



Socio-economic analysis of vegetable seed production in Nepal

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Abstract. A survey was conducted at Musikot, Western Rukum, Nepal in 2019 to analyze the economic results of vegetable seed production using a well-structured pre-tested questionnaire. The average landholding per household was 8.14 ropani (1 ropani = 0.05 ha), as 33.74% of landholding (equal to 50.36% of the cultivated land) was under vegetable seed production. Vegetable seed production generated 46% of on-farm income equal to 23% of total household income. The share of on-farm activities and off-farm activities in household income was almost equal. 64% of the farming households were food self-sufficient. 39% of the farmers were new to the vegetable seed production enterprise whereas 5% of the farmers were involved from 40 years. 49% of the cost in vegetable seed production was incurred in labor. About eight thousand rupee were sufficient to run a vegetable seed production enterprise per ropani that had made a gross margin of NRs 9,614.36 per ropani. Radish occupied 46.5% of the vegetable seed producing land and generated 53.5% of the vegetable seed revenue. BCR of 2.21 suggested that vegetable seed production enterprise brings NRs 2.21 at the investment of NRs 1. Swiss-chard had the highest price spread (90%) whereas radish and turnip had the lowest (57%). Sensitivity analysis showed that vegetable seed production enterprise was a viable business even after a 20% increase in cost and 20% reduction of revenue simultaneously. Disease infestation and insect attack were two major production problems and price fluctuation and inadequate market information were two major marketing problems faced by vegetable seed producers at Musikot, Western-Rukum, Nepal.

Keywords: Economic Analysis, Vegetable seed production, Revenues and Costs, Gross Margin, Price spread

Introduction

The global seeds market reached a value of US\$ 66.9 Billion in 2018 and is expected to reach a value of US\$ 98.1 Billion by 2024 (Seed market, 2020) and Vegetable seed occupies 15% of the global seed industry (Oliver and Shoham, 2019). Nepal is an agriculture-based country with 1/3rd of Gross Domestic Product (GDP) and 2/3rd of the population accounting for agriculture sector (MoAD, 2013). Vegetables and nursery together share 9.71% of the agricultural gross domestic product (AGDP) of Nepal (MoAD, 2015). 55% of the total land that accounts for around 38% of cultivable land of Nepal is geographically the hill (Nepal country report, 1996) which is best suited for vegetable seed production. Nepal has the potential to produce almost all kinds of vegetable seeds (Timsina and

Shivakoti, 2018; HVAP, 2011).

Vegetables in Nepal are being produced on more than 266 million ha of lands and the area under vegetable seed is increasing every year (MoALD, 2015). Besides, vegetable in Nepal has the seed replacement rate of 71% (Paudel, 2016). As a result, the demand for high-quality vegetable seed is steadily expanding (Timsina et al., 2015; HVAP, 2011). Meanwhile, KUBK (2016) mentioned that only 50% of the national demand for vegetable seeds has been met by domestic production over the last decade. Vegetable seeds of more than NRs. 182 million have been imported by Nepal in 2019 from 13 different countries where import from India, China, Japan, Chile and Thailand accounted for more than 90% of the expenditure on vegetable seed import (TEPC, 2020).

Nepal has identified the vegetable seed as a high value

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and low volume product (MoAD, 2013; HVAP, 2011) and one of the cash-generating crops (Baral, 2015). Nepal has prioritized the vegetable seed sector for the growth of the rural economy (UMN, 2015). The vegetable seeds in Nepal have national as well as international market opportunities (MEDEP, 2013) that made it one of the best options to improve agricultural production and food security in a sustainable way (MoAD, 2013). CEAPRED (2009, 2013) mentioned that vegetable seeds give 3–5 times higher income than the alternative cereal crops, enabling farmers to buy at least three times more food as compared to growing traditional food crops on the same unit of land (Timsina and Shivakoti, 2018).

