

Research Article

Economic Analysis of Potato Production in Bale Highlands, South-eastern Ethiopia

Boki Abebe^{*}, Ermias Getnet, Adamu Zeleke

Oromia Agricultural Research Institute (OARI), Sinana Agricultural Research Center (SARC), Socioeconomics Research Team, Oromia, Ethiopia

Abstract

The study was initiated to identify the costs and benefits of economic profitability of potato production and factors affecting potato production at the small-scale farmer's level. This study was conducted in three districts. Purposive and random sampling techniques were applied to select 113 respondents. Primary data was collected directly from the respondent, through interview schedules, key informant interviews, and focus group discussions. Both descriptive statistics and the econometric model, the Cobb-Douglas production function model were used to analyze collected data. The average age of the sample respondent was 42.75 years, while the average household size was found to be 7 family members. The cost-benefit analysis results imply that potato production is profitable in the study area and farmers produce potatoes to improve their livelihood. The model result shows that amount of seed, fertilizer, and fungicide affect potato output significantly at 1%, 1%, and 5% respectively, while human labor was insignificant. The model result depicts that, 56% of the variations in output of potato production could be explained by the explanatory variables included in the model. The biggest problem or constraint faced by potato producer farmers in the area was the lack of improved variety. Therefore, Agricultural Research Centers should have to release improved variety that is relevant to the needs and desires of smallholder farmers.

Keywords

Potato, Cobb-Douglas, Cost-Benefit

1. Introduction

Potato (*Solanum tuberosum* L.) is a source of both food and income in the growing countries of the world which can change greatly the food security of countries because of its high productivity per unit area and time compared to other crops [18]. Nutritionally, potato is considered to be a well-balanced major plant food with a good ratio between protein and calories. Potato is one of the major food crops grown in most the developing countries [11].

Potato has the potential to be cultivated on about 70% of

the 10 Mha of arable land in Ethiopia [7]. In Ethiopia production has increased from 280 000 tons in 1993 to around 525 000 tons in 2007 and it can potentially be grown on about 70% of arable land in the country [13]. However, area cropped with potato (about 0.16 Mha) is small and the average yield (less than 10 Mg ha⁻¹) is far below the potential [3]. This is due to, inadequate technical and managerial production skills, poor contract enforcement (weak institutional framework), imperfections in the marketing

^{*}Corresponding author: bokiabebe2009@gmail.com (Boki Abebe)



chain and very few market-related institutions, and weak infrastructure [2].

Compared to cereals, potato is short duration crops that can yield up to 30-35 t/ha in 3-4 months in Ethiopia [4]. Rapid growth in agriculture is essential for broad-based economic growth, but accelerated growth requires sound use of science and technology embodied in improved seed, fertilizer, agrochemical, and other agronomic practices [15]. However, without an efficient and cost-effective supply of these inputs at the farm gate, science-based growth in agricultural productivity cannot be achieved. The average tuber yield of potatoes was almost constant between 6-8 t/ha in the last 20-30 years while the area planted with potatoes increased from 30,000 ha to about 160,000ha in 2012 [16].

According to [14] potato is one of the most important sources of on-farm income for farmers in Ethiopia. Potato is quickly becoming important source of cash income due to a rising demand in the food processing sector to meet the demand of fast food, snack, and convenience food industries [6]. The raised in demand for the food processing sector is due to growing urbanization, income growing, and diversification of diets

Oromia is the major potato-producing region in Ethiopia that constitutes 51% of the national potato production [5]. Bale zone highland is one of the potential zones of potato-producing in Oromia region. Farmers likely to increase the production and marketing of potato enterprises, among others based on the potential that the crops had in the study area [10].

However, given the mounting pressure on land, sustaining higher rates of growth in agriculture production requires substantial improvements in factor productivity [9]. Consequently, transformation in the structure of production (mostly subsistence-based) to more commercially-oriented production will be key in sustaining growth. In an economy where resources are scarce and opportunities for new technologies are limited, efficiency studies will be able to show that it is possible to raise productivity by improving efficiency without raising the resource base or developing new technology [17]. This will create an advantage of breaking the mono-cropping phenomena and also creates enterprise diversification that helps to minimize risk. So, if this study is undertaken in this potential area of potato production farmer's profitability and benefit is better improve.

Objectives

The general objective of this study was to carry out an economic analysis of potato production in Bale Highlands.

