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RESEARCH ARTICLE

VALUE CHAIN ANALYSIS OF VEGETABLE SEED IN WESTERN RUKUM DISTRICT, NEPAL

Melsan Shrestha[b], Shiva Chandra Dhakal[a*], Rishi Ram Kattel[a], Susan Parajuli[b,c], Katherine Parker[b]

[a]Department of Agricultural Economics and Agribusiness Management, Agriculture and Forestry University, Rampur, Chitwan, Nepal
[b]United Mission to Nepal, Kathmandu Nepal
[c]Westmead Hospital, Western Sydney Local Health District, New South Health (NSW), Australia
**Corresponding Author Email: scdhakal@afu.edu.np*

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ABSTRACT

The vegetable seed is one of the growing high-value subsectors in Nepal because of the increasing commercialization of vegetable production, the deficit of seed supply, and the rising involvement of different actors at different levels of its value chain. In this context, the present study was designed to analysis the value chain of vegetable seeds with a special focus on the competitiveness of the value chain actors. The study was conducted in Western Rukum, Nepal in 2017. Data from 210 randomly selected vegetable seed producers using simple random sampling, 13 seed traders including seed collectors, seed companies and agro vets, eight enablers as well as information from secondary sources were collected and analyzed by using descriptive statistics. The result showed that even having nine functional vegetable seed marketing channels in the district there was a weak relationship among value chain actors. The actors involved in the production and marketing sides had different areas of interest. The producers were typically interested in access to technical input and market assurance in both price and quantity, on the other hand, the market actors were interested in quality assurance and market-led price fixation. Additionally, the market information was limited to the local level seed traders. In the contrast, networking among local traders was found very strong. However, they were also not sure about the quality of seed produced by farmers and had to wait until the quality test by the seed company to clear their product. The finding of this study indicates farmers should maintain the quality of seed, the seed traders should provide the essential information to producers regarding the price and quality standard that need to be met, and government agencies should increase the extension service on the technical know-how of high yielding varieties based on consumers demand to promote the export of the seeds.

KEYWORDS

Value chain, Value chain actor, Vegetable seed, Marketing channel.

1. INTRODUCTION

The vegetable seed is one of the promising sub-sectors to improve the production of agriculture, reduce poverty, and enhance food security in Nepal (MoAD, 2013). It has both comparative and competitive advantages for the local markets as well as exports to neighbouring countries and is a profitable enterprise (Shrestha & Dhakal, 2020). The hilly terrain of Nepal that allows for isolated production to maintain the quality contributes to the potential competitive advantage for seeds produced in Nepal for the export market. Due to certain inherent climatic and geographical difficulties and conditions in India, Bangladesh and other countries there exist wide scope of vegetable seed production and marketing potential, for Nepal (Gautam, 1994). Nevertheless, despite the immense potential of Nepal for vegetable seed production, domestic production could meet only about half (46%) of the total domestic demand in 2016 for the seed to grow vegetables. Vegetable seed demand for 2016 was 2269 Mt while the total vegetable seed production in the country in the same year was only 1050 Mt (KUBK, 2016).

The export of high-value seeds to countries other than India started in 1986. However, the export volume couldn't increase subsequently because Nepalese seeds couldn't compete with other countries' better quality and lower-priced seeds (Gautam, 1994). In this regard, the National Seed Vision (2013-2025) formulated by the Government of Nepal (GoN) has emphasized self-sufficiency, import-substitution, and export promotion of quality seeds through domestic production for achieving an increased seed replacement rate of vegetables from the current 67% to 90% (SQCC, 2013).

Western Rukum district ranked as the topmost contributor among the 77 districts of Nepal in vegetable seed production with a 9.75% share of the

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total national vegetable seed production in 2016. This achievement was despite problems like insufficient seed dealers, channels and networks, lack of seed marketing intelligence, and extension (MoAD, 2013). Additionally, limited investment in technical capacities and lack of abidance to contracts have hampered the quantity and quality of production. As the current vegetable seed market is volatile, the motivation for farmers to produce and market the best product is fragile (SCPL, 2011).

In this regard, this study was conducted to investigate the involvement of various actors in the production of vegetable seed in Western Rukum and to explore the gaps among different actors of the vegetable seed value chain starting from the seed-producing farmers and tracing the products through to traders and finally to the end market, as well as exploring vegetable seed growers understanding of issues throughout the chain.

