

DETERMINANTS OF PRODUCTION AND MARKETING OF VEGETABLES IN KAILALI DISTRICT OF NEPAL

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ABSTRACT

The objective of this study was to find out the existing vegetable production and marketing practices in the Kailali district of Nepal. A total of 100 vegetable growers were selected using a simple random sampling technique. Data collection was done by using a semi-structured interview. Secondary data was collected from the reports and journal articles. Indexing techniques and descriptive statistics were used in this study. It was estimated that the average size of a household's landholding was 0.1689-0.337 hectares. Forty-eight percent of the households earned NRs 1,00,001-2,00,001/year from vegetable farming. About 93% of the farmers were interested in off-season vegetable production. Around 45% of households used different fertilizers, namely urea, DAP, and MOP. Insect and disease attacks (index value = 0.82) were the major problems. Aphid (index value = 0.818) and blight (index value = 0.768) were reported as the major pest and disease, respectively. About 47% of farmers grew hybrid seeds. Farmers sold their products in India (50%), Dadelhdhura (30%), and local markets (20%). The management of insect pests and diseases, access to chemical fertilizers and hybrid seeds, and the provision of offseason vegetable production training to farmers are necessary for the promotion of commercial vegetable production in the district.

Keywords: Commercial vegetable production, Insect and diseases, Hybrid seeds, Income, Off-season vegetable production

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INTRODUCTION

The agriculture sector in Nepal plays a vital role in meeting the basic needs of the people. It employs 60.4% of the total population and contributes approximately 26.5% of the gross domestic product (GDP) (MoALD, 2019). Horticulture is the emerging sector of agriculture in Nepal, providing income and employment to a wide range of farmers and traders with the production and management of fresh fruits, vegetables, flowers, and ornamental plants (Shrestha et al., 2016). Within horticulture, vegetable production has great scope for the improvement of the farm economy (Gurung et al., 2016), including the enrichment of the family diet. Fresh vegetables contain a high number of vitamins, carbohydrates, protein, minerals, and fiber, making them essential for good health (Van Duyn and Pivonka, 2000). The demand for vegetables is increasing as it provides not only an integral part of daily food but also a component of a balanced diet, providing nutritional security (Rai et al., 2019). A wide range of agro-ecological variations in Nepal creates a comparative advantage to produce different vegetable crops. At present, more than 200 vegetable species are grown in the different climatic zones of Nepal, out of which fifty species and their varieties are grown commercially (Shrestha et al., 2004). The diverse ecological niches provide an opportunity to produce and supply fresh vegetables throughout the year in Nepal, which is extremely beneficial in terms of nutrition, employment, and income generation.

Vegetable farming makes effective use of land. Most vegetables are short-duration crops, so 3 to 4 crops can be harvested from the same plot of land in a year. It is more labor-intensive than cereals, having the potential to employ seasonal workers. Vegetables are high-yielding and fetch good prices compared to cereals, and hence can stimulate sub-urban employment along with women's empowerment (Shakti, 1995). Commercial vegetable production creates additional employment opportunities in postharvest operations, particularly in transportation, processing, packaging, and marketing. Vegetables grown in Nepal also have export potential (Dinham, 2003), as there is the prospect of exporting fresh vegetables to the Gulf countries. Vegetables grown in the high land of Nepal can also be exported to Bangladesh, India, Sri Lanka, and Pakistan as off-seasonal products to these destinations. Vegetable production supports the establishment of agro-based industries, as it provides raw materials for such industries. Canning industries use tomatoes, peas, and beans; the pickling industry can use cucumbers, chilies, cauliflower, and alcohol and starch extraction industries make use of potatoes, sweet potatoes, and yams (Singh et al., 2014). On a total of 15,300 hectares of land, farmers in the Kailali district produce roughly 233,000 tons of vegetables per year. According to the District Agriculture Development Office, winter vegetable crops are grown on 5,300 hectares, while the area under spring and summer vegetable crops is 2,700 hectares and 2,300 hectares, respectively. During the winter, potatoes are the main crop that covers nearly 5,000 hectares of land (Budhayer, 2018).

To enhance the production of various types of vegetable crops, financial subsidies and technical assistance programs are being provided to farmers in this district (Budhayer, 2018). However, the vegetable production in the district has been constrained by various technological and socioeconomic factors, as elsewhere in Nepal. Joshi and Piya (2021) reported that various socio-economic factors such as caste, ethnicity, gender, family size, education level, land holdings, and income source are responsible for the adoption of commercial vegetable farming in Nepal. However, the specific information specific to this district and the region is scanty. Therefore, this study was carried out with the objective of identifying key socio-economic factors affecting vegetable production and marketing in the Kailali district of Nepal and the entire Sudur Paschim Province, in general.

