Analysis of Efficient Supply Chain Models of Vegetables: Case of Nepal

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Abstract

The objective of this study is to analyze the supply chain of the vegetable sector in Nepal and explore the issues and challenges that are faced by different stockholders of it. Among agricultural production, vegetables are the second most important agricultural commodity for contributing to the gross domestic product of Nepal. In the context of the trade deficit and supply chain disturbances in vegetable products, this study has built up a supply chain model to recommend a policy for efficient vegetable supply chain development in Nepal. Based on the review of past papers and publications, the study found a shortage of production input, especially fertilizer, as a big problem for vegetable producers. Nepalese farmers are found insecure to find the right market and have trouble with pricing policy. Farmers have faced several problems in both vegetable production and marketing mechanisms from both input supply and marketing of vegetables produced. The study recommends enhancing commercial vegetable farming through the improvement of existing fresh vegetable supply chains in Nepal. Central and local governments should focus on the huge participation of local communities, financial institutions, private transportation services, and international multilateral agencies for the execution of such a supply chain model.

Keywords: *Farmers, Intermediaries, Price, Government intervention, Import, Export,*

1. Introduction

Agriculture is the backbone of the National economy, currently it contributes around 23.9 percent of GDP. Production of the Nepalese agricultural sector has increased by 3.2 percent in the past 2 decades (Economic Survey 2019/20). Around 60 percent of the population are engaged in the agriculture sector in Nepal (Economic survey, 2022). Although the agriculture sector has great potential to drive the overall economy, subsistence farming accounts for 75 percent whereas only 25 percent of farming systems are commercial. The subsistence practice of the production system shows low agricultural labor productivity and land productivity as well (Agriculture Development Strategy 2015 to 2035).

Unchecked imports of goods caused Nepal's trade deficit by 826 billion during 7 months

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of the fiscal year 2079/80. Import of agricultural commodities is growing continuously even in the year of good harvest. Study reflects that the shortage, coordination, institutional system, and processing might be indirect reasons for consistent import in Nepal. Nepal imports vegetables and fruits worth billions of rupees from India as well as China and Bhutan. Import of vegetables and fruits has been increased after lockdown in steady nature. Nepalgunj alone has imported agriculture produce mainly vegetables during the lockdown period around fifty million rupees from the international market while on the contrary the fresh and green vegetable produced by farmers in Banke has gone totally waste due to disruption in the supply chains due to stopping in the transportation during 1st lockdown. Thus, by realizing the significance of overall supply chain development, the Agriculture Development Strategy was formulated as an action plan for the development of agricultural productivities in Nepal for the next 20 years. The major objective of Agriculture Development Strategy is to develop the value chain of major agricultural commodities. Nepal can narrow down the trade deficit if policies are formed considering the supply chain of vegetables and other agricultural products.

1.2 Impulses for the study

There was some shocking news regarding the vegetable price and supply chain in the past few years. Lots of farmers of Jhapa, Kavre and Dhading have thrown their fresh vegetables like tomatoes, cucumbers, cabbages, and watermelon in the street due to lack of supply chain in fresh vegetables and fruits in May 2020 (The Rising Nepal, 12 May 2020) during first Covid 19 lock down due to the lack of transportation. Whereas Indian vegetables were imported and supplied to Nepalese market smoothly even in lock down without any restriction. Similarly, some dairy product farmers threw the milk on the road in May 2019 due to lack of market (The Rising Nepal, 14 May 2019). Recently there was another shocking news of Chitwan, Bharatpur Municipality- 25 that a farmer has thrown her 8 tractor vegetables like, Chilli, cucumber, bitter gourd in to Narayanghat Pulchowk street on 20th Magh 2079 (Himal Khabar Daily News Paper) due to low price. Such scenarios in Nepal indicate that supply chain mechanisms of agricultural products are poor and need a strong institution to regulate the production and supply of farm production especially in vegetables.