Tracing back to history, formal seed production and distribution in Nepal began in the late 1950s - 1960s (MoAD, 2013). Contracts on vegetable seed production at farmer's level started in 1975 (Baral, 2015; MoAD, 2013). However, until 1990, the public sector played a vital role in the production as well as the supply of vegetable seeds in Nepal (MoAD, 2013). Although seed multiplication in Nepal is done by public and private sectors (Paudel et al., 2013), breeder and foundation vegetable seed production is still limited to the government body: NARC and government Seed Farm (Baral, 2015). National Seed Vision (2013 – 2025) has been prepared by/in Nepal (MoAD, 2013) with the target to increase the seed replacement rate of vegetables over 90% to safeguard the national interest of seed-sufficiency, import-substitution and export promotion of quality seed.

The diverse agro-climate in Rukum from warm sub-tropical to cool temperate Himalayan range offers a vast scope of growing seeds of various vegetables (Dhakal, 2013) Thus, Rukum has long been known as the most potential district for vegetable seed production in Nepal (SVSPC, 2014; MEDEP, 2013; DDC, 2012; HVAP, 2011). Vegetable seed production in Rukum started with the establishment of a government farm named Vegetable Seed Production Center (VSPC) at Chapa in 1978 that was primarily responsible for the supply of foundation seed in the district (VSPC, 2018). Thus, Rukum has the potential of rural economic growth through the development of vegetable seed sub-sector (Pun and Poudyal, 2018).

The study is aimed to analyze the economic aspects of vegetable seeds production in some enterprises situated in Musikot municipality of Western Rukum district, Nepal.

Material and methods

Description of the study area

The study was conducted in Western Rukum district

of Nepal in 2019. Sanichaur-13 and Loribang-14 villages of Musikot municipality were selected for the survey on the recommendation of Agriculture Knowledge Center, Western-Rukum. Musikot is located at 28°35'48" N and 82°33'03" E and lies on the bank of Sani-Bheri River. Musikot municipality covers an area of 136.06 Km² including 7,317 households with 16,322 females and 17,560 males (SVSPC, 2014).

Sampling and sampling size

A purposive sampling technique was used to conduct the study. A total of 60 households from Sanichaur and Loribang village of Musikot municipality, Western-Rukum were interviewed with a pre-tested well-structured questionnaire. Key informant interview with some of the local traders was also done.

Data collection and analysis

Primary data were collected from field survey whereas secondary data were collected from different kinds of literatures and reports of Agriculture Knowledge Center (AKC, Western-Rukum), Vegetable Seed Production Center (Chapa, Western-Rukum), Central Bureau of Statistics (CBS), etc. The data was processed and analyzed with descriptive statistics using computer software MS-Excel 2010.

Indexing

Various problems were ranked with the use of an index. Scaling techniques, which provides the direction and extremity attitude of the respondents towards any proposition, was used to construct the index (Miah, 2016). The major problems were identified by using five-point scaling technique comparing very severe, severe, moderate, slight and very slight using scores of 5, 4, 3, 2 and 1 respectively. To identify the major problems in the production and marketing of vegetable seeds at Musikot, Western-Rukum, the respondents were confronted with a list of existing problems and asked to provide a scale value for all of them. During the data processing, the following formula was used for the final ranking of problems

$$I_{Problem} = \sum \frac{S_i F_i}{N}$$

Where,

$I_{Problem}$ = index value for intensity of the problem

S_i = Scale value of i^{th} intensity

F_i = Frequency of i^{th} response

N = Number of observations

Economic analysis

Gross Margin Analysis

Gross margin is the financial difference between returns

received from the sales of products and the direct costs associated with producing that product. The gross margin in the vegetable seed production was calculated as:

$$\text{Gross Margin} = \text{Net Sales} - \text{Direct cost for production of goods sold}$$

Benefit-Cost Analysis

Benefit-cost analysis (BCA) is a technique for evaluating a project or investment by comparing the economic benefits of activity with the economic costs of the activity. The benefit-cost ratio (BCR) of the vegetable seed enterprise was calculated using the following formula:

$$\text{BCR} = \frac{\text{Gross Return}}{\text{Total Cost}}$$

Price Spread and Producer's Share

The retail price for the vegetable seeds in the agro-vets of Tulsipur sub-metropolitan, Dang district was compared with the farm-gate price of vegetable seeds at Musikot, Western-Rukum. The price spread is the difference between the price paid by the consumer and the price received by the farmer for the same unit of product.