MATERIALS AND METHODS

Study site

For this study, Dhangadhi Sub-Metropolitan City in the Kailali district was purposefully selected. Dhangadhi is the provincial headquarter of the Sudur Paschim Province and hence has ample opportunities and basic infrastructure for the marketing of farm products, including fresh vegetables. Moreover, it is also the border town of the district with India and has the potential to export fresh vegetables to nearby Indian markets. This Sub-Metropolitan city extends over a 261.75 sq km area with a total population of 204,788 (CBS, 2021).

Sample size

The total number of households in Dhangadhi sub-metropolitan city is 29143 (NepalArchives.Com, 2021). Among them, around 70% were engaged in agriculture, and the rest were in government jobs, business, and so on. One hundred households were chosen randomly from that 70% population for this study.

Data collection

The primary data was collected using a semi-structured questionnaire. Primary data was used to examine the relationship between vegetable production and income generation. In this survey, 100 respondents were randomly selected from among the vegetable growers in Dhangadhi sub-metropolitan city. Secondary data was collected from various sources such as books, journals, published articles, and reports published by the cooperatives and various institutes and organizations.

Indexing technique

Farmers' perceptions of problems in vegetable production and marketing were assessed using a 5-point scale (1.0, 0.8, 0.6, 0.4 and 0.2) representing very high, medium, low, and very low importance, respectively. The respondent's position on the continuum is indicated by this total score (Ghose, 1981; Kerlinger, 1983). Using the formula below, the index of importance is calculated.

$$I_{imp} = \sum (s_i f_i / N)$$

Where,

I_{imp} = Index of importance,

\sum = Summation

s_i = Scale value,

f_i = Frequency of importance given by the respondents

N = Total numbers of respondents.

Data analysis

The collected and coded data were arranged in different forms such as charts, tables, diagrams, pie charts, and graphs. Descriptive statistical tools like mean, frequency, and percentage (%) were used for data analysis. The collected data was analyzed using SPSS 21 (IBM Corp., Armonk, NY, USA) and Microsoft Excel 2016 (Microsoft Corp., Redmond, WA, USA). The findings were logically interpreted, and the necessary conclusions were drawn.

RESULTS AND DISCUSSION

Vegetable crops produced in the study area

In the study area, almost 40% of respondents cultivated mainly tomatoes, and 35% cultivated both tomatoes and cauliflower, while only 25% of the respondents cultivated cauliflower only. The market price of tomatoes and cauliflower during the offseason is higher; therefore, the number of farmers growing these vegetables is increasing. Pokharel (2021) found that tomato cultivation was more profitable with a B/C ratio greater than 1, i.e., 2.15.

Personal factors in vegetable production

Gender

Both genders were found to be involved in vegetable farming. However, the involvement of females in vegetable farming was found to be higher (63%) than that of males (37%). Women play a significant role in land preparation and the marketing of vegetable produce in Nepal (Joshi and Kalauni, 2018), which allows them to be self-sufficient, and independent, increase their capabilities and improve their social status in their families and communities (Rai, 2017).

Age

The age group of 25-35 years was found to be the most involved in vegetable farming (37%), which indicated that younger generations were more involved in vegetable farming. The age of farmers affects the degree of adoption of innovations in farming, and this is one of the determinants of vegetable production (Adeoye, 2020). It is less likely for aged farmers to embrace technological modifications in their farming systems (Dang et al., 2019).

Education

Among the respondents, 20% were found to be illiterate, while 80% were literate, and 33% of the respondents reported that they had passed intermediate level. The assessment of the education level of farmers was also carried out by Khan et al. (2020) and Adebayo and Oladele (2013), Verma et al. (2018), Saini et al. (2017), and Maurya et al. (2017). The findings revealed that illiterate people contributed to agricultural production as well, but due to a lack of technical knowledge and new innovations, they continued to use outdated practices that hampered vegetable production. They must be trained and kept updated with new practices and methods to increase production.

Family size

The family size of the respondents varied from less than 3 to more than 9 members. 46% of respondents had a family size of 6–9, while 39% of respondents had a family size of 3-6, and only 4% of respondents had less than 3 family sizes in the study areas. All family members were engaged as laborers in vegetable farming. The majority of households had a large family size in this study. Households with a large family size may be a readily available labor source. As a result, household members may be a ready source of labor for farm work. Family size determines the availability of laborers for the production process and thus is a determinant of vegetable production.