1.3 Market related challenges

There are several challenges to develop entrepreneurship. Challenges are both in input supply as well as product delivery and marketing. Market linkage as well as market intelligence are poorly developed. Due to this, farmers keep supplying vegetables in the market at throw away prices. Even if farmers decide not to sell their product, they cannot hold them for a long time due to lack of storage infrastructure. Poor post-harvest handling and limited or no value additions to the product are also the challenges faced by farmers in semi urban and rural areas (Sawtee, 2017). During the main season the price offered by traders to the farmers does not even cover the cost of production and farmers decide not to sell them and they rather incinerate vegetables in the soil. Such

scenarios are repeated every year. While farmers cannot sell their fresh vegetables in the main season, Nepal imported 55768 Metric tons of dried vegetables in 2015 (Thapa & Dhimal 2017). This scenario suggests to us the pitiful scenario of value addition through processing. Consumers are paying a high price for the vegetables and farmers are not paid the proper share of the price. The lower price received by producers amid higher price at the market might have been due to the inefficient marketing system, poor post-harvest handling and limited or no value addition (Pokhrel, DM 2010). Despite having different issues from production, value addition to marketing; commercial vegetable farming and proper marketing is one of the potential sectors for import substitution as well as export promotion. Exploration of existing problems in different stages of the value chain is necessary to make recommendations for enhancing agricultural entrepreneurship in Nepal.

2. Objectives of the study

The general objective of the study is to prepare efficient supply chain models of vegetables integrating different levels of government agencies, cooperatives, and the private sector.

The specific objectives are:

a. To develop a supply chain framework in which local, provincial and federal governments can facilitate and promote the supply chain of vegetables.

b. To restate the role of the cooperative sector in supply chain and value addition of agro- products.

c. To prepare a policy framework to attract organized private entities in marketing agro-products and make them responsible to farmers and consumers.

3. Significance of the study

Under the operating supply chain process of vegetables, there is a great gap between the price that farmers receive in their farmland and the retail price that is paid by consumers. From this, farmers are not getting fair prices for the products and on the other side, consumers are exploited due to price hikes. The role of government agencies acting upon existing policies has not been able to control the regular but unfair participation of market intermediaries. Similarly, the second parties of the market, market intermediaries are generally individuals, and their performances are not under the supervision of any regulatory body. In such circumstances, the formation of an efficient and fair supply value chain model will support and guide the authority to regulate the market practice for overall welfare in the society.

4. Literature Review

Marketing is defined as the various socio-economic activities that control the flow of goods and services chain from producer to consumers (Hillstrom & Hillstrom, 2002). Marketing is also the design of plans and projects, the principles of pricing, promotion

and supply of goods, services, and ideas to fulfill needs and desires of persons and organizations (Carter, 1997). Logistics also explains that the major entities of the market supply chain are storage, transportation, market creation, funding arrangement and design of the supply chain. Transportation is one of the main components of logistics (Tseng, Yue,and Taylor, 2005), Physical facilities and infrastructure arrangement in all types of markets are far from satisfactory (FAO, 2001). Due to perishability, farmers and marketers are losing a bulk of their vegetables each year in Nepal (Bhattarai et al., 2005). Seasonal excess supplies, unavailability of warehouses, transportation management are common problems during normal production season (Mishra and Kumar, 2012). Value chains are controlled by firm leaders and chains contain several layers, each of which has a particular functional strategy in transforming the raw materials to final goods and services of consumption.

5. Methodology

The study largely depends on analysis of different entities of the supply process in the market. The supply chain is based on sound reference of the literature and current market practice. For that, a number of desk reviews bring the real supply chain practice in the market and its layers. Similarly, supporting agents of agricultural development like state and local government, financial institutions, cooperatives, international agencies such as World Bank, ADB and IMF etc. are studied in terms of their contribution in supply chain mechanism. Secondary data is used from reliable sources. Moreover, international practice of supply chains of vegetables is also incorporated in the study.

5.1 Study area and tools for analysis

Secondary data has been used in the study. Primary information is gathered from different vegetable production areas contributing as the backward linkage areas of Kalimati Wholesale Market for Fruits and Vegetables. Various secondary sources such as articles, census data, and global trends in relevant sectors are reviewed and analyzed before designing the Supply Chain tool.

