in production and fresh vegetables are cultivated. There is also an increasing trend of importing fresh vegetables and growing population. A vegetable sub-sector study needs to be carried out across the country and based on the findings of the vegetable sub-sector study, production plans should be made and implemented. Similarly, to meet the demand and reduce the trade deficit, the government should bring the policy like the Prime minister agricultural modernization program (PMAMP) and strongly implement them. Government should provide all the facilities to grow commercial farming.

Commercial and economic farming should be focused and prioritized in the fiscal planning of the local, provincial and central governments. Apart from this, modern tools, technology, human resources with skills and knowledge for the betterment of agriculture should be imported for the increase of production of fresh vegetables and agriculture sector. Government should facilitate importing new technology and easily available fertilizer to farmers. All these levels of government should invest in systematic agricultural marketing and set up cold storage for the management of import fresh vegetables and domestically grown vegetables.

The cold storage and warehouse should be provided and priority should be given to store domestic vegetables produced within the country. It is essential to build infrastructure to store an excess of produce during flush seasons, and supply in lean seasons. Commercial farmers should be provided with easy access to financing for technology transfer. Government should provide proper facilitation of agriculture roads to send their products into the market. Agriculture experts, agricultural institutions, government, and other stakeholders should come together for proper study and research for holistic development, increase in agriculture output and reduce the trade deficit. In a country like Nepal with limited land area for cultivation of agriculture and a poor economy, there is no alternative to increase the production of fresh vegetables by adopting modern agriculture techniques and use of modern seeds that grow in Nepal favourable climate and soil with limited resources.

The government needs to formulate favourable policies in favour of all actors involved in the vegetable sub-sector at the central level while they can provide required support and services, monitor, supervise, and follow up the vegetable production program at the field level. Vertical and horizontal communication and forward and backward linkages can also be made by the concerned authorities at the district and provincial levels. Production incentives or creating a favourable environment for the local vegetable producers should be made in such a way that more numbers of farmers or producers will participate in a vegetable production program.

Arrangements for crop insurance against natural calamities. Production loans to vegetable growers at a reasonable interest rate. Initially, the government can subsidize interest rates and once they become professionally and technically successful in commercial vegetable farming, subsidies on loans can be withdrawn. Government should impose high taxes on the import of vegetables to stimulate local production. All stakeholders and government should create such an environment that the cost of production in producing vegetables within the country will be at a cheaper or lower rate than the vegetables imported from abroad. Only then can we reduce the trade deficit in fresh vegetables in Nepal.

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