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RESEARCH ARTICLE

COMPARATIVE SOCIO-ECONOMIC ANALYSIS ON RICE GRAIN AND SEED PRODUCTION IN PARBAT, NEPAL

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ABSTRACT

A comparative study was conducted in Modi Rural Municipality, Phalebas Municipality and Kushma Municipality of Parbat district aimed to compare the input use, productivity and profitability of rice grain and seed production among different socio-demographic farmers. Sampling 135 household, the survey employed a purposive selection of survey areas and stratified simple random sampling. Semi-structured questionnaire were utilized for interviews, with data analyzed using SPSS and MS Excel. The study obscurely shows that the respondents practicing rice seed production have higher year of schooling and training attended than the respondent practicing rice grain production. Further, the seed producers are in direct exposure to quality seed and fertilizer subsidy leading to production cost. It showed that the gross income received from rice seed production was higher than of grain production. The analysis showed that the productivity of rice as a seed production (575.81±277.80 kg/ropani) was found to be significantly higher than grain production (378.19 ± 151.3 kg/ropani). On an average, BCR of seed production (2.22) was found significantly higher than rice grain production (1.44). Hence, the productivity and profitability of seed production is higher than grain production in rice.

KEYWORDS

Rice, Grain, Seed, Socio-economic, BCR

1. INTRODUCTION

1.1 Background

Rice, being a staple for over 60% of the global population, is of paramount importance, especially in Asia, where 95% of its consumption occurs (Khanal and Maharjan, 2014). In Nepal, its cultivation spans diverse agro-ecological zones, from the Terai plains to elevation as high as 3050 meters in region like Chumchure, Jumla (Joshi et al., 2011).

It contribute 29.75% to AGDP of the national GDP and 21% of cereals sectors which is 49.41% (Poudel et al., 2021). Nepal annually produces 4.21 million tons of rice from 1.55 million hectares with an average productivity of 2.71 tons per hectare (MoALD, 2021). Almost half of Nepalese people's entire calorie needs are met by rice (Acharya et al., 2020). About 104 kg of milled rice is available per year per person in Nepal (Thapa et al., 2018). Since there are more than 1,700 rice landraces documented in Nepal, in height from 60 to 3,050 m, a key location for rice genetics resource (CDD, 2015).

According to reports, Nepal imported food grains worth $30 billion during the first ten months of the previous fiscal year, (Sapkota et al., 2021). Rice imports to Nepal increase by 20.68% during the first 10 months of the current fiscal year (2019/20). It has been estimated that by the year 2025, the world's farmers should produce about 60% more rice than at present to meet the food demands of the expected world population (Sapkota et al., 2021). Food insecurity is prevalent, with mountain and hilly zones having higher rates than the Terai zone (Chemjong and KC, 2020).

More than 65% of farmers use informal sources with poor germination and productivity (Sapkota et al., 2018). Nepal is a net importer of rice due to low farm productivity, limited livelihood opportunities, weak market connectivity, and other underlying causes (CBS, 2019). Productivity is assumed to be lower in traditional agriculture than in the modern sector (Dethier and Effenberger, 2012). Timely supply of quality seeds and other agriculture inputs increases crop yields by 15-25% (Bhurtel et al., 2018).

Rice farming has been adopted by many farmers over the district and has been reflected in their livelihood strategies. Rice cultivation is primarily focused for seed and grain purpose. Several constraints are restricting rice growing farmers to shift to seed production which are still unexplored. Exploring the existing socio-economic situation of rice grain and seed production in the site of study is an important requisite for further expansion of the seed production of rice (Khatri et al., 2018).

The information is helpful for PMAMP, local government, policy maker to improve their programs. It aims to find out what is the difference in economic condition by producing seed over grain of rice and the comparative cost and production practices like seed rate, amount of organic manure and chemical fertilizer, numbers of irrigation, amount of pesticide used, labor requirement etc. used. The comparative study of input use, productivity and profitability between seed and grain production of rice is thus essential to find out which one is better and for the adoption of profitable enterprise along with the supply of quality seeds to other areas of Nepal.

