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Economics of Onion Seed Production and Marketing in West Rukum, Nepal

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ABSTRACT- Onion seed production is an important income-generating enterprise for smallholder farmers in Nepal, particularly in hill regions with favorable agro ecological conditions. However, production inefficiencies and weak market linkages may limit farmers' profitability. This study aimed to assess the economics of onion seed production and marketing in Rukum (West), Nepal, focusing on production costs, profitability, factors affecting gross income, marketing channels, and major constraints. Primary data were collected from 60 vegetable seed-producing households in Chaurjahari Municipality and Sano Bheri Rural Municipality through household surveys, key informant interviews, and focus group discussions. Descriptive statistics, gross margin analysis, benefit-cost ratio (BCR), producer's share, and Cobb-Douglas production function were employed for data analysis.The average onion seed production was 33.68 kg per household, with a productivity of 617.40 kg/ha. The production cost and gross revenue were NPR 338,336.30/ha and NPR 1,076,125/ha, respectively, generating a gross margin of NPR 737,788.80/ha and a BCR of 3.18. Labour accounted for the highest production cost (51.62%), followed by crop protection (20.06%). Fertilizer and crop protection costs had positive and statistically significant associations with gross income at the 10% significance level. Approximately 81.7% of farmers sold their seeds to local traders, while the producer's share of the consumer price was only 18.75%. Disease and pest infestation and untrustworthy traders were the major production and marketing constraints, respectively.Onion seed production is a profitable enterprise in Rukum (West). Improved technical extension services, integrated pest management, access to quality foundation seeds, farm mechanization, and stronger market linkages are essential to enhance production efficiency and farmers' profitability.

Keywords: Onion seed production; Production economics; Profitability; Benefit-cost ratio; Marketing channel; Producer's share; Rukum; Nepal.

I. Introduction

Agriculture sector contributes about 28.9% of the national GDP and about 66 % of the total population of the country is actively involved in this sector. Nepalese agriculture system is dominated by small marginal farmers practicing subsistence agriculture having small and fragmented land holding . Horticulture provides a better profitable option in case of limited land holding condition. Horticulture contributes about 21.42% of the total agriculture production and vegetables alone contribute about 12% of the total agricultural production in Nepal. Seeds are the basic input for the agricultural production. Quality seeds account for 20-25% of the productivity. Vegetable seeds are the low volume-high value commodities. Seed based technologies offer the easiest options for increasing the crop productivity. It can be a suitable medium for small scale farmers to uplift their socio-economic condition because of its high market value and increasing demand.

The demand for vegetable seeds is increasing and the country's production status isn't being able to match the total demand. Nepal exported vegetable seeds of NRs.5 million and imported vegetable seeds of NRs. 430 million in 2017 .The total vegetable seed production in the country is about 1050.05 MT (Private-1044.9 MT and Governmental 5.16 MT) and the total requirement of the seed is 2296 MT in the year 2014/15 . Besides, the estimated seed replacement rate (SRR) of the vegetable crops including hybrid in Nepal is 66 percent and expected to reach 90 percent in 2025 . Similarly, the vegetable

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farming area has largely increased by 41% from 2001 to 2011 with reduction in the acreage of the cereal crops in the same period and the families cultivating the vegetables have doubled in the same period . The area under vegetables has increased by 13.61%, production by 16.299% and productivity by 2.39% from 2071/72 to 2073/74. Similarly Nepal has exported vegetables of Rs.282763008 and imported vegetables of Value Nrs. 12505494757.. This increase in the acreage in the vegetable farming provides a good scope for the vegetable seed production.

The agro-ecological conditions of Nepalese hills and mountains helps in the production of quality seeds and planting material which can be easily linked to the highly populated and heavily cultivated lands of Terai of Nepal, India, Bangladesh and other South Asian nations.

Rukum district has been hub in the production of the vegetable seeds as it is the highest contributor of vegetable seeds among districts in Nepal. Sub-Tropical Vegetable Seed Production Centre located in Chapa, Rukum is the highest producer of the vegetable seeds. Rukum has about 74 vegetable seed producing farmers group (18 female, 3 male and 53 mixed types) registered in the DADO office till 2016. The area under vegetable seed cultivation was 250 ha with productivity of 0.49 MT/ha in the year 2015/16 .