The specific objective includes;

To identify and quantify the costs and benefits of potato production in the study area

To analyse factors affecting potato production under small-scale farmers

2. Methodology

2.1. Description of the Study Area

Bale zone is one of the administrative zones in Oromia Regional state which is located in south-eastern Ethiopia. The zone is found in Southeast of Oromia Regional State that extends from 5° 22'S – 8° 08'N latitude and 38° 41'W – 40° 44'E longitudes. It has borderlines with Arsi, Guji, West and East Hararge zones as well as Somali and Southern Peoples' Regional States. The altitude ranges from below 1000 in the lowlands to 4377m above sea level in the highlands. This study was conducted in three districts of Bale zone which has potential in terms of potato production [5].

The total area of Bale zone is about 63,555 km² which is 16.22% of Oromia region. About 10.6% of the land is arable land used for crop production, 24.6% is grazing land, 41.8% is forest, and others 25% [5]. Crop production and livestock management is the major livelihood making of the households in rural areas of the zone. Cereal, pulse, and horticultural crops are the major crops produced in Bale zone. Potato is among the horticultural crops majorly under expansion currently. The study was conducted in three major districts of potato producers in Bale zone. Sinana, Goba, and Dinsho were the three districts selected for the study [19].

2.2. Sampling Techniques

The study employed multistage sampling techniques in selecting representatives of households. In the first stage, three districts were selected purposively based on potential potato production areas from the highland Bale zone. Accordingly, Dinsho, Sinana, and Goba districts were selected. In the second stage, five (5) potato-producing kebeles (Mi'o, ayidda, Karrari, Qaso, and Walta'i Azira) were also selected purposively based on the potentiality of potato production kebele. The third stage: 113 representative sample respondents were selected using a simple random sampling method from the total households of all selected kebeles. The total population of these five selected kebeles was 2840 households. The simplified sample size determination formula provided by [20] was employed to determine the required sample size with a level of precision (e) = 9%.

$$n = \frac{N}{1+N(e^2)}$$

Where; n is sample size, N is Total population size and e is level of precision.

Table 1. Sample size.

District	Kebele	Sample Size
Dinsho	Mi'o	31

District	Kebele	Sample Size
Sinana	Ayidda	25
	Karrari	4
	Qaso	26
	Walta'i Azira	27
Goba		
Total		113

Hence, three kebele were selected from Dinsho districts and one kebele from each of Sinana and Goba districts. Among those districts, Dinsho has more selected kebeles rather than both Sinana and Goba. This is due to the potentiality of districts and kebeles by the potato production.

2.3. Types and Method of Data Collection

Both primary and secondary data were used for this study. Primary data was collected from sample households through interviews as well as focus group discussions and key informant interviews. Those primary data include demographic, socio-economic, and institutional factors, while secondary data is collected from published and unpublished documents and other relevant data sources.

2.4. Method of Data Analysis

To address the objectives of the study, descriptive statistics, and econometric methods of the data analysis were employed. Descriptive statistics such as mean, frequency, standard deviation, and percentage were employed for describing data on demographic, socio-economic, and institutional characteristics of the sample households in the study area.

Gross margin analysis (GMA): The gross margin analysis contains estimating the efficiency of individual farmers so that a comparison can be made between enterprises of different farm plans. The aim of this analysis was to estimate the cost, returns, and profitability or loss per hectare. It is a very valuable planning tool in situations where fixed capital is a negligible portion of the farming enterprise as is the case in subsistence [12]. The gross margin by definition is the difference between the gross farm income (G F I) and the total variable cost (TVC) i.e. $G.M = GFI - TVC$. The gross margin analysis was used to determine the profitability of potato production in the study area.

Cost-benefit analysis was calculated from the variable quantitative data collected from potato producer farmers during the survey.

Econometric Model

A classical Cobb-Douglas (C-D) production function was used to estimate the degree of influence of the inputs/factors of production concerning the agricultural output. The production function is determined by the resources available to

the farmer. In agriculture, continuous factors of production are land, labor, and capital. Other factors such as fertilizer, pesticides, and soil also play a significant role in the production of agricultural output.

Production is defined as the process of transforming two inputs into economically useful output. The first empirical analyses of production functions, [4] were precisely studies of the functional distribution of income between capital and labor in the context of an aggregate (macroeconomic) production function.