6. Discussion

6.1 Facts about the farm products

In the year 2011/12 total cultivated area was 245,037 Ha. Yielding 3298816 Mt of agricultural production with 13.46 Mt/ Ha. Productivity. After ten years, the total cultivation area increased to 284121 Ha. Yielding 3993167 Mt of products with 14.05 Mt/Ha productivity. There are no significant changes in terms of production and productivity.

Vegetables are the second most important crop contributing 13.2 percent in AGDP. The commercialization rate of vegetable farming is growing day by day. From the area of 286864 Ha, 3958230 Metric tons of vegetables were produced last year with the productivity of 13.8 Metric ton/ha (ADS 2015, MOAD 2075 and Agriculture diary

2075). There is a steady increase in the area as well as in the production of vegetables in the country. Compared to 2011/2012 with 2020/2021. However, at present we are importing many vegetables both in fresh and preserved forms. But we also have a comparative advantage of off-season and offside vegetable production due to a wide range of topographic and climatic variation. Farmers in the eastern hill of Nepal grow vegetables to supply in India and Bangladesh (Sawtee, 2016). Vegetables harvested from small areas can generate more revenue compared to the cereals crop harvested from the same area. Rice harvested from 31 percent of total harvested area in the country contributes 19 percent of AGDP whereas vegetables harvested from less than 10 percent of total harvested area contribute 13.2 percent of AGDP. Despite the increase in cultivated area as well as total production of vegetables in Nepal, the yield per unit hectare of land is not impressive. According to the ADS assessment report there is still a 3 Metric tons of yield gap between current yield and potential yield. A lower yield per unit area as well as a high volume of import of vegetables in fresh as well as preserved form indicates the problems in production as well as value addition.

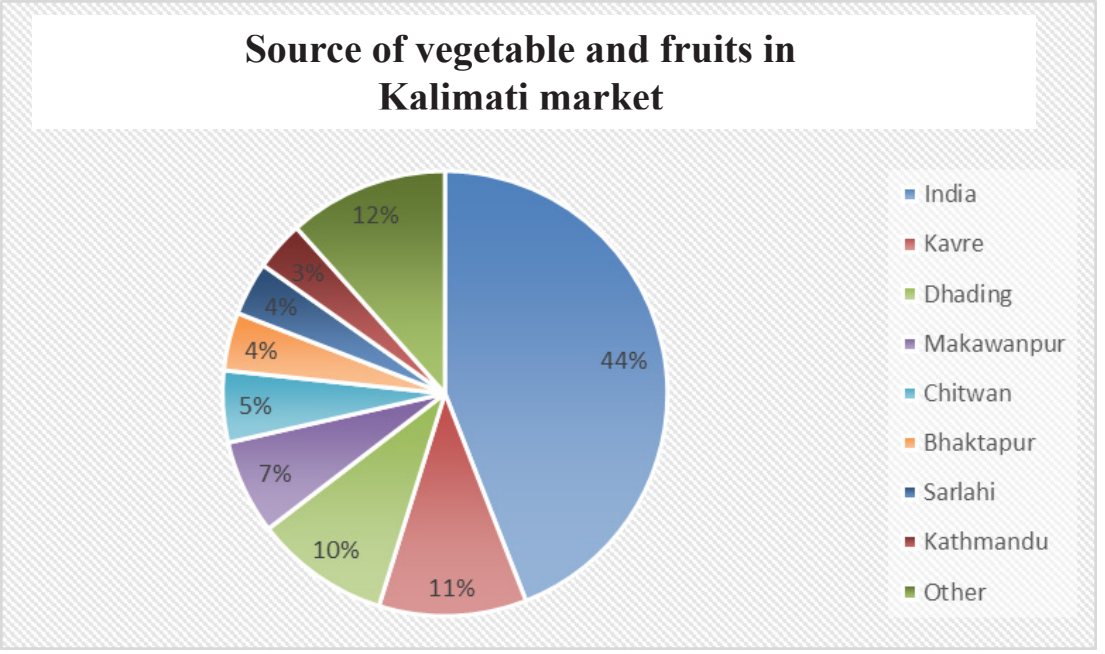
S.N.	Year	Area (Ha.)	Prod (Mt.)	Yield (Mt./Ha.)
1	2011/12	245,037	3,298,816	13.46
2	2012/13	246,392	3,301,684	13.40
3	2013/14	254,932	3,421,035	13.42
4	2014/15	266,937	3,580,085	13.41
5	2015/16	280,807	3,929,034	13.99
6	2016/17	277,393	3,749,802	13.52
7	2017/18	286,864	3,958,230	13.80
8	2018/19	297,195	4,962,383	14.37
9	2019/20	281,132	3,962,383	14.09
10	2020/21	284,121	3,993,167	14.05