The following formula was used to calculate the price spread (in %) in vegetable seeds of Musikot, Western-Rukum:

$$\text{Price spread (\%)} = \frac{\text{Price paid by consumer} - \text{Price received by farmer}}{\text{Price paid by consumer}} * 100$$

The proportion of retail price gain by the producer of vegetable seeds was determined by using the following formula:

$$\text{Producer's share (\%)} = \frac{\text{Price received by farmer}}{\text{Price paid by consumer}} * 100$$

Sensitivity Analysis

Vegetable seeds production at Musikot, Western-Rukum was analyzed at varying conditions of cost and revenue. What happens to BCR of the vegetable seed production was analyzed by changing the cost and revenue cash flows by the following three conditions:

- The cost of production increased by 20% (keeping other conditions constant)
- The revenue generated decreased by 20% (keeping other conditions constant)
- The cost increased by 20% and the revenue decreased by 20% simultaneously.

Results and discussion

Household description

Average household size was 5.81 which was above the national average, i.e. 4.88 in 2011. 64.31% of the household members were economically active (16-59 year). 91.5% of the respondents were literate and 71.66% of the households were headed by male.

Landholding and use

The average landholding per household was 8.14 ropani (1ha = 19.66ropani) which is slightly lower than the national average, i.e. 0.6 ha. 33.74% of the landholding was used for vegetable seed production which was 50.36% of the cultivated land. 58.3% of land used for vegetable seed production was upland and 41.7% was lowland.

Food Sufficiency Status

Figure 1 shows that 64% of the farming households were food self-sufficient and they met the household consumption demand for staple foods from their production. Likewise, 23%, 10% and 3% of the farming households were able to meet the household consumption demand of staple foods for 9 months, 6 months and only 3 months, respectively.

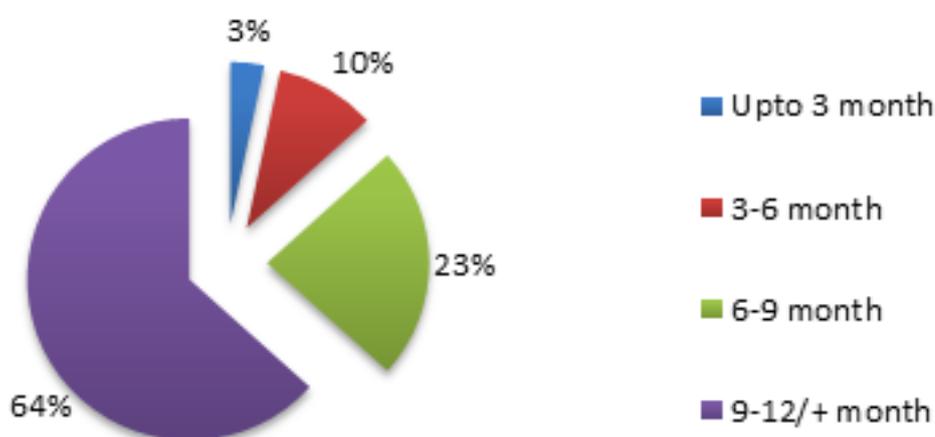


Figure 1. Food sufficiency status of vegetable seed producing households at Musikot, Western-Rukum

Experience and training on vegetable seed production
 5% of the farmers were involved in the vegetable seed production enterprise for 40 years, 28% of the farmers

have been involved for 20 and 30 years each. 39% of the farmers were new to the vegetable seed production enterprise and they were involved for 10 years (Figure 2).