2. Materials and Methods

Western Rukum district being the highest contributor to vegetable seed production among all 77 districts in Nepal (MoAD, 2013) was selected purposively for this study. Data were collected from 201 seed producers selected using a simple random sampling technique. Additional information was collected from 13 seed traders from local, regional, and national levels. Among them, five were local seed collectors, who were also the agents of seed companies selected based on the 'snowball sampling' technique, three were seed companies at the regional and national level; one from Tulsipur Dang, one from Chitwan, and one from Kathmandu selected purposively based on name recognition in Rukum for interview. Similarly, three local agro-vets were from Western Rukum and two agro-vets were from the Chitwan district. Eight enablers at various stages from the local, regional, and national levels were also interviewed.

Both the primary and secondary data were collected and analyzed for the study. Primary data from the seed producers were collected through a cross-section household survey using a personal interview schedule. Whereas Key Informant Interview (KII) was conducted among the selected seed traders and enablers, and a Focus Group Discussion (FGD) was conducted with the seed producer cooperatives. While, the secondary sources included were reports of relevant national agencies, local governments, as well as non-governmental agencies, and published literature, which was reviewed for necessary secondary information.

The total income of a household was calculated by summing the share of income of households from different sectors, and the income from the vegetable seed sector was expressed in percent of total income as its contribution to household income. The following formula was executed to determine the contribution of vegetable seeds to household income.

$$\text{Contribution of vegetable seed (in \%)} = \frac{\text{Share of income from vegetable seed}}{\text{Total income}} \times 100$$

The producers' share of the major four vegetable seeds; cauliflower seed, onion seed, radish seed, and pea seed produced in the study area was calculated by using the formula presented as followed (Kohls & Uhl, 1985).

$$Ps=(Pf/Pr)\times 100\%$$

Where,

Ps= Producers' share

Pr =Retailers price (NPR/Kg)

Pf =Farm gate price (NPR/Kg)

3. Results and Discussion

3.1 Socio-demographic characteristics of respondent households

The socio-demographic characteristics of the respondent households such as the age, year of schooling and the main occupation of the household head, educated members, economically active population, dependent ratio, family size, ethnicity, gender, and the family type of the respondent households were analyzed.

The mean age of the household head was 48.3 years in the study area with a minimum of 22 and a maximum of 80 years. The average family size was six. The average schooling years of the household head was 5.0 years and an average of 65% of household members had taken formal education.

Among the household members, about 3.9 were economically active, the age category between 15 to 59 years. The dependency ratio which is the ratio of the dependent population of the age group below 15 years and above 59 years to the economically active population was found to be 0.35 in the study area.

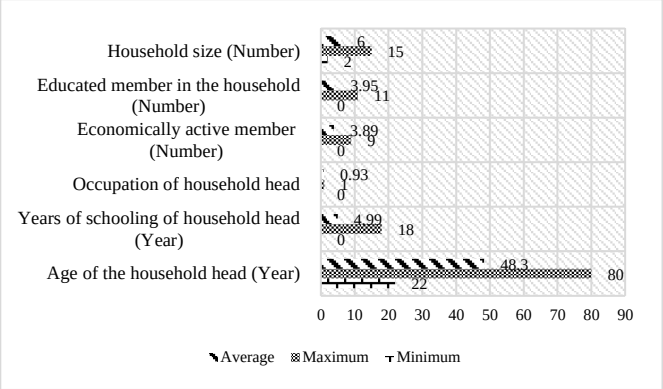

Figure 1: Socio-demographics characteristics of the respondent households.

Similarly, about 93% of households were engaged in agriculture. In the study area, about 86% of household heads were found to be male, whereas the female-headed households were only about 14%. Regarding the type of family, about 58% of the household were joint (multi-generational) families while the remaining 42% lived as a single household.

3.2 Different sources of household income in the study area

Within all 201 households, off-farm income including remittance from a family member in foreign service, salaried employment (domestic service), daily wages, social security fund, and business had contributed 63% of the total household income. The remaining 37% of income in the area came from the farming sector. Within the farming income, vegetable seed production was the greatest contributor, followed by livestock. The vegetable seed production contributed 14% of the total income. The following chart presents the contribution of different sources of income in the household income in the study area.