Vegetable production land area

The landholding size per household is given in Figure 1. It shows that vegetable production is lower, not due to fewer farmers engaged in it but due to the small size of landholdings. So, the farmers require innovative farming practices to increase the production per unit area of their small piece of land. The size of the land is a very important factor in vegetable production (Abur, 2014; Umar and Abdulkadir, 2015; Zalkuw et al., 2014). Vegetable production totally depends on the size of the land. Higher production can be achieved from a larger area of land, and lower production can be achieved from a smaller area of land.

Farmers' interest in training on seasonal and off-seasonal vegetable production

The results revealed that 93% of the respondents were interested in off-seasonal farming and 7% were interested in seasonal farming. This reveals that farmers were interested in off-season vegetable farming, but only a few (40%) had received proper training. So, for the promotion of commercial vegetable farming, the provision of technical training and adequate backstopping were found to be the prerequisites.

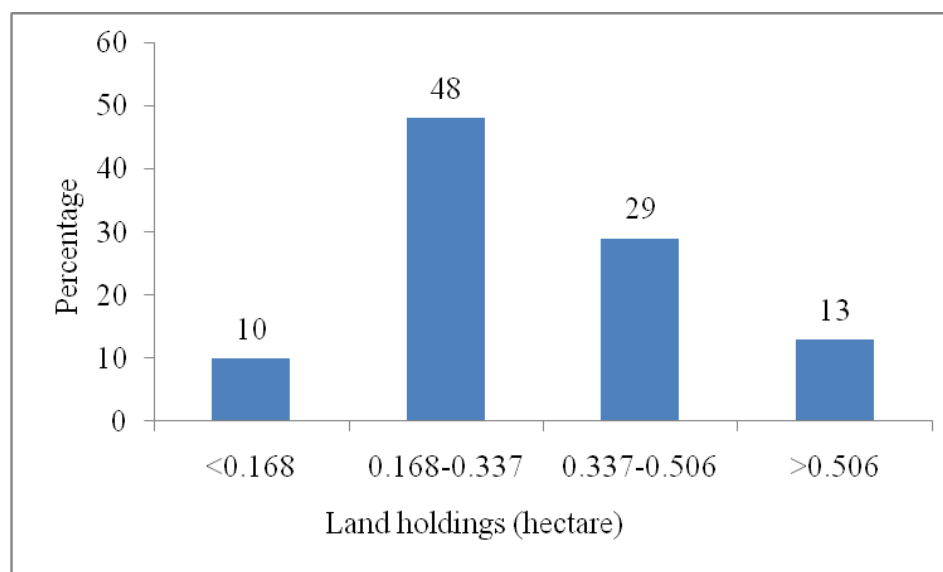


Figure 1. Land area under vegetable production in the study site

The occupation of respondents

About 61% of the households in the study area were farmers, while 38% were wage workers, and 1% were engaged in services. This shows the wage labor surpluses in the study site, which can be utilized in farming if the vegetable sector is well commercialized. If the farmers were provided adequate technical support services and training, there were ample chances for commercial production of vegetables in the study district. The majority of people are involved in agriculture as the primary occupation in Nepal (Durbar, 2014).

The annual income of respondents

Almost half of the respondents (48%) had an annual income of between NRs 1 and 2 lakhs. Another 29% had an annual income of between NRs. 2-3 lakhs. Another 13% had an annual income greater than 3 lakhs and 10% had an annual income of between NRs. 50000 to NRs. 10000 (Fig. 2). The source of this annual income is from selling vegetables.