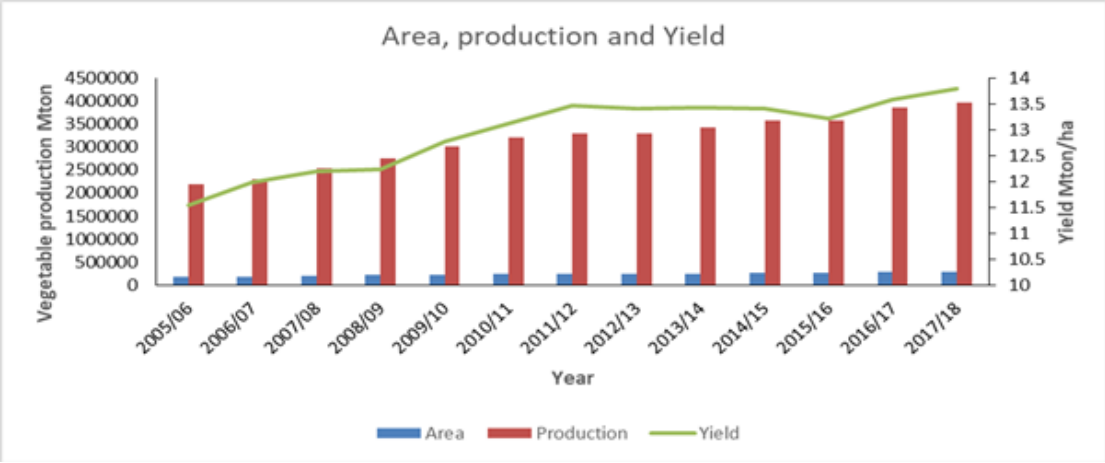
Source : Statistical information on Nepalese Agriculture 2077/78 (2020/21).

Area as well as production of vegetables in Nepal has been increased. The area covered by vegetable cultivation in 2017/2018 (286864 ha) is 51 percent more than that of 2005/2006. Similarly, the production of vegetables in 2017/2018 (3958230 Mt) is 81 percent more than that of 2005/2006. However, according to the latest available data from the Ministry of Agriculture and Livestock Development of Nepal, the total

vegetable production in Nepal during the fiscal year 2019/2020 was around 6.3 million metric tons. This represents a significant increase from the previous year's production, which was around 5.5 million metric tons. The major vegetables produced in Nepal include tomatoes, potatoes, cauliflower, cabbage, beans, peas, onions, garlic, and chilies. The highest vegetable producing regions in Nepal are the Terai and mid-hills regions. The Terai region produces around 45 percent of the total vegetables produced in the country, followed by the mid-hills region which produces around 35 percent of the total. However, it's important to note that vegetable productivity in Nepal can be affected by various factors, such as weather, pests and diseases, and infrastructure. The government of Nepal has been implementing various programs and policies to support vegetable farmers and improve their productivity in recent years. The increase in area as well as production of vegetables is not enough to reduce the import of vegetables from other countries. In the last 12-month vegetables worth 28665129000 NPR has been imported to Nepal while exporting vegetables worth 1432535000 NPR with trade deficit of 27232594000 NPR.

Figure showing area, production, and yield of vegetables in Nepal since 2005 to 2016/17.





Kalimati fruit and vegetable market run by Kalimati fruit and vegetable market development committee is the main vegetable and fruit market in Kathmandu valley. Out of the total incoming agricultural produce in the market 85.67 percent was vegetable in 2074/2075.