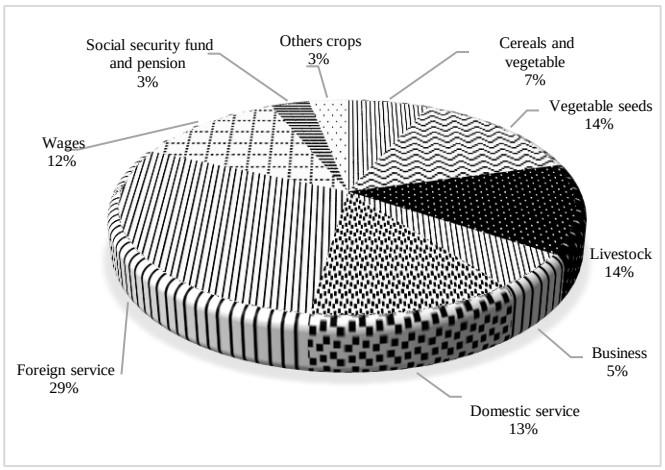

Figure 2: Different source of household income in the study area

3.3 Marketing Channel

The vegetable seed marketing channels in the study area were often not linear. The same actors were found playing different functions. Similarly, there was an interconnection among the actors and channels. In aggregate, nine different predominant marketing channels were existing, which are as follows

i. Producers → Cooperatives → District Federation of Seed Cooperatives (DFSC) → Vegetable growing farmers
ii. Producers → Cooperatives → DFSC → Local agrovets → Vegetable growing farmers
iii. Producers → Cooperatives → DFSC → Outside district agrovets → Vegetable growing farmers
iv. Producers → Cooperatives → DFSC → Local Agrovets → Outside district agrovets Vegetable growing farmers
v. Producers → Cooperatives → DFSC → Seed Companies → Outside district agrovets Vegetable growing farmers
vi. Producers → Agent (local seed collectors) → Local agrovet → Vegetable growing farmers
vii. Producers → Agent → Outside of the district agrovet → Vegetable growing farmers
viii. Producers → Agent → Local agrovet → Outside of the district agrovet → Vegetable growing farmers
ix. Producers → Agent → Seed Companies → Outside of the district agrovet → Vegetable growing farmer

3.4 Vegetable seed value chain map

The vegetable seed value chain in Western Rukum included various stages and activities. It involved three components, namely, functions, actors, and enabling environment. The functions include the process with which the products are delivered from its origin to the end-users. Actors are those who were involved in the transfer of products. Whereas enabling environment indicates the rules and regulation, infrastructures, and regulatory bodies which were in favor of enabling the business.

3.4.1 Functions

The principal functions of the value chain were identified as the input supply, assembling, marketing, and consumption of the vegetable seeds. Seeds, fertilizers, pesticides, organic manure, and labor were the major inputs used by vegetable seed producers in the study area. The majority of the household had taken required foundation seeds from SVSPC and the rest had taken from agro vet nearby them, cooperative in which they are associated as well as from local level seed agents. All the agro vets, cooperatives, and agents also used to take foundation seed from Subtropical Vegetable Seed Production Center (SVSPC), Rukum. Nepal Agriculture Research Council (NARC) was the source for breeder's seeds to SVSPC. Besides, few farmers were getting the foundation seed from Non-Governmental Organizations (NGOs) getting from SVSPC and different NARC stations. Most of the farmers purchased fertilizers and pesticides from agro vets nearby them and very few were used to take it from cooperatives. Regarding the labor supply, about 69% of the total labor force required in vegetable seed production was managed by the households themselves while the rest about 31% was managed locally in the exchange labor system and by hired labor.

The produced seeds were collected and marketed individually or collectively. Most of the seeds were collected by local level seed agents from the farm of the producers. The DFSC is also used to collect seeds through seed producers' cooperatives. However, the volume was less compared to the volume collected by agents. Both the agents and DFSC were providing the majority of its collected volume to the seed companies and the rest were providing to agro vets outside from the district and directly to the consumers. Some of the local level agro vets also used to play the role of agents.

The primary level of cleaning and grading was done by farmers. Whereas the DFSC was involved in grading, laboratory test and providing truth full level of seed before sending to market. While agents used to send seed directly to the market including seed companies. Seed companies were primarily involved in seed quality testing, labeling, and packaging. The wholesaling of the seed was done by seed companies from Dang, Kathmandu, and Chitwan. While retailing was done by the agro vets and cooperatives. Farmers throughout the country involved in vegetable production were the consumers of vegetable seeds produces by Western Rukum. However, none of the seeds produced in the study year was found exported outside of the country through a legal channel.