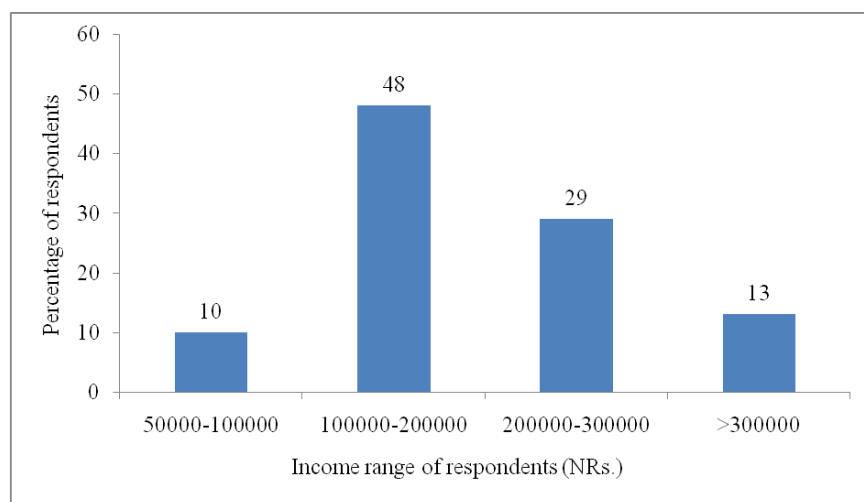


Figure 2. Average annual income of the respondents

Distribution of respondents based on their total profit

The distribution of the respondents based on their annual net profit derived from their vegetable farming has been presented in Table 1. This shows that vegetable farming is very supportive of improving the economic status of the farmers in Dhangadhi sub-metropolitan city. Intensive vegetable farming is aiding in income generation (Mariyono et al., 2020).

Table 1. Distribution of respondents based on their annual net profit

Total Profit (NRs)	Frequency	Percentage
55000-150000	37	37
150000-250000	35	35
250000-350000	16	16
350000-450000	8	8
450000-550000	4	4

Technical factors of vegetable production

Types of seeds used by the respondents

In nearly half of the farm households in the study area, 47% used hybrid seeds for vegetables. The high preference for the hybrid seeds was due to their high productivity and fast-growing nature. About 45% of the farm households used both the hybrid and local seeds. Only 8% of respondents used hybrid and improved seeds. Because of the higher productivity of hybrids, farmers are more willing to grow hybrid vegetables. The use of hybrid varieties of vegetables and crops is increasing in

Nepal due to their high productivity and the availability of such seeds in agro-vets (Bashyal, 2021).

The type of chemical fertilizer used by the respondents

About 45% of farm households applied the combination of the most available chemical fertilizers, namely urea, DAP, and MOP. This indicates that nearly half of farm households are aware of the importance of using nitrogen, phosphorus, and potassium in vegetable crops in a balanced manner. It was interesting to note that nearly 40% of households did not use any chemical fertilizer, while 7% of households used only urea, and 9% used a combination of urea and DAP (Figure 3). However, the reason behind not using any fertilizer was primarily due to its unavailability. The frequency of no application of chemical fertilizers was found to be due to the unavailability of chemical fertilizers in the local market. Chemical fertilizers are used more than organic ones nowadays and have an adverse effect on the environment (Savci, 2012).

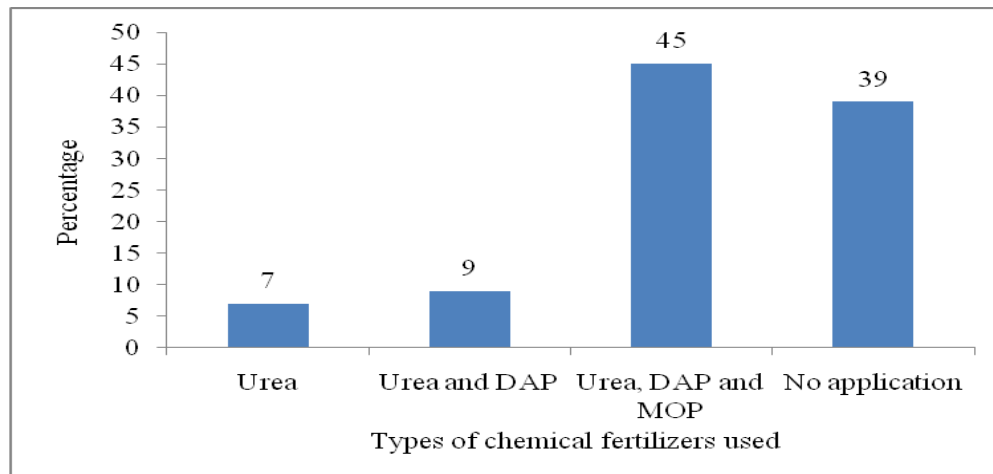


Figure 3. Chemical fertilizers used by respondents

Marketing factors of vegetable production

Marketing channel

According to Acharya and Agarwal (1999), agricultural marketing includes all activities involved in the supply of farm inputs to farmers and the movement of agricultural products from farmers to consumers. At the study site, many actors were involved in the production and marketing of vegetables. The farmers of Dhangadhi sub-metropolitan city sold their produce in markets through different channels as described below.