2. OBJECTIVES

2.1 General objectives

- To study the rice seeds and grain production status and its economic analysis in Parbat district

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2.2 Specific Objectives

- To examine the socio-demographic characteristics of the respondents
- To determine cost and return associated with production of rice seeds and grains

3. METHODOLOGY

3.1 Location of the study site

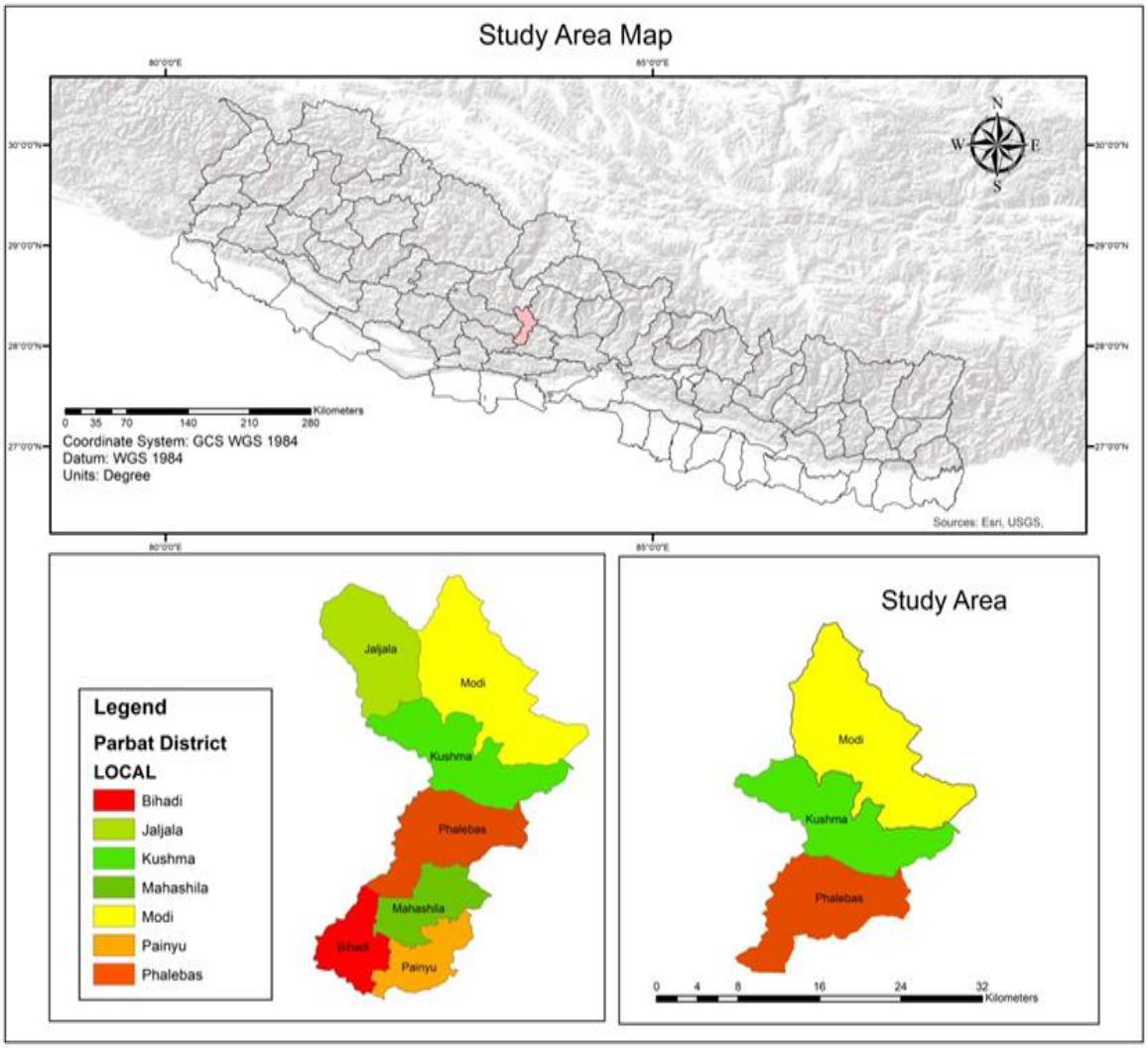


Figure 1: Map of Nepal Showing Parbat District

The study was mainly conducted at all ward from Kushma Municipality, Ward no 4,6,10 and 11 of Phalebas Municipality and 5 &6 ward of Modi Municipality was selected by using purposive random sampling method.

3.2 Sample and Sampling Technique

A total of 135 samples including 65 rice seed producing farmers and 70 rice grain producing farmers was collected from stratified simple random sampling.