3.4.2 Actors

Input suppliers, seed producers, local seed traders, wholesalers, retailers, and consumers were the major actors involved in the vegetable seed value chain in Western Rukum. The following are the details of the actors.

3.4.2.1 Input suppliers

There were different six types of input suppliers who were providing seeds and the other inputs to the farmers for vegetable seed production in the study area. They were SVSPC, agro-vets, cooperative, agents, District Agriculture Development Office (DADO), NGOs, and farmers themselves. SVSPC was providing foundation seeds directly to most of the farmers. While, agents, agro vets, cooperatives, and NGOs were providing foundation seeds to the rest of the farmers. The other inputs like fertilizers, pesticides, drip irrigation sets, sprinkler irrigation systems, and sprayers were proving by agro vets. Similarly, seed producer cooperatives were providing fertilizers to the farmers at a subsidized rate. While, *Kisanko Lagi Biu Bijan Karyakram* (KUBK) and UMN had provided processing equipment, irrigation channel, and technical support to the farmers. DADO had taken responsibility for the provision of technical inputs to the producers. There were 23 agro vets in the study area. Likewise, a total of 10 seed producer's cooperatives were functioning in the study area.

3.4.2.2 Producers

There were 1575 vegetable seed producers associated with 74 farmers group in the Western Rukum district. Among them, none of the farmers had made a formal contract with seed traders. Informal contract with local traders was a customary practice in the study area. Some farmers were marketing their seeds through the cooperative. However, the majority of the farmers did not have any idea about the market dynamics and were producing seed on their way and selling it to the market after harvest.

3.4.2.3 Local seed traders

Local traders were the bridging agent between producers and wholesalers for the marketing of vegetable seeds. There were 16 agents of different seed companies, and a DFSC in the study area who were playing a key role in procurement and selling the vegetable seed outside the Western Rukum district. Agents had a very strong horizontal informal network for negotiating the price with seed companies and fixation of price to give farmers. They first were collecting vegetable seeds from farmers within their territory individually. And then they were practicing calculating the production within Western Rukum and the whole country roughly. Finally, they compare with their collection collectively. After that, they had practiced bargaining with seed companies and agro vets to fix the price. Only after receiving the payment from seed companies they used to go to farmers to pay them. These agents covered 85% of the total volume of the sale of vegetable seed in the study area whereas DFSC covered only 15% of the volume produced.

All most all the agents were farmers too. Whereas the rest were members of the cooperative, and owner of the agro vets. Neither of the agents was interested to sell the product they collected to cooperatives due to suspicion of getting a lower margin and chance of losing their own business. Agents were collecting seeds without considering the quality standard of the seed. As a result, farmers were also preferred to sell to the agents.

3.4.2.4 Wholesalers

The value chain from seed distributors onwards was not often linear but with multiple actors were involved in multiple activities. Primarily seed companies or seed entrepreneurs were used wholesaling vegetable seed directly to agro vets and cooperatives. They covered 77.5% of the volume of seed produced in the study area. They were collecting seeds from local traders, processing, testing for the quality, and packing them to make available to the retailer and end market. The majority of them also were importing seeds from other countries as well and were supplying to the market. Apart from the seed companies local agro vets and DFSC were also involved in wholesaling of the vegetable seed. They were wholesaling it to the agro vet outside of the district. The volume of the wholesaling seed by local agro vet and DFSC was 8% and 3.5% of the total production respectively in the study area.

3.4.2.5 Retailers

Mostly, the agro vets outside from the district, agro vet inside the district as well as cooperative were playing the role of the retailers of the vegetable seeds from the study area. The local agro vet had multiple roles in the value chain of vegetable seed in the Western Rukum district. They were involved in input supply to farmers, assembling of seeds and providing to the seed companies, whole selling of seeds to the agro vets outside from district as well as retailing to farmers both in the district and outside of the district. The agro vets outside of the district were providing

seeds to the end-users throughout the country. It covered 98.5% of the total volume of the transaction and the rest was covered by DFSC and local agro vets.

3.4.2.6 Consumers

Vegetable growers of the respective area were the end users of vegetable seeds. They were the key actors for whom the producer produced vegetable seeds and traders were involved to transact the product. The consumers got vegetable seeds from the retailers. Retailers used to collect the consumers' demand and preference and they were passing to the producers and input suppliers as demand through the channel involved in marketing.