Channel 1: Grower → Pre-harvest contractor → Commission Agents → Retailer → Consumers

Channel 2: Growers → Wholesalers → Commission Agents → Retailers → Consumers

Channel 3: Producers → Middlemen → Collection centre → India

Channel 4: Growers → Retailers → Consumers

Channel 5: Growers → Producer representative → Export → India

Various marketing channels were identified by Bhandari et al. (2021) in tomato. The distribution of marketing channels in the study site is given in Table 2. Channel 2 is the most common on survey sites. The production goes from growers to wholesalers, wholesalers to commission agents, commission agents to retailers, and finally from retailers to consumers (Table 2). Here, the commission agents are dealers, who buy produce from the farmers and then supply it to retailers.

Table 2. Distribution of marketing channels in study site

SN	Types of marketing channels	Frequency	Percentage
1	Channel 1	30	30
2	Channel 2	35	35
3	Channel 3	15	15
4	Channel 4	12	12
5	Channel 5	8	8

Sales volume and market location

The respondents of the study area sell their products in India (50%), and nearby districts, particularly Dadeldhura (30%). Interestingly, only 20% of the vegetables grown at the study site were sold in local markets.

Ranking of problems with vegetable production

Insect/pest and disease attack was the most severe problem, followed by market, technical know-how, irrigation, and financial problems with index values of 0.82, 0.66, 0.59, 0.5, and 0.42, respectively (Table 3). Financial issues being the least severe, this shows that farmers have enough savings for capital investment. Though finance was not the limiting factor for the farmers in Dhangadhi to move forward with the commercial production of vegetables, various authors have identified financial limitation as the number one bottleneck of commercial farming, followed by inadequate market infrastructures such as market information systems, storage facilities, stable market price, and quality assurance services along with technical support services (Joshi and Piya, 2021; Kharel et al., 2021).

Table 3. Ranking of major problems faced by the respondents

SN	Problems	Index value	Rank
1	Insect and disease	0.82	I
2	Market	0.66	II
3	Technical	0.59	III
4	Irrigation	0.5	IV
5	Financial	0.42	V

Insect pests of vegetables

The farmers in the study location reported that aphids, fruit flies, fruit borer, whitefly, and white grub were the major nuisances to their vegetable crops (Table 4). Aphid was the most severe for them, followed by fruit fly, fruit borer, whitefly, and white grubs, each with index values of 0.818, 0.632, 0.544, 0.53, and 0.486 (Table 4). Insect pests are one of the factors affecting vegetable production (Thapa et al. 2021). Moreover, Jha and Regmi (2009) also found that the incidence of pests has increased in commercial fields.

Table 4: Severity index of major pests identified in the study area

SN	Insect problem	Index value	Rank
1	Aphids	0.818	I
2	Fruit fly	0.632	II
3	Fruit borer	0.544	III
4	White fly	0.53	IV
5	White grubs	0.486	V

Diseases of vegetables

The major diseases found in the study villages in vegetable farming were blight, downy mildew, powdery mildew, damping off, and wilt. Blight was found to be the most severe, followed by downy mildew, powdery mildew, damping off and wilt with index values of 0.768, 0.638, 0.586, 0.542, and 0.46, respectively (Table 5).

Table 5. Severity index of major diseases identified in the study area

SN	Disease problem	Index value	Rank
1	Blight	0.768	I
2	Downy mildew	0.638	II
3	Powdery mildew	0.586	III
4	Damping off	0.542	IV
5	Wilt	0.46	V

As vegetables are generally susceptible to a wide range of pests and diseases, these are major constraints to vegetable farming which requires intensive efforts for proper management (Dahal and Manandhar, 2021).

CONCLUSION

This study examined the determinants of vegetable farming in the Kailali district. Farmers are interested in commercial vegetable production. There was easy access to hybrid seeds, chemical fertilizers, and product sales markets. However, the presence of insects (aphids, fruit flies, fruit borer, whitefly, and white grubs) and diseases (blight, downy mildew, powdery mildew, damping off, and wilt) posed significant challenges to commercial production. Insect pests and diseases should be controlled by adopting various practices such as using botanicals, maintaining sanitation, and using chemicals at the recommended dose carefully. For this, farmers required adequate training and regular technical support services. As vegetable production is one of the major occupations of farmers in the district, timely training along with other support services should be provided to them to enhance their capacity.

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