Seeds are the basic inputs for the production of the crops and the quality of the seed determines the production. Rukum in spite of its huge potential in the vegetable seed sector, farmers are less opting for this enterprise because of the technicality of this sector, the price and market related problems. The profitability from the vegetable seed enterprise is reported to be lower than normal wages from other economic activities and thus fewer youth are attracted to the farming. So the production is decreasing and the country should depend upon the huge imports of vegetable seed from the abroad market.

Thus the profitability of farmers is to be found in this sub sector. The various costs associated with the total cost of production of vegetable seed are to be measured and the factors affecting gross revenue from seeds should be analyzed to focus on trend of utilization certain resources.

The market channels are not properly developed and it is controlled by the middlemen and farmers are not getting price that they are demanding and the consumers are paying more of it for the same one. So the market margins, share of each actor in the supply chain should be accessed for the easy flow of the vegetable seed in the market. The open border has challenged the formal seed sector by allowing the unregistered seed in Nepalese territory. The consumers are opting for these seed from informal sector which the retailers and wholesalers have more profit selling than the truthfully labeled formal sector's seed. The market demand is being fulfilled by the seeds from informal sector which may be inferior in quality.

GoN has projected 500 MT of truthfully labeled vegetable seed production by 2019 from Rukum, Rolpa, Salyan, Gulmi, Argakhanchi and Pyuthan. Similarly, GoN has aimed 2407 MT of domestically produced vegetable seed, exports of 750 MT and imports of 210 MT in 2025. The estimated seed replacement rate (SRR) of the vegetable crops including hybrid in Nepal is 66 percent and expected to reach 90 percent in 2025 The assessment of the profitability of the vegetable seed sector helps to increase the production level of the vegetable seeds in the coming years to meet these national projections. The cost of the different resources used in the vegetable seed production and its share in the cost of total production will be determined and the cost of production can be significantly reduced by alternative resource utilization. The analysis of the marketing channels prevailing in the district helps to reduce the price spread and increase the marketing efficiency. The monopoly of the middle men in the marketing sector and the price determination of the seed will be reduced and the farmers will get the more effective price for their production. This will motivate more farmers for vegetable seed production. The determination of the profitability can help to reduce the poverty in the district. The employment opportunities

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can be developed and the rate of foreign migration for employment can also be reduced. The position of the district in the human development index is 63rd in Nepal with 0.386 total points whereas 49.1 % of people are below the poverty line . This status of poverty can be solved by the promotion of the vegetable seed production and proper marketing facility. The main objective of study was to determine the economics of vegetable seeds production.

II. Research Methodology

The study was conducted in Chaurjahari Municipality and Sano Bheri Rural Municipality of Rukum (West) district. The study site was purposively selected based on volume of vegetable seed production and number of farmers adopting the vegetable seed enterprise. It is located at Karnali Province of Nepal. A total 60 vegetable seed growers of the study area were surveyed for the data collection. Field and market survey was conducted to obtain the data related to vegetable seed production and marketing. The survey was undertaken through interviews with farmers using questionnaire, local traders, executives of cooperatives involved in the seed enterprise, seed companies and retailers using checklist. Reports and publication from DADO, CBS, AEC, KUBK, MOAD and other various organizations and scholar articles related to the vegetable seed provided the secondary data related to the vegetable seed production and marketing status of the study district and whole Nepal. In the study area selected household were surveyed with a series of open and close-ended questions to collect the production information. Key informants like DADO officers, officers from NGO's/INGO's, local traders, executives of cooperatives, personnel from seed companies were asked questions for better overview of the status of production and marketing of vegetable seeds and collection of marketing data. FGD was conducted with the zone operation committee of PMAMP to assess the current problems in the seed sector and to validate the authenticity of data collected through field survey.

The data collected from the survey were coded, tabulated and analyzed using Microsoft Excel, SPSS and. Simple descriptive statistics such as average, standard deviation and percentage was used for analysis of socio demographic and economic data. The analysis of benefit cost ratio, producer's share and Cobb-Douglas regression of factors affecting gross income from onion, radish and cauliflower seed was done. Gross margin of the producer in a particular enterprise is the difference between the gross revenue earned and the total variable costs incurred.

Mathematically,

GM= GR-TVC

1. WHERE,

GM = Gross Margin

GR= Gross Revenue

TVC= Total Variable Cost

Benefit cost ratio is the ratio of gross revenue with total cost. It was interpreted as the return received on the costs of one Rupee.