Production function analysis PFA [8] affirmed that the production function describes the law of proportion that is, the transformation of factor inputs into products or output at any particular period. The production function depicts the technology of a firm, an industry, or of the economy as a whole.

The production function includes all the technically efficient methods of production. It describes not only a single isoquant but the whole array of isoquants each of which shows how output varies as the factor inputs change. Production function offers a measurement of valuable economic tools such as marginal productivity of factor of production, marginal rate and elasticity of substitution, factor intensity, the efficiency of production, and return to scale

Consequently, the Cobb-Douglas production function was used to estimate the returns to scale in potato production and the extent of resource use efficiency in potato production in the study area.

Model specification

To determine the contribution of variable input to potato production, Cobb Douglas production model was employed. Cobb Douglas production model was specified to determine the possible relationship between the production of potato and inputs used in production.

$$y = AX_1^{\beta_1} X_2^{\beta_2} X_3^{\beta_3} X_n^{\beta_n} + U^e$$

Where;

Y= quantity of potato produced (output)

$X_1 = X_n$ = factors of production

$\beta_1 - \beta_n$ = parameters to be estimated

e = Error term

The equation shows that the relationship between output and the inputs is non-linear. So further the Cobb-Douglas production function was transformed into log-log form to assess empirically. Log-log model is made popular in empirical work is that the slope of dependent variable concerning explanatory variable. The equation derived is given as

$$\ln Y = A + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \dots + \beta_n \ln X_n + e$$

3. Result and Discussion

This section presents the major findings of the study and discusses it in comparison with the results of other studies.

Both descriptive and econometric methods were used to analyze the primary data. Descriptive statistics were employed to describe the general demographic, socio-economic and institutional characteristics of sample respondents. Econometric analysis was also used to identify factors affecting potato production in the study areas. The cost-benefit analysis was used to assess the profitability of potato production in the study areas.

3.1. Demographic and Socio-Economic Characteristics of Sample Household

Demographic Characteristics of sample Household

Demographic characteristics entail the fundamental background of a household sample. The result indicates that the overall average year of formal schooling of the total sampled household heads had up to only 5 years of formal education and family size is one of the variables that characterize farm households. The average household size was found to be 7.27, with a minimum of 1 and maximum of 29 family members, showing that family sizes were large and labor-intensive for the agricultural practice in the study area. The age of sample respondent households ranged from 19 to 85 with an average of 42.75 and a standard deviation of 14.54. The survey result showed their average level of education and family size was 5.51 and 7.27 respectively; with a standard deviation of 2.77 and 5.36 respectively.

Table 2. Demographic characteristics of the sample households for continue variables.

Variable	Min.	Max.	Mean	Std. D
Age	19.00	85.00	42.7	14.54
Education Level	-	12.00	5.51	2.77
Family size	1.00	29.00	7.27	5.36

Source: Own survey result, 2021

Table 3. Demographic characteristics of the sample respondents for nominal variables.

Variable	Frequency	Percent	Cum. Percent
Sex of household head			
Female	2	2.65	2.65
Male	110	97.35	100.00
Total	113	100.00	
Religion of household head			

Variable	Frequency	Percent	Cum. Percent
Muslim	97	85.84	85.84
Christian	16	14.16	100.00
Total	113	100.00	

Source: Own survey result, 2021

The study was required to find out the gender distribution among the respondents in the study area. The result indicates that the majority of respondents among the total sample were male 110 (97.35%); while the remaining 3 (2.65%) were female. With regards to religion, from the total sample respondents, 97 (85.84%) were Muslim and the remaining 16 (14.16%) were Christian respondents.

Socio-Economic Characteristics of Sample Household

The socio-economic factors chosen for the study included total land holding, land allocated for potato production, and livestock holding. The result of the study revealed that the average total landholding of sample respondents was found to be 3.60 hectares, while the average land allocated for potato production was 1.75 hectares.

To help with the analysis, the livestock number was converted to a tropical livestock unit (TLU). The number of livestock owned accounts for all types of livestock possessed by the household. Accordingly, the average number of livestock owned by sampled households which were measured by tropical livestock unit (TLU) is 11.71 tropical livestock units. This relatively implies that respondents use livestock production with crop production (crop-livestock mixed farming system).