3.3 Research Design

The purposive area were selected, informed by literature review, and problem was identified by FGD, KII, informal talks with the farmers and field observation. Appropriate methods and methodology were chosen. Pre-testing with 10 respondents was done to check the validity and effectiveness of interview schedule. Primary data were obtained from the field survey while secondary data were collected from published and unpublished literatures, AKC profile, and agriculture statistical profile, etc. The data analysis was done by using both primary and secondary data using statistical tools like MS Excel and SPSS.

4. DATA AND DATA TYPES

4.1 Primary Data

The primary data were collected from the farmers of the site because they have been cultivating improved rice from many years and hybrid rice from few years from now. They have got experience in cultivating both improved and hybrid rice and were well known with the inputs requirement and productivity of each. Primary data collection was conducted through focus group discussion, key informant survey and questionnaire.

4.2 Focus Group Discussion (FGD)

FGD was conducted to generate the preliminary status of rice cultivation in the selected site of study. They provided a broader range of information which was helpful to know the general input use condition, productivity and profitability of seed and grain production at farm level.

4.3 Key Informant Interview/Survey (KII/S)

To develop further idea of the study site, informal discussion and interview with key informants was done. Model farmers, teachers, village elders, co-operative staff and other knowledgeable persons were taken as the key informants.

4.4 Household Survey (HHS)

In order to collect the information, knowledge, experience and their perception about the opportunities and challenges of seed production and the inputs used, questionnaire survey was conducted. The data and information were collected at family level. A set of questions related to the amount of inputs used, productivity, cost of cultivation and agronomic practices of both seed and grain were asked from one household head of

the family. The questionnaire set contained open and close ended questions.

4.5 Secondary data

Secondary data were obtained from AKC annual reports, newsletters, bulletins and relevant articles, libraries and information office, Department of Agriculture, Ministry of Agriculture and proceedings of several NGOs and INGOs. Beside these, information were also obtained from International Rice Research Institute's publications.

4.6 Data Analysis Technique

After the completion of household survey the next step was data entry and analysis. The information collected from the field was coded, tabulated and analyzed using MS Excel and SPSS. Other descriptive statistics like graphs, charts and other such tools were also used to present the data.

4.7 Gross Margin

Gross margin is the value of output by producer, which is computed at the farm gate price minus total variable cost.

Gross margin = Gross return - Total variable cost

Where,

Gross return = Price × total quantity marketed

Total variable cost = Summation of cost incurred in all the variable

4.8 Benefit Cost Analysis

Benefit cost analysis was done after calculating the total cost and gross return from the rice cultivation. Cost of production was calculated by summing the variable cost items in the production process. For calculating gross return, income from product sale was accounted. Therefore, the benefit cost analysis was carried out by using formula:

$$B/C = \frac{Gross return}{Total variable cost}$$

4.9 Indexing

Production constraints in rice cultivation was ranked with the use of index. Scaling techniques, which provides the direction and extremity attitude of the respondent towards any proposition was used to construct index (Miah, 1993). The formula given below was used to find the index.

$I_{prob} = \Sigma S_i F_i / N$

Where,

I_{prob} = Index value for intensity Σ = Summation

S_i = Scale value of i^{th} intensity f_i = Frequency of i^{th} response

N = Total number of respondents

4.10 Chi-square test or test of independence

In order to study the weather two variables were independent or associated with each other; chi-square was applied.

$$\chi^2 = \sum \frac{(O_{ij} - E_{ij})^2}{E_{ij}}$$

Where, χ^2=Chi-square

O_{ij} = observed frequency of each ijth term

E_{ij} = indicates expected frequency of ijth term

i= 1, 2, 3…….. r

j= 1, 2, 3……k

This was tested at 0.05 level of probability for different degree of freedom.