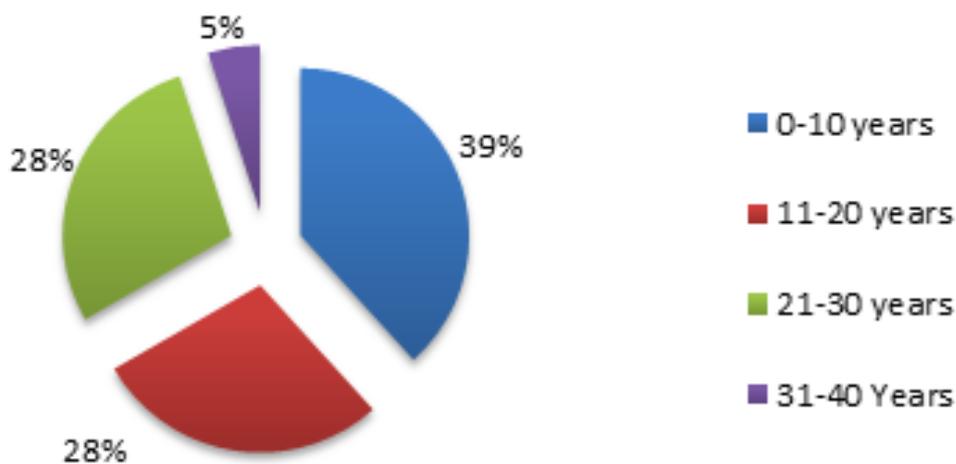


Figure 2. Experience of farmers on vegetable seed production at Musikot, Western-Rukum

Only 48% of the farmers had attended the training on the production of vegetable seeds provided by the Vegetable Seed Production Center (VSPC), Chapa and

NGOs (Figure 3). Most of the farmers (52%) did not get an opportunity to attend any training on vegetable seed production (Figure 3).

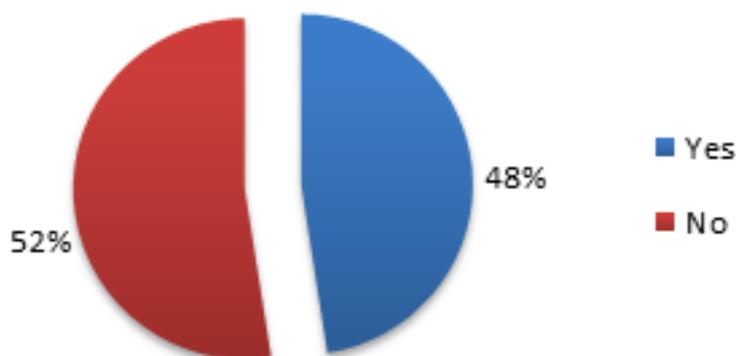


Figure 3. Training attended by the vegetable seed producers at Musikot, Western-Rukum

Household income and its determiners

Various sources and their contribution (on a % basis) on the farm and household income of vegetable seed producers at Musikot, Western-Rukum is presented on Figure 4 and Figure 5, respectively. Vegetable seeds generated 46% of the

on-farm income (Figure 4) equal to 23% of household income (Figure 5). Share of on-farm activities (fresh vegetables, vegetable seed, livestock and cereals) and off-farm activities (off-farm employment and remittance) in household income was equal, i.e., 50% by each group.

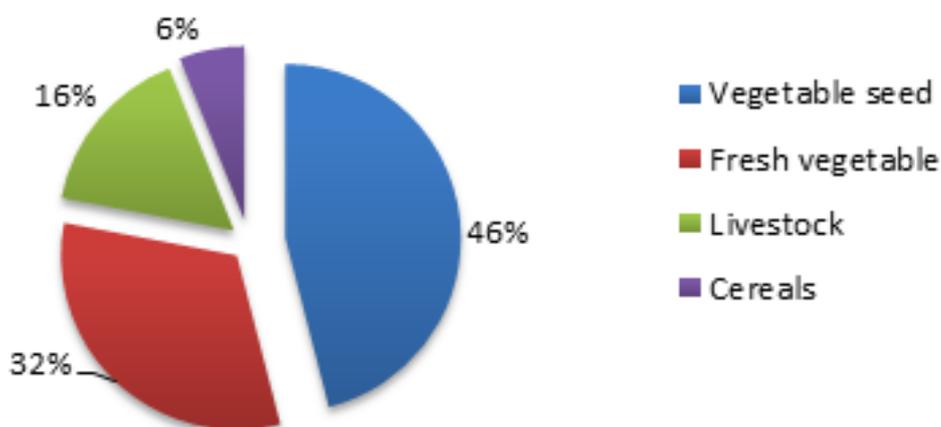


Figure 4. Share of various activities on the farm income of vegetable seed producers at Musikot, Western-Rukum