Major districts contributing vegetables to this market are Kavre, Dhading, Makawanpur, Chitwan, Bhaktapur, Sarlahi and Kathmandu. Vegetables and fruits from India account for 44 percent of 227675 Mt. Besides India, Kavre, Dhading and Makawanpur supply around 30 percent of the total vegetable supply.

6.2 Imports of Vegetables and other agricultural products

Agricultural imports of Nepal can be affected by various factors such as trade policies, exchange rates, and global market conditions. According to the latest available data from the Nepal Rastra Bank, the total value of agricultural imports to Nepal during the fiscal year 2020/2021 was around NPR 231.34 billion (approximately USD 1.96 billion). The major agricultural products imported to Nepal includes:

Cereals: Nepal imports a significant number of cereals such as rice, wheat, and maize to meet the domestic demand. During the fiscal year 2020/2021, the value of cereals imported to Nepal was around NPR 117.56 billion (approximately USD 997.25 million).

Pulses: Nepal also imports pulses such as lentils, chickpeas, and beans to meet the domestic demand. During the fiscal year 2020/2021, the value of pulses imported to Nepal was around NPR 9.83 billion (approximately USD 83.37 million).

Edible oils: Nepal imports a significant number of edible oils such as soybean oil, palm oil, and sunflower oil to meet the domestic demand. During the fiscal year 2020/2021, the value of edible oils imported to Nepal was around NPR 25.98 billion (approximately USD 220.57 million).

Fruits and vegetables: Nepal also imports a significant number of fruits and vegetables

such as apples, oranges, grapes, and onions to meet the domestic demand. During the fiscal year 2020/2021, the value of fruits and vegetables imported to Nepal was around NPR 11.68 billion (approximately USD 99.12 million).

Dairy products: Nepal also imports dairy products such as milk powder, butter, and cheese to meet the domestic demand. During the fiscal year 2020/2021, the value of dairy products imported to Nepal was around NPR 23.74 billion (approximately USD 201.28 million).

7. The supply chain model

A functional model of the supply chain which comprises collection and distribution channel, marketing channel, funding channel and operational channel is discussed below

7.1 Collection and distribution channel

According to the figure, Central Marketing Corporation is the main regulatory body of the supply chain. Under the regulation of Central Marketing Cooperation, the Regional Marketing Unit makes a supply chain in small units. In the initial stage two major collection centers like collection units in local areas (Dhading) and major cities (nearby markets like Naubise) will collect the farmer's product from local or farming areas. Both 1st phase collection centers, collection units in local areas (Dhading) and major cities (nearby markets like Naubise) supply its collection in Kathmandu (capital city) or collection units (in each local area) make the supply chain into both cities of district head-quarters.