4.11 T-test

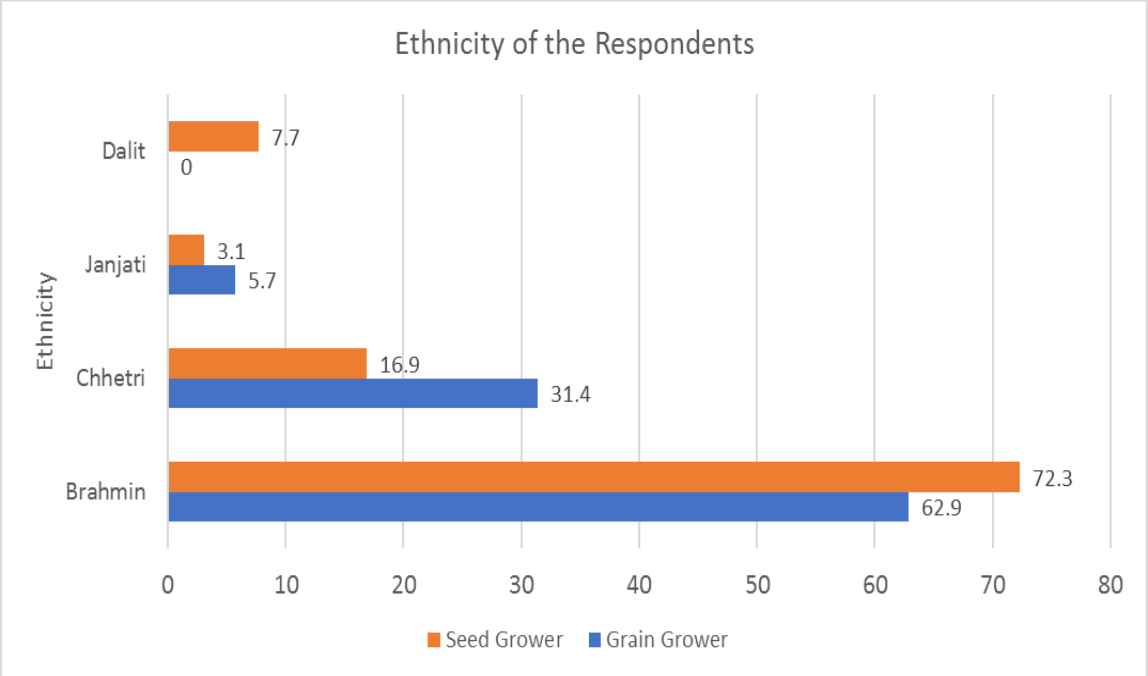
Two tailed independent sample *t*-test was used to compare the means between seed and grain producers about the amount of inputs used, cost of inputs, cost of production, and productivity.

5. Results

5.1 Socio-demographic Characteristics of Respondents

5.1.1 Ethnicity

Among rice seed growers, Brahmin were found in majority (72.3%) followed by Chhetri (16.9%), Dali t (7.7%), and Janjati (3.1%). Similarly, among rice grain grower, Brahmin were found majority (62.9%) followed by Chhetri (31.4%), Dali t (0%), and Janjati (5.7%) were found.