According to [1], livestock is one of the major assets for farmers and also indicates the wealth of farmers. In this study, farmers owned a wide range of livestock types that include like, milking cow, non-milking cows, trained oxen, bull, heifer, calves, donkey, horse, matured sheep, and young sheep and matured chicken.

Table 4. Socio-economic characteristics of the sample households.

Variables	Min	Max	Std. Deviation
Total land holding (ha)	0.20	7.00	3.60
Land Allocated for potato production	0.67	2.83	1.75
TLU	0.82	35.58	11.71

Source: Own survey result, 2021

Out of the total sample households, only 8.85% had utilized credit in the study area during the study year. This was

due to credit services were providing with an interest rate. However, according to Islamic teachings, earning interest on credit is forbidden. Moreover, households used the credit to purchase inputs, buy livestock, and food items as well as start-up capital for petty trading. Access to timely information on prices and quantities plays a crucial role in reducing the risk of losing money on a market transaction. However, the result of the study revealed that only 24.78% of the sample household had access to market information. The survey data indicated that only 9.73% of the total households have been receiving training. Low access to training leads to reducing the managerial ability of the farmers. Out of the total household interviewed, only 41% of respondents were members of multipurpose cooperative.

Table 5. Institutional characteristics of the sample respondents for nominal variables.

Variables	Response	Frequency	Percent	Cum. Percent
Access to credit service	no	103	91.15	91.15
	Yes	10	8.85	100.0
	Total	113	100.00	
Access to market information	No	85	75.22	75.22
	Yes	28	24.78	100.00
	Total	113	100.00	
Access to training	No	102	90.27	90.27
	Yes	11	9.73	100.00
	Total	113	100.00	
Membership of multipurpose cooperative	No	67	59.29	59.29
	Yes	46	40.71	100.00
	Total	113	100.00	

Source: Own survey result, 2021

3.2. Cost, Return, and Profitability Analysis

The costs, returns, and profitability analysis are presented in Table 6.

Gross Return

The gross return was computed by multiplying the total output from the sampled farmers in average per hectare by the farm gate price of potato per quintal at what they sold after harvested. The average price was 797.64 Birr per quintal while the average output obtained per hectare was 134.53 quintals. The gross return was 107,306.51 Birr per hectare.

Cost of Production

In estimating the total cost of production, only the variable costs components were considered. Since, fixed costs are

negligible in small-scale crop production (Nandi et al., 2011) Furthermore, the farmers used different inputs (i.e. seeds, fertilizer, fungicide, labor, and land cost.) to boost production and productivity of potato in the study area.

Cost of Seed

The farmers accessed potato seeds from different sources like multipurpose cooperatives, local markets, and farmer-to-farmer seed exchanges. The average market price for seed was 688.44 birr per quintal (6.88birr/kg) of potato seed. The total cost of potato seed for the farmers was 13,672.42 birr per hectare.

Cost of Fertilizer

Potato production, like any other crop, requires the use of different inputs. Fertilizer application is one of the most important practices that need to be used by potato growers. The average amount of fertilizer used by the respondents was 5.03 quintals per ha. The average price of fertilizer was 1629 birr per Quintal. The total cost of fertilizer for all the farmers was 8,194.07 birr per hectare.

Cost of agrochemical (Fungicide)

Fungicide is the most chemical used for potato production in this study area.

Labor Costs.

The labor cost includes the cost of land preparation, fertilizer application, planting, weeding, and harvesting or human labor cost from pre-cultivated to post-cultivated. The average wage rate was 130.83 Birr per man-day and with an average of 40.35 men or labor used for a hectare starting from land preparation to harvesting. The total cost of labor for potato production was 5,278.99 Birr per hectare.

Land Cost

Land is one of the most important inputs in agricultural practices. Land cost was 6820 birr per hectare on average.

Total Variable Cost.

The total variable cost of potato production consists of the costs of fertilizers, seeds, agrochemicals, and labor. Table 6 shows that the total variable cost was 36,905.59 per hectare. The high cost of production could be said to be responsible for the underutilization of the inputs by farmers.

Gross Margin

The gross margin represents the difference between the total returns (Gross returns) and the total variable cost. Table 6 depicts that potato producer farmers earned or were profitable with a gross margin of 70,400.92 Birr per hectare. The result implies that potato production is profitable in the study area and farmers produce potato for improves their livelihood like other crops.

Table 6. Gross margin of potato production.