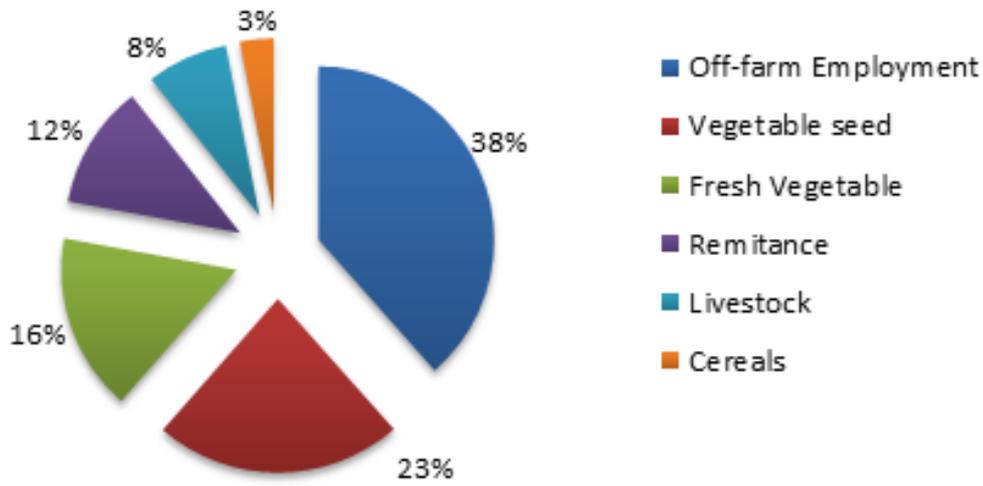


Figure 5. Share of various sources on the household income of vegetable seed producers at Musikot, Western-Rukum

Source of inspiration to Vegetable seed production

40% of the farmers were motivated by technical experts of Vegetable Seed Production Center (VSPC), Chapa, Western-Rukum. 38% of the farmers were inspired by other vegetable seed-producing farmers of

the Musikot, Western-Rukum; 17% of the farmers had vegetable seed production enterprise from their previous generation, and 5% of the farmers were motivated by the higher market price of vegetable seeds as compared to other crops (Figure 6).

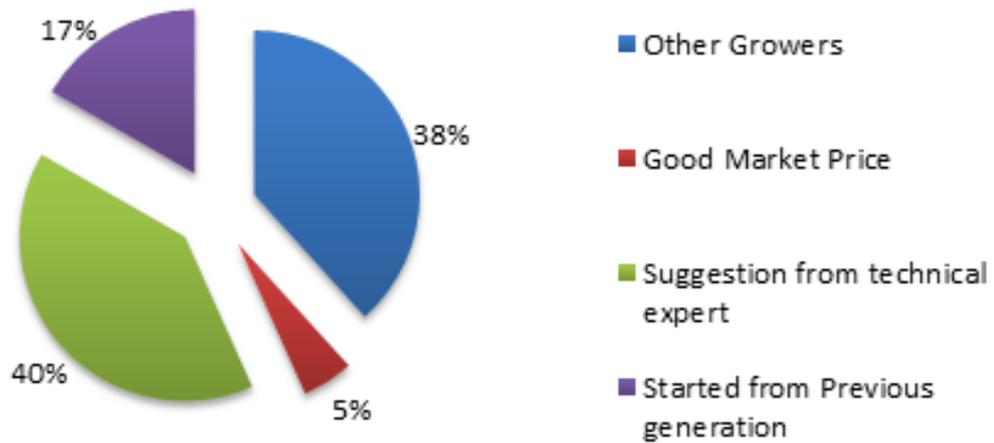


Figure 6. Sources of inspiration to vegetable seed producers at Musikot, Western-Rukum

Share of different variable Cost on vegetable seed production

Among different variable cost, the contribution of Labor

(49%) was the highest followed by the Land Preparation (20%), Manures and fertilizers (21%), Seed (7%), Pesticides (2%) and Irrigation (1%) (Figure 7).