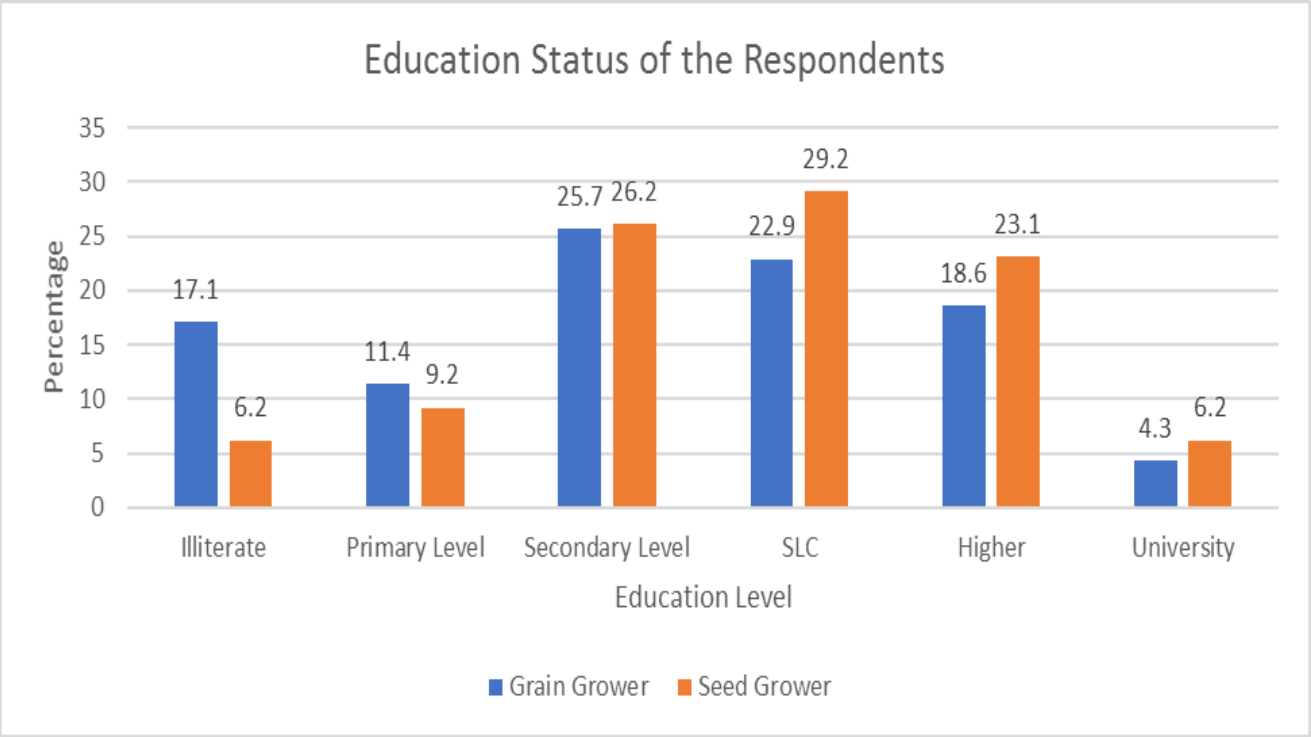


Source: Field Survey, 2023

Figure 2: Distribution of Ethnicity among Rice Seed Grower and Grain Grower

5.1.2 Education Status

From the chart below, it is evident that 25.7% acquired secondary level of education, 4.3% acquired university level education, 17.1% of households were illiterate, 11.4% acquired primary level education, and 18.6% of household belongs to higher education in rice grain growers.



Source: Field Survey, 2023

Figure 3: Education level of Household Head of Rice Seed Growers and Seed Grower

5.1.4 Occupations of Respondents

The studied revealed that majority of the respondents were engaged in agriculture in both seed and grain producing practices. As grain producing 80% of the respondent are involved in agriculture, 5.71% are in business, 8.57% in services, 1.42% in foreign income while 4.3% respondents involved in government job. Similarly, 90.7% are carrying agriculture as primary occupation in seed producing farmers, 4.61% in business, 1.53% in services and 3.07% of the respondent belongs to government job. It is not surprising that main occupation of the respondent was found to be agriculture.

Table 1: Different Occupations of the Respondents in Surveyed area of Parbat, 2023

Types of Occupations	Grain Producers	Seed Producers
Agriculture	56(80)	59(90.7)
Business	4(5.71)	3((4.61)
Services	6(8.57)	1(1.53)
Foreign Income	1(1.42)	0(0)
Government Job	3(4.3)	2(3.07)
Total	70(100)	65 (100)

Source: Field Survey, 2023

Figures in parentheses indicates percentage

6. Production Characteristics

6.1 Distribution Based on Paddy Cultivated Area and Productivity

The average land holding size of respondents in the study area was 6.48 Ropani and productivity was 492 Kg/Ropani which was higher in comparison to national productivity (190.5kg/Ropani) by 301.5kg/Ropani.

The farmers having intermediate mean farm size 7.54 ropani are mainly focused on seed production as in further large cultivated area it was found to be difficult in management of quality seed production, lack of market, and technology adoption. Hence, the study concluded that the rice productivity was statistically significant whereas rice cultivated area was statistically non-significant between seed producers and grain producers at a 1% level of significance.

Table 2: Distribution Based on Paddy Cultivated Area and Productivity

Variables	Grain Grower	Seed Grower
Area (Ropani)	6.27±4.76	7.54±5.30
Production (Kg)	1835.51±1084.91	3600.12±1868.3
Productivity (kg/Ropani)	378.19±321.53	575.81±277.80

Source: Field Survey, 2023

7. Economics of Production

7.1 Average Cost of Production of inputs

Successful rice cultivation requires higher amount of different inputs along with proper care and management. The production cost involves the cost of seed, organic manure, chemical fertilizers, herbicide, irrigation, labor and machinery. All the cost are presented in Nepalese rupees and are on per hectare basis. Average cost of production of rice seed and grain production is shown below.