3.4.3 Enabling environment

An enabling environment favors the value chain. In the value chain of vegetable seed in the Western Rukum district, several enabling environments were prevailing. The government bodies like Ministry of Agricultural Development (MoAD), Department of Agriculture (DoA), DADO, NARC, National Seed Board (NSB), Seed Quality Control Center (SQCC), National Seed Company Limited (NSCL), SVSPC, Municipalities and Rural Municipalities, Non-government bodies like NGOs, KUBK, Prime Minister Agriculture Modernization Project (PMAMP), UMN, District Federation of Agriculture Cooperative (DFSC) and Agriculture Cooperatives were enablers existing in the value chain of vegetable seeds. Apart from that private sectors like the District Chamber of Commerce and Industry (DCCI), Seed companies, Transport owners, crop inspectors, and seed quality testing lab had also facilitated seed production.

Additionally, local traders, different seed laws, policies, and guidelines including Nepal Seed Vision (2013-2025), National Seed Policy (2000), Seed regulation (1997), Seed act (1988) were also the existing environment in the value chain of vegetable seed in Western Rukum district.

The following diagram depicts a map of the vegetable seed value chain in the study area.

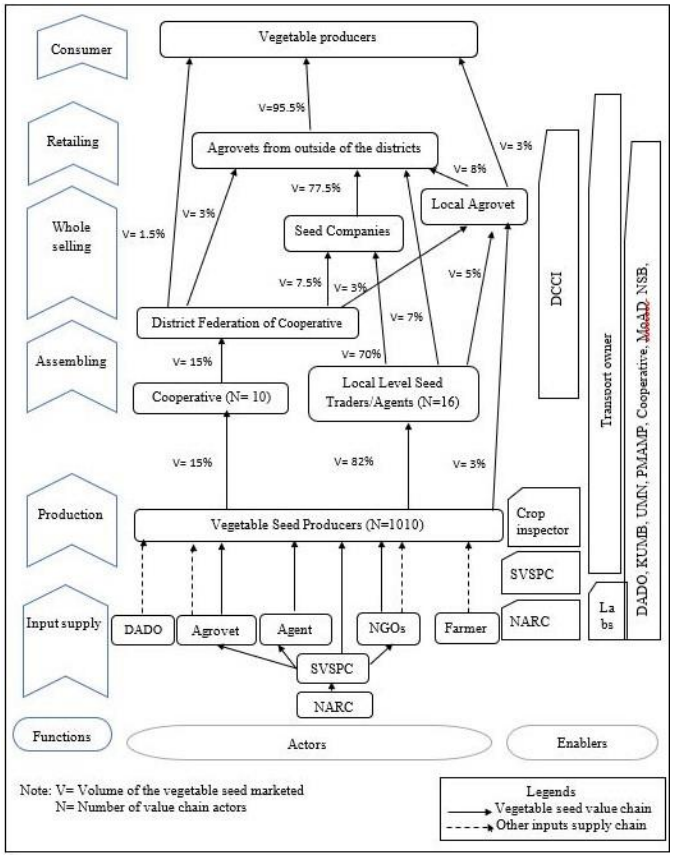

Figure 3: Map of the vegetable seed value chain in Western Rukum District

3.5 Marketing margin and producers' share of major vegetable seeds in the study area

A total of thirteen types of vegetable seeds were grown in the study area. Among them, marketing margin and producers share on the retail price of major four vegetable seeds namely cauliflower seed, onion seed, pea seed, and radish seed were calculated. The marketing margin of the cauliflower seed was highest followed by onion seed, pea seed, and radish seed. Whereas the producer's share on retail price, onion seed had the highest followed by radish seed, cauliflower seed, and pea seed. The following table depicts the marketing margin and producers' share of major vegetable seeds in the study area

Table 1: Marketing margin and producers' share of major four vegetable seeds in the study area

Vegetable seed	Cost (NPR/Kg)	Farmgate price (NPR/Kg)	Retailing price (NPR/Kg)	Marketing margin (NPR/Kg)	Producer s' share (%)
Onion seed	465	721	1600	879	45.0
Cauliflower seed	289	477	1500	1023	31.8
Radish seed	124	172	400	228	43.0
Pea seed	105	128	500	372	25.6

3.6 SWOT analysis

Strength, Weakness, Opportunity, and Threat (SWOT) analysis of vegetable seeds at different stages of the value chain; production, processing, and marketing were done. Following are the key aspects of the SWOT analysis.