Mathematically,

Benefit cost Ratio= Gross revenue/Total cost

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III. Producer Share= Cost Received By Producer/Cost Paid By Consumer *100

1. Cobb-Douglas Production Function

A Cobb-Douglas production function was modeled to estimate and analyses the factors affecting gross income of the onion, radish and cauliflower seed separately. The gross income may be affected by seed cost, fertilizer cost, crop protection cost, labour cost, animal labour cost and nursery preparation cost. The model specified and used was represented by;

$$y = ax_1^{b_1}x_2^{b_2}x_3^{b_3}x_4^{b_4}x_5^{b_5}x_6^{6}e^{\mu}$$

Above equation was changed to linear form by taking natural logarithm on both sides, which is expressed as,

$\text{Log } y = \log a + b_1 \log x_1 + b_2 \log x_2 + b_3 \log x_3 + b_4 \log x_4 + b_5 \log x_5 + b_6 \log x_6 + \mu$

2. WHERE,

y= Gross income from vegetable seed (onion, radish, cauliflower)
a= constant
x_1=Seed cost
x_2=Labour cost
x_3=Animal labour cost
x_4=Fertilizer cost
x_5=Crop protection cost
x_6=Nursery preparation cost (in cauliflower only)
e= base of natural logarithm
μ=Error term

b_1, b_2, b_3, b_4, b_5 and $b_{6\ are}$ the coefficients for seed cost, labour cost, animal labour cost, fertilizer cost, crop protection cost and nursery preparation cost respectively. Cost of labour was obtained by adding various labour costs incurred from early stages to the last stages of seed production.

IV. Results And Discussion

1. Socio Demographic Characteristics

The average age of the household head was found to be 47.55 years whereas the average age of the respondent was 42.95 years. The average size of the household of the respondent was 6.4 which was higher than 4.98 of the whole district. The average number of the economically active population per household was 4.23. The average count of male members in a household was 3.33 and female members were 3.08. 0.38 number of individual per household had migrated to foreign nations. The average age of experience of the vegetable seed growers in seed farming was 26.72 years. Out of 93.3% of the household head were male and remaining 6.7% were female. 55% of the respondents were male whereas 45% of the respondents were female.The ethnic composition of the study area was mixed type. 56.7% of the surveyed respondents were Brahmins/Chhetri whereas 31.7% were Janajatis, 5% Dalits and 6.7% were Thakuris. The proportion of the Dalits is low as they were not found to be involved in the vegetable seed farming due to lack of irrigated landholding and to meet the food obligations they had to cultivate cereal crops in their available landholding.

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In case of the educational status, about 3.3% of the household heads were illiterate whereas 30% were just literate. 23.3% of the household heads had attended Primary education, 13.3% had attended lower secondary education, 11.7% had attended secondary level, 13.3% had attended higher secondary level of education and 5% of the household head had attended university level of education. Similarly, the major occupation of the surveyed households was agriculture. About 63.3% of the household heads were involved in agriculture as their major occupation, 18.4% were involved in the service sector, and 3.3 % in Business activities and 15% were involved in daily wage earning activities. The average land holding of the respondents was 0.54 ha with 0.3 ha *Khet* land and 0.23 ha *bari* land. The average irrigated land was 0.35 ha and vegetable seed was cultivated in 0.14 ha. Around 64.8 percent of the total landholding was irrigated and 27.78 percent of the total landholding was allocated for the vegetable seed enterprise.

V. Area And Productivity Of Onion

The average area under of Red Creole (onion) seed cultivation was (0.05 ha). The average production of the onion seeds per household was 33.68 kg. The average productivity of the onion seeds was 617.40 kg/ha.

Table 1. Area, production and productivity of the Onion in study area

Variables	Onion
Area(ha/HH)	0.05 ± 0.28
Production(kg/HH)	33.68 ± 20.54
Productivity(kg/ha)	617.40 ± 188.95

1. Costs, Returns And Bcr Of Onion Seeds

The average cost of production of onion seed was found to be NRs. 33833.6/ha with the total average gross income of NRs. 1016125/ha which consisted of the average revenue from onion seeds (NRs. 926125) and from onion vegetables as byproducts (NRs. 150000). The average gross margin of onion seed cultivation was NRs. 737788.8/ha).The Benefit cost ratio was found to be 3.18 for onion seed cultivation. The fresh vegetables as byproducts in seed enterprise were harvested during thinning out and roughing. They were the chief vegetable source of the seed producers. Normally half of the onion bulbs produced in the previous year was used as planting material for seed production the current year for same area of land and the remaining bulbs were used as fresh vegetable purpose.