Input variable (Items)	Average Quantity	Price per unit	Total Value
1) Gross Return			

Input variable (Items)	Average Quantity	Price per unit	Total Value
Average Yield Qt/ha	134.53	797.64	107,306.51
II) Variable Cost			
Seed Qt/Ha	19.86	688.44	13,672.42
Fertilizer Qt/ha	5.03	1629.04	8,194.07
Agro-chemical (fungicide) Kg/ha	4.16	599.41	2,940.11
Labour man day/ha	40.35	130.83	5,278.99
Land Cost /ha			6,820.00
Total Variable Cost			36,905.59
Gross Margin			70400.92

Source: Own survey result, 2021

In the study area, the major crops produced included potato, wheat, and barley. For producing a crop, costs, and return are important factors that dominate the decision-making process of the farmers. According to data collected during focus group discussion (FGD), Potato production is the most profitable as compared to wheat and barley production in this study area.

3.3. Econometric Model Analysis Results

In this subsection, the results of Cobb-Douglas production function were presented and discussed to analyze factors affecting potato production in the study area. The total potato production of farm households was influenced by different factors. The result depicts those three explanatory variables which have been found to significantly influence the dependent variables while one explanatory variable (Labour) was not statistically significant. Those three explanatory variables including seed, fertilizer, and agro-chemical were presented as followed.

Table 7. The result of Cobb-Douglas production model.

Variable	Coef.	Std. Err	T	P> t
Seed	.000334	.0000591	5.65	0.000
Fertilizer	.001023	.0002663	3.84	0.000
chemicalS	.049245	.022655	2.17	0.032
Labor	.001960	.0043359	0.45	0.652
Cons	3.23066	.1619641	19.95	0.000
R-squared = 0.5615				
F(4, 89) = 28.49				
Prob > F = 0.0000				

Source: Own survey result, 2021

The result depicts that seed, fertilizer, and agrochemicals were independent variable which is significantly influenced the total amount of potato output at 1%, 1%, and 5% levels of precision respectively. The result showed that the R^2 value (0.5615) implies that about 56% of the proportion or variation of the potato output (dependent variable) was explained by the explanatory variable included in the model. Similarly, the F-value (28.49) of the equation was significant at 1% level of probability and implies that the model was well defined.

The practice of appropriate input rate use is the main practice of potato production in the study area. The contribution of specified variables that affect output of potato production can be seen from the estimated coefficient result of Cobb-Douglas production model above.

Seed(X_1): the value of production coefficient for seed was 0.0003341 which was significant at 1% level and had a positive relationship with potato output. Positive significance indicates that an increase of one unit of seed in potato production process resulted in boost increase in the total output of potato production by 0.0334%. However, the seeding rate of potato depends on the size of potato seed, by keeping another factor constant in the study area.

Fertilizer(X_2): the coefficient of fertilizer was 0.0010238 points as an increase in a unit of fertilizer in potato production process resulted in an increase potato output by 0.1024% and this was significant at 1% level, by keeping another factor constant.

Fungicide(X_3): the value of the coefficient of fungicide was a direct relationship with potato output and significant at 5% level. The result showed that the value of coefficient of fungicide was 0.0492458 indicating that an additional a unit of fungicide in potato production process resulted, in an increase 4.9246% of potato output, by keeping other factor constant in the study area.

The summation of all coefficients of input in potato production was 0.0525. If the sum of all coefficient of input was less than one and greater than zero ($0 < \sum \beta_i < 1$) prevails that potato production was found in diminishing return to scale. If allocate their resource in the second stage production zone, indicates that if all input used increased by one percent (1%), the total output of potato is increased by 0.0525%.

Pearson Correlation Analysis Between input used and potato output

The correlation analysis was run to show the exact nature of the relationship between input and potato output. Table 8 shows that all input has a direct relationship with potato output level. However, the two variables have a strongly significant and positive relationship with each other. This depicts that, there was complementary nature of the input used in the potato production.

Table 8. Pearson Correlation Coefficients.