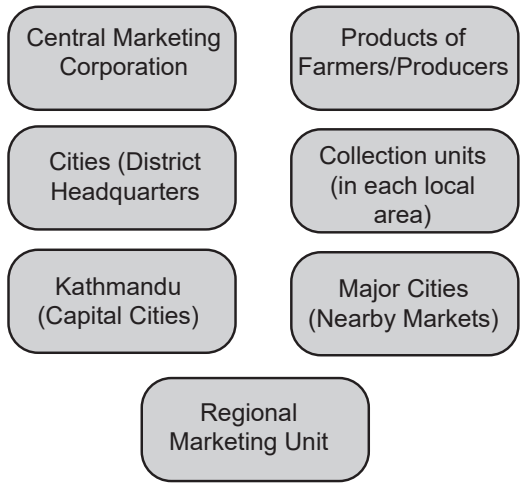


Figure: Collection and Distribution Channel

7.2 Marketing channel

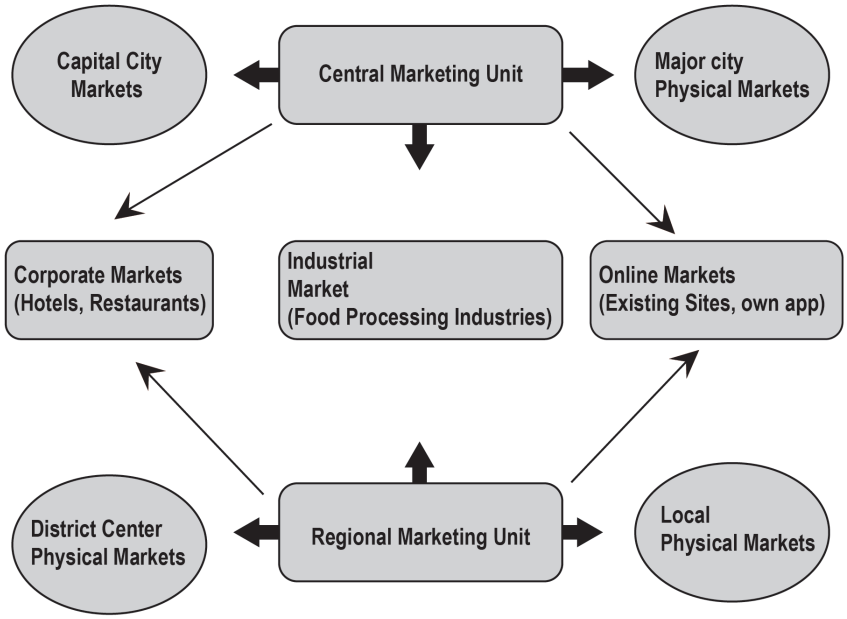


Figure :Marketing Channel:

Above figure shows the purpose model of the marketing channel in the Supply chain in Nepal. Central Market Unit collects all vegetables and fruits from Major cities physical market and Capital City's Market. After the collection of vegetables Central Marketing Units makes its supply chain into:

i) Corporate Markets in Hotel and Restaurant,

ii) Industrial market (food processing industries),

iii) Online markets (Existing Sites, own app) for demand creation.

Another entity of the market is the Regional Marketing Unit that collects the vegetables from Local Physical Market and District Center of Physical Market. It further makes supply of its collection into

i. Corporate Markets in Hotel and Restaurant,

ii. Industrial market (food processing industries),

iii. Online markets (Existing Sites, own app) for demand creation.

7.3 Funding and investment channel

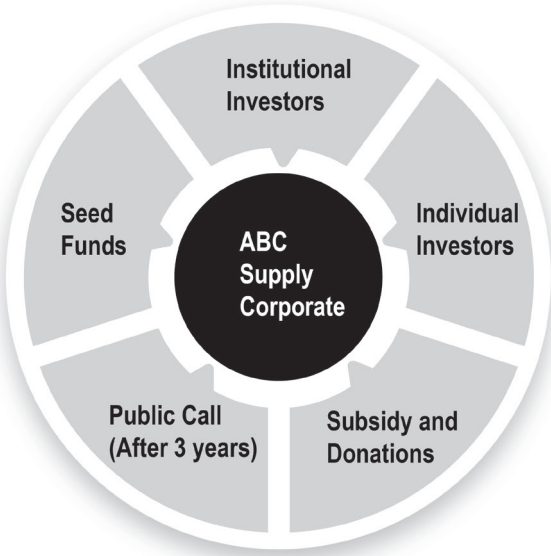


Figure: Funding and Investment Channel

In the above figure, I have shown the financial mechanism for supply chain development. There will be a company that operates under the company act for maintaining the demand and supply chain smoothly. ABC Company is the authentic Supply Corporation Ltd. their various multilateral and bilateral as well as inter and external Donor agencies will provide the initial set up fund as seed fund. There will be the provision of institutions like bankers and other organizations of the country. Individual people can make investments in ABC Company Ltd. To establish and for sustainable development of the supply chain the government should provide the subsidy either in tax or in seeds fund. After 3 years working in the supply chain development ABC Company Ltd can call general people by issuing its share into the Primary market.