Table 2. Cost and Return of the onion seed producer in study area

Variables	Onion
Cost of production (NRs./ha)	338336.3 ± 63713.7
Gross Revenue from byproducts (NRs./ha)	150000
Gross Revenue from seed (NRs./ha)	926125± 283407.6
Gross Income	1076125 ± 283407.6
Gross Margin	737788.8
BCR	3.18

2. Source Of Foundation Seed

The majority of the vegetable seed growers (61.7%) depended upon local traders for the source of foundation seed. Similarly, cooperatives in the study site were found to distribute foundation seed to 28.3% of the farmers whereas 10% of the vegetable seed

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growers directly brought their foundation seed from Sub-Tropical Vegetable Seed Production Farm, Chapa. However local traders and cooperatives also brought the foundation source seeds from Sub-Tropical Vegetable Seed Production Farm, Chapa. The farmers believed the local traders as their direct source of foundation seed as they thought marketing with traders would be easier after they produce the seed. The government has fixed the price of the foundation seed produced from the governmental farms at NRs.1540 for Kathmandu Local cauliflower, NRs. 500 for Mino Early of Radish and NRs.2000 for Red Creole of Onion.

3. Table 3. Source Of Foundation Seed For Radish, Onion And Cauliflower Seeds In The Study Area

Source of Foundation Seed	Frequency	Percentage
Local Traders	37	61.7
Cooperatives	17	28.3
Vegetable Seed Production Centre	6	10

4. Cost Of Production Of Onion Seed

Bulb to seed is employed for the seed production of Red creole variety of onion. So first bulb was produced from the seed and the following year the bulbs were planted for seed production. Thus it took two years for the production of the onion seed. The total cost of production of onion seed was NRs. 338336.3 out of which 47.55 percent was incurred during bulb production and 52.45 percent was incurred during seed production. Labour cost constituted 51.62 percent of the total cost of production followed by 20.06 percent of crop protection cost. The heavy infestation of Purple blotch was the main reason for the high protection cost. Seed cost comprised 5.99 percent, FYM cost 9.67 percent, urea cost 0.69 percent and DAP cost 0.18 percent of the total cost of production.

Table 4.Cost of production of onion seed per ha and its share to the total cost

	Bulb production	**Seed Production**	**Total**
Seed cost	**20280 ± 4139 (5.99)**	**-**	**20280 ± 4192 (5.99)**
FYM Cost	**12077 ± 5174(3.57)**	**20633 ± 9098.(6.10)**	**32710 ± 14215(9.67)**
Urea Cost	**928 ± 683(0.27)**	**1392 ± 1038(0.41)**	**2320 ± 1731(0.69)**
DAP Cost	**291 ± 454(0.09)**	**291 ± 459(0.09)**	**583. ± 919.(0.18)**
Labour Cost	**79975 ± 8597(23.64)**	**94675±19557(27.98)**	**174650± 27392(51.62)**
Animal labour cost	**20166 ± 1040(5.96)**	**19750 ±1581(5.84)**	**39916± 1922 (11.80)**
Protection cost	**27150± 9846 (8.02)**	**40725 ± 14957(12.04)**	**67875 ± 24929(20.06)**
Variable cost	**160868 ± 22893(47.55)**	**177467 ± 41003(52.45)**	**338336 ± 63713**

Figures in parentheses resemble percentage share to the total cost of production and figures after ± represent standard deviation.

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5. Factors Affecting The Gross Income From The Onion Seed

A Cobb- Douglas production function was run based on the cross sectional data to find out the effect of various cost components on gross income of radish, onion and cauliflower seed in the study area. The explanatory variables included in the model were seed cost, labour cost, animal labour cost, crop protection cost and fertilizer cost. Coefficient of multiple determinations (R^2) is a summary measure which tells how well the sample regression line fits the data. The R^2 for the Cobb-Douglas regression analysis of factors affecting the gross income of the onion seed was 0.794. This indicates 79.4% of the variation in the gross income is explained by the independent variables included in the model. The adjusted R^2 was 0.764 indicating 76.4% of the variation in the dependent variable explained by the explanatory variables included in the model after taking the degree of freedom into account. The measure of the overall significance of the estimated regression F value was 26.265 which were significant at 1% level of significance. 22.6% increase in the fertilizer cost could increase the gross income by 100% and it was found significant at 10% level of significance and 24.9% increase in the crop protection cost could increase the gross income by 100% and it was found significant at 10% level of significance.