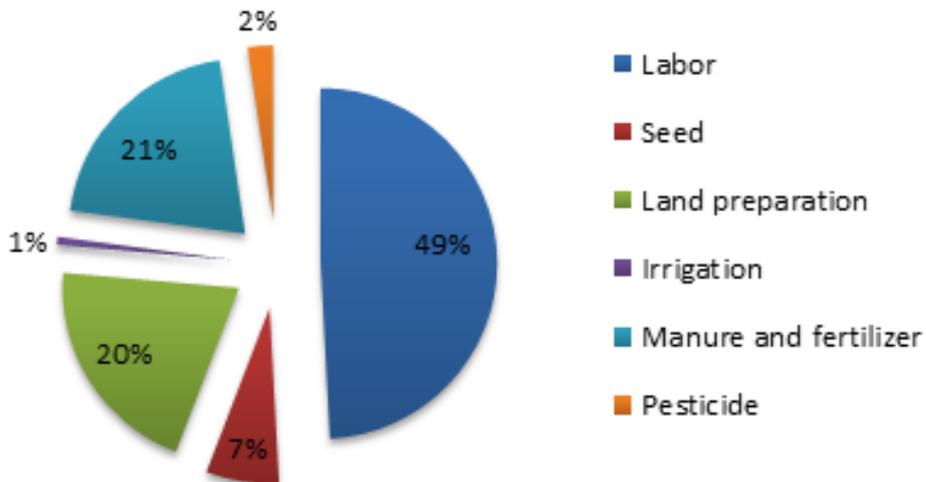


Figure 7. Determiners of cost on production of vegetable seeds in Musikot, Western-Rukum

Vegetable seeds in terms of land coverage and revenue

Vegetable seeds producing land occupied by various vegetables and their contribution to the revenue at Musikot, Western-Rukum is presented in Table 1. Radish occupied 46.5% of the vegetable seed producing land and generated 53.5% of the vegetable seed revenue.

Onion was the second most frequent vegetable grown for production of seed followed by Turnip, Cauliflower, Swiss-Chard, Pea, Broadleaf Mustard, Broad bean, Cress and Cabbage. However, Cabbage was the least cultivated vegetable for seed production at Musikot, Western Rukum that occupied 0.5% of the vegetable seed producing land and contributed just 0.5% on vegetable seed revenue.

Table 1. Coverage and contribution of vegetable seeds in the area of production and revenue

S.N	Vegetable seeds	Coverage on the area of production (%)	Contribution on Revenue (%)
1	Radish	46.5	53.5
2	Onion	12	14
3	Turnip	10.5	12.5
4	Cauliflower	10.5	12
5	Swiss chard	7	3.5
6	Pea	5.5	1
7	Broadleaf Mustard	4.5	2
8	Broad bean	2	0.5
9	Cress	1	0.5
10	Cabbage	0.5	0.5

Gross margin and Benefit-Cost Analysis

Per Ropani cost incurred in vegetable seed production, revenue from vegetable seeds per Ropani, gross-margin and Benefit-Cost ratio (BCR) of vegetable seed enterprise at Musikot, Western-Rukum is presented in Table 2.

On average eight thousand rupee were sufficient to run the vegetable seed production enterprise per Ropani with the gross margin of NRs 9,614.36 per Ropani. An average BCR of 2.21 suggested that a vegetable seed production enterprise at Musikot, Western-Rukum brings NRs 2.21 at the investment of NRs 1.

Table 2. Gross margin and Benefit-cost ratio

Study area	Direct Cost/ Ropani	Revenue/Ropani	Gross margin/Ropani	BCR
Sanichaur	8,204.74	16,472.81	8,268.07	2.01
Loribang	7,711.20	18,671.85	10,960.65	2.42
Average	7,957.97	17,572.33	9,614.36	2.21

Price Spread and Producer's share

Price spread and producer's share in consumer's rupee during the marketing of vegetable seeds produced at Musikot, Western-Rukum is presented on Figure 8. Price spread of 90% was observed in Swiss-

chard on which producer's share in consumer's rupee was only 10%. Radish and Turnip were two vegetable seeds observed with the lowest Price spread and the highest Producer's share, i.e. 57% and 43%, respectively.