	Total output	Seed	Fertilizer	Fungicides	Labor
Total output	1.0000				
Seed	0.6167*	1.0000			
Fertilizer	0.5748*	0.5183*	1.0000		
Fungicides	0.2900	0.1230	0.2104	1.0000	
Labor	-0.0629	-0.0170	-0.1274	0.1486	1.0000

Source: Own survey result, 2021

constraints faced by potato Producer farmers

Table 9 shows that about 16% of the sample respondents faced the problem of land shortage, 6% were faced with problems of low productivity, and about (65%) percent of the respondents faced the problem with lack of agricultural technologies like improved variety, fertilizer, and disease management technologies. However, 54% of the respondents

faced a problem of Disease prevalence. About 12%, 34%, 4%, and 60% of the respondents face the problems of weed prevalence, frost and insect prevalence, and market problem prevalence respectively. The majority of the respondents faced the problem associated with a lack of agricultural technologies especially since there is no potato harvesting technology in the study area.

Table 9. Constraints faced by the respondents.

Problems	Frequency	Percentage	Rank
Land shortage	18	15.93	6
Low productivity	7	6.19	8
Lack of agricultural technologies	73	64.60	1
Disease prevalence	61	53.98	3
Weed prevalence	13	11.50	7
Frost prevalence	38	33.63	4
Insect prevalence	5	4.42	9
Wild life attack being bio-diversity hotspot	19	16.81	5
Market problem	68	60.17	2

Source: Own survey result, 2021

4. Conclusion and Recommendation

Conclusion

The study was initiated to carry out the economic analysis of potato production in Sinana, Goba, and Dinsho districts of Bale highlands. Descriptive statistics and Econometric model, Cobb-Douglas production function were used by converting to log-log model to analyze factors affecting potato production. For producing a crop, costs, and return are important factors that dominate the decision-making process of the

farmers, and Economic analysis was followed for final decision-making about competing for economic enterprises' profitability.

The finding shows that 97.35% of respondents were male and only 2.65% of respondents were female. The major inputs used to produce potato in the study area were seed, fertilizer, fungicide, and human labor and land. The total cost of potato production was 36,905.59 birr per hectare of land. The average gross return from potato production was 107306.51 birr. Accordingly, gross margin of production of potato was 70400.92 birr per hectare. Similarly, according to data obtained or gathered from FGD, potato production is the most profitable as

compared to other crops produced in the study area.

The result of the Econometric model, Cobb-Douglas production function model shows three explanatory variables which are seed, fertilizer, and agrochemical were significant at 1%, 1%, and 5% respectively with a positive relationship to potato output while one explanatory variable which is labor was statistically not significant. Accordingly, R-square (0.56) shows that 56% of the variations in the total output of potato production could be explained by the explanatory variables (seed, fertilizer, agrochemical, and labor) included in the model.

Currently, farmers are faced with different constraints of potato production include; lack of improved variety, market problems, disease prevalence, frost prevalence, wildlife attacks being biodiversity, and other constraints that were the more farmers' problems in the study areas. Especially unsuitable roads during the rainy season with the high cost of transportation were major marketing problems as per the information from FGDs, KII, and household survey. The production and productivity along with the profitability of potato production could be increased if the above-mentioned problems are managed properly with the effort of all the responsible and concerned stakeholders.

Recommendation

Based on the findings of the study, the following recommendations were given:

1. The majority of respondents could not use the credit service from the credit institution. This is due to credit being given with an interest that is not allowable or unsuitable in the Muslim religion and due to the high-interest rate. To minimize this problem, the government should have to build or initiate a credit service that is free from interest.
2. More of the respondents couldn't access to participate in different agricultural training in the area. There is a need for more training of farmers by extension workers who need to be greater attention from the government. In addition, if demonstrations on potato production are expanded and reached around this area by the research center, farmers' awareness and productivity is more increase.
3. Market information and marketing systems play a great role in the profitability of potato producer farmers in the study area. A market price is fluctuating from time to time and seasonally. However, farmers have limited market information and they sell their products to local traders with unsatisfied prices. To sustain and improve those problems, the concerned body should have to distribute updated market information among farmers, especially at the time of harvesting.
4. The practice of appropriate input rate use was the main practice of potato production in the study area. But potato producer farmers could not follow the input rate use which was caused by poor awareness and poor linkage with DA and other agricultural experts. So, DA

and other agricultural experts should have to capacitate farmers' awareness about input rate use of potato production will boost potato output and increase farmers' profitability in this area.

5. The most problem or constraint faced by potato producer farmers in the area was the lack of improved variety. Therefore, the Agricultural Research Center should have to generate an improved variety that is appropriate to the needs and desires of smallholder farmers.

Conflicts of Interest

The authors declare no conflicts of interest.

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