6. Table 5. Cobb-Douglas Model For Factors Affecting Gross Income From Onion Seeds In Study Area

	Coefficients	Standard Error	t Stat	P-value
Intercept	2.192	6.292	0.348	0.730
Seed cost(NRs.)	0.218	0.154	1.410	0.168
Labour Cost(NRs.)	0.032	0.200	0.160	0.874
Animal Labour cost(NRs.)	0.380	0.615	0.618	0.541
Fertilizer Cost(NRs.)	0.226*	0.115	1.965	0.058
Crop Protection Cost(NRs.)	0.249*	0.133	1.869	0.070
F Value	26.265***			
R2	0.794			
Adjusted R2	0.764			
Returns to Scale	1.11			

7. Market Channel

Nearly 82 percent of the producers sold their seed to local traders and 18.3 percent of the producers sold to cooperatives. The local traders and cooperatives supply the seed to seed companies. The members of the cooperatives were also found to sell their seed production to the local traders due to limited market contact of cooperatives.

Table 6 marketing channel of onion seed in study area

Market Channel	Frequency	Percentage
Local traders	49	81.7
Cooperatives	11	18.3

8. Production And Marketing Cost

The average cost of production was NRs. 528.95/kg for onion seed. The producer had a gross margin of NRs. 971.05 in onion when they sell their onion seed at NRs.1500/kg. The Benefit Cost Ratio per kg of seed was found to be 2.84 for onion.

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The marketing costs incurred by the local traders and the cooperatives included transportation and packaging cost. The seed were packaged in plastic made sacks. The packaging costs was found to be and NRs. 1.5 for onion seed. The transportation cost of the seed from the study area to the seed companies Kathmandu was NRs. 9 per kg. The local traders had a gross margin of NRs.139.5 in onion. The company paid NRs. 1650 for onion seed to the traders.

Table 7. Production and Marketing cost and margin in study district

Aspect	Description	Onion
Production	Average Cost of Production (per kg)	528.95
Production	Sales Price (per kg)	1500
Production	BCR	2.84
Production	Gross Margin (per kg)	971.05
Marketing	Marketing Costs	10.5
Marketing	Packaging	1.5
Marketing	Transportation (Rukum to Kathmandu)	9
Marketing	Purchasing Price	1500
Marketing	Local Traders Cost	1510.5
Marketing	Sales Price	1650
Marketing	Gross Margin	139.5

9. Price Spread And Producer Share Of The Vegetable Seeds

The price spread was NRs. 6500 for onion seed and the producer share was 18.75% for onion seed .The price received by farmers NRs. 1500 for onion. The traders and the cooperatives sold them to seed companies at NRs.1650 for onion after transportation and bulk packaging. The seed companies processed the seeds and sold them in small plastic packets at NRs.5000 for onion for which the consumer paid NRs.8000 for onion seeds

Table 8. Price spread and Producer Share of onion seed in study area

Items	Onion
Farmer's price (NRs./kg)	1500
Local traders / cooperatives price (NRs./kg)	1650
Seed Company's price (NRs./kg)	5000
Retailer's price (NRs./kg)	8000
Price spread (NRs./kg)	6500
Producer's share (%)	18.75

VI. Problems

The infestation of diseases and pests was ranked the major problem in the vegetable seed production.. The farmers were barely literate to understand the technicalities of the seed production and the cultivation practices were still the conventional type and there was a lack of skilled manpower to overcome this problem. The pod stage of cauliflower and radish and the flowering stage of onion coincided with the April-March which is the most severe season of hailstones which damages a major portion of crops declining yield potential. Seed farming is an extremely tedious job and due to increased cropping duration and requirement of a lot of intercultural management practices, the labour requirement is extremely high. Also there was a problem in sufficient availability of the chemical

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fertilizers and the source foundation seed itself in the Sub-tropical Vegetable Seed Production Farm, Chapa was severely infested with the diseases.