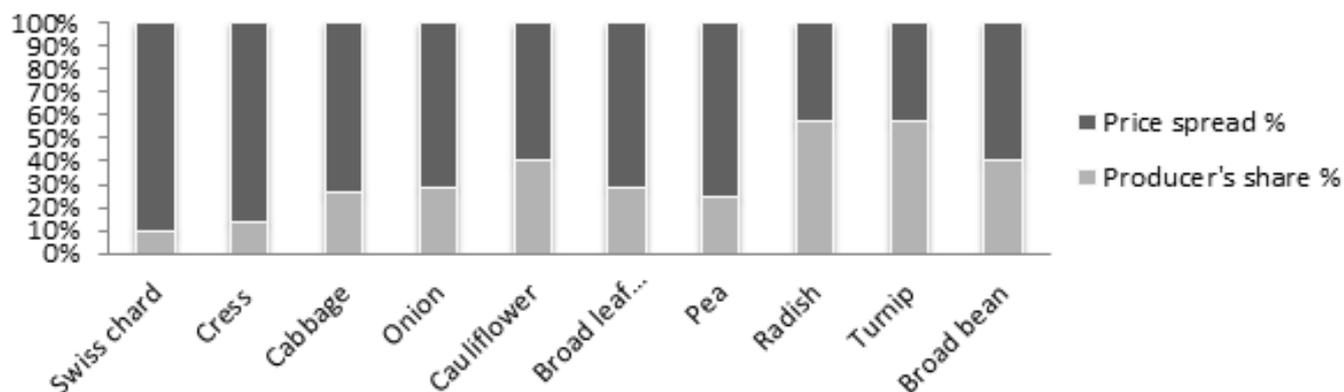


Figure 8. Producer's share and price spread in vegetable seed production enterprise

Sensitivity Analysis

Sensitivity analysis on BCR showed that vegetable

seed enterprise in Musikot was viable even under the increased cost of production by 20% and decreased revenue by 20% simultaneously (Table 3).

Table 3. Sensitivity analysis of vegetable seed production

Study Area	BCR under increased cost by 20%	BCR under decreased Revenue by 20%	BCR under increased cost by 20% and decrease Revenue by 20%
Sanichaur	1.67	1.61	1.34
Loribang	2.02	1.94	1.61
Average	1.84	1.77	1.47

Production and marketing problem

From the Study, it appears that among different production problems disease infestation ranked first followed by insect attack, input unavailability and low

technical knowledge (Table 4), whereas among marketing problems price fluctuation ranked first followed by inadequate market information, lack of processing facility and lack of transportation facility (Table 5).

Table 4. Ranking of different Production problems

Rank	Identified production problems	Index value
1	Disease infestation	4.37
2	Insect attack	4.33
3	Input unavailability at the time	2.67
4	Low technical knowledge	2.47

Table 5. Ranking of different Marketing problems

Rank	Identified marketing problems	Index value
1	Price fluctuation	4.47
2	Inadequate market information	4.10
3	Lack of processing facility	3.07
4	Lack of transportation facility	1.70

Conclusion

Based on the results of the study, it appeared that vegetable seed enterprise was a labor-intensive profitable business as the gross margin was on average 9614.36 per ropani with the B/C ratio of 2.21. Vegetable seed enterprise was the major contributor to on-farm household income. Radish had a major contribution in area of production as well as on revenue generated in the study area. Maximum of 90% price spread was observed in Swiss-Chard and minimum of 42% was observed in Radish and Turnip. The major source of inspiration among respondents was the suggestion from technical experts of government, farms and NGOs. According to the sensitive analysis, Vegetable seed production in Musikot, Western-Rukum was not vulnerable even at a 20% increase in cost and a 20% decrease in revenue simultaneously, as the BCR was 1.47 on average. Disease and Insects infestation were the major production problems, whereas price fluctuation and inadequate market information were the major marketing problems.

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References

- Baral S**, 2015. Market access and vegetable seed production a case of vegetable seed production in Nepal. Thesis for MSc, Wageningen University.
- CEAPRED**, 2009. Annual reports. Vegetable seed project (VSP). Ekantakuna, Lalitpur: Submitted to Swiss Development and Cooperation.
- CEAPRED**, 2013. Annual reports. Vegetable seed project (VSP). Ekantakuna, Lalitpur: Submitted to Swiss Development and Cooperation.
- DDC**, 2012. Periodic District Development Plan 2069/70-