Table 3: Average Cost of Production of Inputs					
Variable	Grain Producer (n=70)	Seed Producer (n=65)	Mean difference	T-value	p-value
Fixed Cost					
land Cost	1993.91±166.51	1993.13±203.70	0.260	0.08	0.521
Machinery Cost	882.85±540.40	882.62±381.12	0.237	0.003**	0.044
Variable Cost					
Nursery Cost	1782.74±1201.71	1881.02±856.00	-98.283	-0.544*	0.1
Tillage Cost	2601.35±804.24	2648.76±829.04	-47.417	-0.337	0.462
Transplanting Cost	2926.86±932.51	3226.04±2854.69	-299.183	-0.831	.690
Organic Manure	3377.39±26430.74	3954.30±1582.20	-576.910	-1.529**	.050
Chemical Fertilizer	445.77± 144.66	625.78±82.20	-172.87	-8.231***	0.00
Weeding Cost	2317.78±814.90	2875.29±1260.91	-557.51	-3.073*	.101
Pesticides	307.66±192.46	427.20±158.05	-119.534	-3.4	.396
Harvesting Cost	5204.42±2854.72	52223.06±1025.11	-18.63	0.05***	.000
Total Cost of Production	21847.36±7200.20	23737.21±4953.68	2180.323	-1.7***	0.00

Source: Field Survey, 2023

(*, **, *** represent 10%, 5%, 1% level of significance)

7.2 Average Return from the Rice Production

Total production cost, gross returns, gross margin and BCR all were significantly different (P<0.001, 0.1 indicates 1% and 10% level of significance) between grain and seed production of rice. Total production cost per ropani (Rs.21847.36), gross return per ropani (Rs.31658.44).gross margin per ropani (Rs.9811.08) and BCR (1.44) of grain production of rice were significantly lower than the total production cost per ropani (Rs.23737.21), gross return per ropani (Rs.52508.05).gross margin per ropani (Rs.28770.84) and BCR (2.22) of seed production of rice. Khatri et al. (2018)-found that rice seed producers, with higher education and training, earned more income than grain producers and revealed that seed producers achieved a higher benefit-cost ratio (BCR) of 2.67 compared to grain producers' BCR of 1.93.

Table 4: Economic indicators of rice seed and grain production in Parbat (2023)					
Variable	Grain Producer (n=70)	Seed Producer (n=65)	Mean difference	T-value	P-value
Total Cost	21847.36±7200.20	23737.21±4953.68	-1889.85	-1.7***	0.0
Gross Return	31658.44±12762.63	52508.05±15759.40	-20849.61	-8.4*	0.066
Gross margin	9811.08±7704.77	28770.84±13917.88	-18959.75	-9.8***	0.00
BCR	1.44±0.30	2.22±.53	-0.77832	10.48***	0.00

Source: Field Survey, 2023

(*, **, *** represent 10%, 5%, 1% level of significance)

The result indicates that the cost of production of seed production was higher however gross return was much higher than grain production of rice. Xie and Hardy (2009) noted that additional cost of seed production averages 5% with a range of 1% to 18% across countries. In present research, rice seed production has 54.85% higher gross margin than grain production. Also, the BCR of seed production (2.22) is higher than grain production (1.44). Thus, the rice seed production is more profitable than grain production. Xie and Hardy (2009) reported that the marginal returns of seed over grain production averages about 27%, ranging from 23% to 119% across countries and the benefit- cost ratio of rice seed production (2.22) is marginally higher than that of rice grain production (1.44).

8. Discussion and Conclusion

The study revealed that small-scale Farmers engage in subsistence production, with Brahmins being the majority. Education plays a role, with secondary level being common in seed and grain producers. Khatri et al. (2018) found educated rice seed producers earned more, with higher benefit-cost ratio of 2.67. Xie and Hardy (2009) noted a 5% average additional cost for seed production, while our study shows a 54.85% higher gross margin for rice seed than grain production, with a BCR of 2.22, making seed production more lucrative.

Sapkota et al. (2021) linked education and occupation to higher rice yields. Notably, agriculture is the main income source for both grain and seed producers, with post-harvest costs being significant. The BCR for seed production (2.22) surpasses grain production (1.44), emphasizing its profitability.

In conclusion, the study offers a robust foundation for decision-making and targeted interventions to enhance the sustainability of rice production in Parbat, benefiting both farming communities and the region's economy.

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ABBREVIATIONS

AGDP	Agricultural Gross Domestic Product
BCR	: Benefit Cost Ratio
CBS	: Central Bureau of Statistics
CDD	: Crop Development Directorate
FAO	: Food and Agricultural Organization
FGD	: Focus Group Discussion
GDP	: Gross Domestic Product
HHS	: Household Survey
INGO	: International Non-Governmental Organization
MoAD	: Ministry of Agricultural Development
NARC	: National Agriculture Research Council
NGO	: Non-Governmental Organization
PMAMP	: Prime Minister Agriculture Modernization Project
SPSS	: Statistical Package for Social Sciences