Table 9. Problems of production of onion seeds in the study area

Production Problems	Level of problems	Level of problems	Level of problems	Level of problems	Level of problems	Weight	Index	Rank
Production Problems	1	0.8	0.6	0.4	0.2	Weight	Index	Rank
Diseases and Pest Infestation	41	12	7	0	0	54.8	0.91	I
Insufficient technical knowhow and lack of skilled manpower	9	21	8	9	13	36.8	0.61	II
Climatic problems	7	15	16	15	7	36	0.60	III
Poor mechanization	2	7	14	20	17	27.4	0.46	IV
Lack of quality foundation seed and other inputs	1	5	15	16	23	25	0.42	V

1. Post-Harvest Problems Of Onion Seeds

The major post harvesting problem the farmers were facing was the unscientific seed extraction methods. The bull power was used to thresh radish seeds from radish pod which could decline the quality of the seeds. Onion seeds were immersed in water during extraction and it was a general practice. Farmers' cleverness for increased weight of those onion seeds was major hindrance for sufficient drying and the quality was declined. There was also absence of grading and truthfully labeled packaging facility. Farmers had less knowledge of the safe moisture content of the seed and the moisture meter was not available. The random storage of seeds at high moisture percentage had reduced the quality. The absence of scientific packaging material was the major reason for increased moisture content of the seeds during seed transportation.

Table 10. Post-harvest problems of onion seeds in the study area

Post-harvest problems	Level of problems	Level of problems	Level of problems	Weight	Index	Rank
Post-harvest problems	1	0.67	0.33	Weight	Index	Rank
Problems on seed extraction methods	25	18	17	42.67	0.71	I
High moisture percentage	20	23	17	41.02	0.68	II
Absence of grading and truthful labeled packaging facility	15	19	26	36.31	0.60	III

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2. Marketing Problems Of The Vegetable Seeds

Abundance of non-trustworthy traders in the marketing sector was major problem as ranked by the producers. The traders mixed the seeds after collection from all the producers and the good quality seed also fetched low price. Traders delayed the payment of money and sometimes returned back the seeds to producers which were the major reason of lack of trust between the farmers and the traders. The price was unpredictable and the heavily fluctuating. The farmers didn't have many market options and the seeds couldn't be used for other purposes except marketing. So farmers had lower bargaining power. The cooperatives and the farmers group couldn't develop uniformity in the seed produced and a proper market. The members of cooperatives also had to sell their seeds to the local traders. The cooperatives were more focused on the grants and supports by various organizations and they were more of a savings and loan type of cooperatives rather than agricultural cooperatives.

3. Table11. Marketing Problems Of Onion Seeds In The Study Area

Marketing Problems	Level of problems	Level of problems	Level of problems	Level of problems	Level of problems	Weight	Index	Rank
Marketing Problems	1	0.8	0.6	0.4	0.2	Weight	Index	Rank
Abundance of non-trustworthy traders in marketing	31	14	8	7	0	49.8	0.83	I
Price Fluctuation and Unpredictability	10	17	15	10	8	38.2	0.64	II
Low Bargaining power of Farmers	7	14	14	6	19	32.8	0.55	III
Underdeveloped cooperatives/Farmers Group	2	10	10	20	18	27.6	0.46	V
Limited Market Options	10	5	13	17	15	31.6	0.53	IV

VII. Conclusions

Onion seed production is a profitable agricultural enterprise in Rukum (West), Nepal, with a benefit-cost ratio of 3.18, demonstrating its potential to improve farmers' income. However, disease and pest infestation, high labour costs, inadequate technical knowledge, and weak market linkages remain major challenges. Labour and crop protection constitute substantial production costs. Improving access to quality foundation seeds, strengthening extension services, promoting integrated pest management and farm mechanization, and developing effective linkages among farmers, cooperatives, and seed companies are essential. Strengthening farmers' bargaining power, seed quality management, and marketing efficiency will further enhance the sustainability and competitiveness of onion seed production.

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cooperation received from the concerned officials of the NAMP potato zone, Rolpa/ local agricultural offices, agro-vet personnel, farmer groups, and other key informants during data collection and field visits.

2. Data Availability

Data will be available upon request

3. Declarations

Ethics approval: Not applicable

Consent to participate: informed consent

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