3.6.1 SWOT analysis of vegetable seed production

Table 2: SWOT analysis related to the production of vegetable seeds

Strength	**Weakness**
1. Climatic suitability and undulated land. 2. Use of leisure time. 3. Better than cereals and livestock. 4. Presence of Subtropical Vegetable Seed Production Centre in the district.	1. Limited knowledge of insect pest management. 2. Less number (1) of seed inspector in the district 3. Outmigration of labor 4. Fragmentation of land and lack of irrigation facility. 5. Lack of technical knowledge and support from concerned authorities. 6. Poor unity among farmers.
Opportunities	**Threats**
1. Cooperative farming, grading, and packaging of seed at the district level. 2. Youth employment at the local level. 3. Increase saving and easy to fulfill household needs.	1. Increasing insect pests. 2. Highly dependent on climatic conditions. 3. Highly fluctuating price. 4. Highly use of pesticides affects human health and deteriorate soil fertility.

3.6.2 SWOT analysis of vegetable seed processing

Table 3: SWOT analysis related to the processing of vegetable seeds

Strength	**Weakness**
1. Presence of indigenous knowledge on curing and grading.	1. Lack of capital for investment in processing and grading machines. 2. Lack of seed testing lab in the district. 3. Low-value addition at the local level.
Opportunities	**Threats**
1. Subsidy on processing and grading machine. 2. Testing, truthful labeling, and packaging at the district level.	1. High competition among traders. As the result, they take the seed from producers without processing it.

3.6.3 SWOT analysis of vegetable seed marketing

Table 4: SWOT analysis related to the marketing of vegetable seeds

Strength	**Weakness**
1. Availability of local level traders or agents in the vicinity. 2. Persuasive communication and network among the agents. 3. Increasing market demand.	1. Lack of market information on price and market demand. 2. Less bargaining power of producers. 3. The dependency of producers on local level agents for market information.
Opportunities	**Threats**
1. Group marketing. 2. Contract farming would bind both the parties to abide by the terms and conditions of the contract and bring about a feeling of mutual trust and belief.	1. Uncertainty of price. 2. No price-fixing mechanism. 3. Cartel among agents regarding the pricing of seeds. 4. Agents fix the price to farmers only after they sell to the market. 5. The demand of consumers for hybrid seeds.

4. Conclusions

The study was executed to explore the value chain of vegetable seeds in the Western Rukum district of Nepal. Rukum district was ranked as the topmost contributor among the 77 districts in Nepal with its share of 9.75% of the total national seed production and was still ample space for expansion. Vegetable seed production was a major contributor to the annual household income and ranked second after foreign services. It contributed about 14.2% of the total household income.

Farmers, agro vets within the district as well outside of the district, seed producer's cooperatives, SVSPC, NGOs, DFSC, agents or local seed traders, seed companies, and vegetable growers were the major actors of the value chain of vegetable seed in the study area. Major nine types of marketing channels were present in the district. Even though, there was a gap in different levels of issues in the seed value chain. The issue includes quality of source seed, limited technical knowledge with the local agro vet on quality of seed, lack of access of producers on information related to price and market demand as well as service providers. Increasing insect pest infestation in the study area and less technical know-how among the farmers was another issue. Furthermore, there was a mismatch across the divergent functions and actors of the value chain. The actors involved in the production and marketing sides had a different area of interest. The producers were typically interested in access to technical input, market assurance in both price and quantity, on the other hand, the market actors were interested in quality assurance and market-led price fixation. Additionally, the market information was limited to the local level seed traders. Producers had to depend on the local traders regarding the price and quantity. Farmers had to accept whatever they give the price. In the contrast, networking among local traders was found very strong. Even though they collected seed individually from farmers they used to make an alliance for bargaining with seed company regarding the price and after then fix the price to give farmers. However, they were also not sure about the quality of seed produced by farmers and had to wait until the quality test by the seed company to clear their stuff.

This research has drawn recommendations at three different levels. Firstly, the farmers should maintain the proper isolation distance and quality of seed and increase their access to the district federation of seed producer cooperative for the marketing of seed. Secondly, the seed traders should provide the essential information to producers regarding the price and quality standard that need to be meet in advance, Finally, the government bodies should increase the extension service on the technical know-how of high yielding varieties based on consumers' demand.

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Conflict of Interest

The authors declare that they have no conflict of interest.

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