8. Miscellaneous

There are unchecked imports of vegetables from neighbouring countries. The quarantine testing mechanism as per the legal provisions has not been implemented seriously. The health status of Nepalese people is ignored by this rampant act. On the other hand, Nepalese farmers are not able to get the market. They throw away their products in the street because of a lack of market or very low prices. It seems that the government of Nepal is not paying attention to formalizing the agricultural market. No supply chain has been formulated yet which could endorse social justice. Middlemen are gaining much more than the farmers. Market mechanism is totally obstructed. If the government does not pay heed to this issue, the Nepalese economy will be destroyed in the years to

come. Proper supply of fertilizers and insecticides is not assured. The limited farming blocks are also devoid of such inputs.

In order to overcome all such anomalies, the government needs to activate the policy of private, public, and cooperative partnership model. Cooperatives will be made more responsible on this issue because cooperatives are formed by the local farmers. The culture of production will be instilled and made widespread if all such arrangements are made. The assurance of public welfare is the prime concern of the government in the modern time.

9. Conclusion and recommendation

Producers who are producing fresh vegetables in comparatively small land holding areas indicated that availability of input and agricultural finance at subsidized rates could help them expand their business. Value addition practice at the producer's level is rarely found. However, many producers are doing value addition by grading their product. The price of vegetables produced by farmers has been found to be fixed by traders operating in local areas in consultation with the traders at major cities. Since there are no storage structures near the production areas, farmers have to sell their produce immediately after harvest at a price paid by traders. There is a big gap between farm gate price received by farmers and retail price of farmer’s product paid by consumers due to the presence of intermediaries. The difference ranged between farm gate price received by farmers and retail price of farmer’s product paid by consumers ranges from Rs.25 to Rs. 90. Such big gap is created by the middlemen. Marketing through local collection centers is limited as facilitators to gather traders and farmers in one place for competitive market practice. The collection centers are just trying to ensure that farmers are getting money for the sale of their produce at a price fixed by local traders in consultation with traders in major towns. Shortage of production input, especially fertilizer, is a big problem for the producers. Government, as per the established development model (public, private and cooperative sectors are the pillars of the Nepalese economy). Cooperatives are recommended to extend their services to enhance the justful supply chain of vegetables. Government can regulate the model strictly so that domestic farmers would benefit, which ultimately ensures extended social welfare in the nation.

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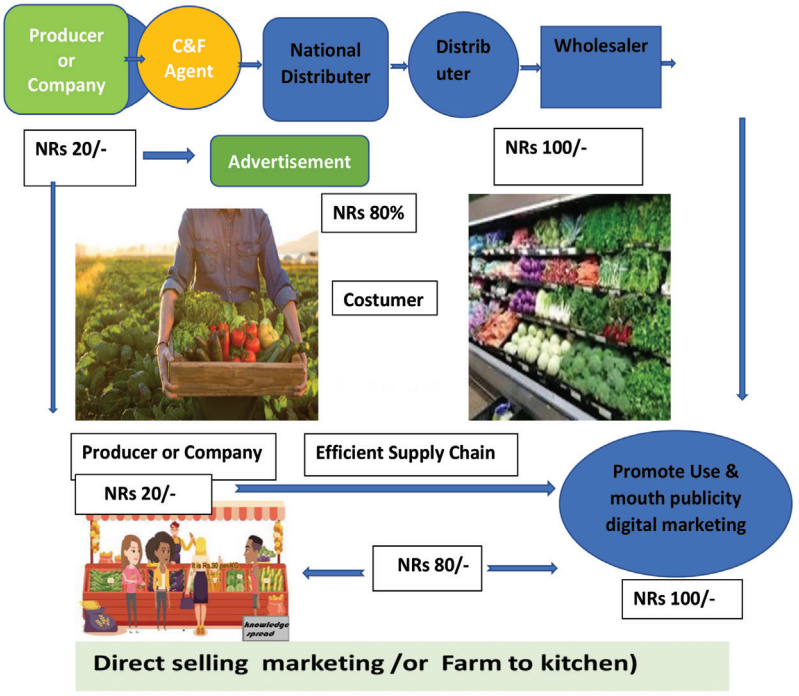
ANNEX-1

Direct Selling Vs Traditional Marketing:



ANNEX-2