- 2073/74 (2012-2016), Rukum. District Development Committee (DDC) Office, Rukum, Nepal.
- Dhakal S**, 2013. Seed producer organization of farmer: an experience of western Terai, Nepal. *Agronomy Journal of Nepal*, 3, 156-167.
- HVAP**, 2011. A Report of value chain analysis of vegetable seeds in Nepal. Government of Nepal, Ministry of Agriculture and Cooperatives, High Value Agriculture Project in Hill and Mountain Areas (HVAP). Project Management Unit, Surkhet, Nepal.
- KUBK**, 2016. Vegetables seed value chain report. *Kisanka lagi Unnat Biu-Bijan Karyakram (KUBK)*. Ministry of Agriculture Development, Government of Nepal.
- MoAD**, 2013. National Seed Vision 2025 (Seed Sector Development Strategy). National Seed Board, Ministry of Agriculture Development (MoAD), Government of Nepal, Kathmandu, Nepal.
- MOAD**, 2015. Selected indicators of Nepalese agriculture and population. Government of Nepal, Ministry of Agricultural Development, Agri-Business Promotion and Statistics Division, Singh Durbar Kathmandu, Nepal.
- MoALD**, 2015. Vegetable statistics 2014/15. Government of Nepal, Ministry of Agriculture and Livestock Development, Department of Agriculture, National Center for Potato, Vegetable and Spice crop Development, Kirtipur, Kathmandu. Retrieved from <http://vdd.gov.np/public/kcfinder/upload/files/Vegetable%20statistics%20%282071.72%29.pdf>
- MEDEP**, 2013. Natural resource, market demand and target group analysis of Rukum District. Natural and Organizational Resource Management Services, Micro Enterprise Development Program (MEDEP), Ministry of Industry, United Nations Development Program (UNDP).
- Miah AQ**, 2016. Applied statistics for social and management sciences. Singapore: Springer.
- Nepal country report**, 1996. Nepal: Country report to the FAO International technical conference on plant genetic resources. Retrieved (2020/5/24) from <http://www.fao.org/docrep/013/i1500e/Nepal.pdf>
- Oliver E and Shoham J**, 2019. Analysis of sales and profitability within the seed sector. <http://www.fao.org/3/ca6929en/ca6929en.pdf>
- Paudel MN**, 2016. Prospects and limitations of agriculture industrialization in Nepal. *Agronomy Journal of Nepal*, 4, 38-63.
- Paudel MN, Pokhrel S, Gadal N, Ferrara GO, Kc D, Joshi P and Humagain R**, 2013. An overview of different seed production initiatives in Nepal. *Agronomy Journal of Nepal*, 3, 1-10.
- Pun AB and Poudyal D**, 2018. Assessment of present status and action plan development of vegetable seed enterprise in Rukum, Nepal. *Journal of Agriculture and Natural Resources*, 1, 122-132.
- Seed market**, 2020. Seeds Market: Global Industry Trends, Share, Size, Growth, Opportunity and Forecast 2019-2024. <https://www.researchandmarkets.com/reports/4775577/seeds-market-global-industry-trends-share>
- SQCC**, 2013. Seed Balance Sheet for FY 2013. Seed Quality Control Centre (SQCC), Ministry of Agriculture Development, Lalitpur, Nepal.
- SVSPC**, 2014. Annual Report. Sub-tropical Vegetable Seed Production Centre, Chapa, Rukum, Nepal.
- TEPC**, 2020. Individual product wise Import [NRS]. Government of Nepal, Export import data bank, Trade and export promotion centre, Ministry of Commerce and Supplies, Pulchowk, Lalitpur, Nepal. <http://www.efourcore.com.np/tepcdatabank/commoditywise.php?txtmode=search>
- Timsina KP, Shivakoti GP and Bradford KJ**, 2015. Supply situation of vegetable seeds in Nepal: an analysis from policy perspective. *Nepalese Horticulture*, 10, 26-36.
- Timsina KP and Shivakoti GP**, 2018. Vegetables production and marketing: practice and perception of vegetable seed producers and fresh growers in Nepal. *Agriculture & Food Security*, 7, 11.
- UMN**, 2015. Annual Progress Report. United Mission to Nepal (UMN), Rukum Cluster, Rukum and Vegetable Seed Production Cooperative Association, Musikot-1, Rukum.
- USAID**, 2004. Trade Competitiveness of vegetable seed. A case study. The United States Agency for International Development (USAID), Nepal.
- VSPC**, 2018. Annual Progress Report 2074/75. Musikot: Rapti Offset Press.