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Determining the Technical Efficiency of Potato Farms and Influencing Factors in Bamyan Province

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Abstract: ***Considering the limitation of resources in agriculture, the need to shift the method of higher productivity through increasing inputs into improving the technical efficiency is becoming more important. Since potato production is one of major agricultural activities in Bamyan province which supports the livelihood of the majority of the peasant community and more thane50% of the country's total potato production is produced here, the province has the most prominent position compared to other provinces in this regard. The current study aimed to determine the technical efficiency of potato farms and the influencing factors in Yakawlang district and Bamyan center. The required were collected using stratified sampling method by filling questionnaires with 286 potato farmers in 2019. To determine the technical efficiency of potato production, Cobb- Douglas stochastic frontier production function along with inefficiency function were applied. The results showed that the inputs such as area under cultivation, labor force, amount of seed, amount of DAP fertilizer and animal manure had positive and significant effects on potato production. The mean of technical efficiency was 71.5% varying from the lowest of 26.9% to the highest of 92.7% was calculated. the inefficiency model also revealed that the variables marital status, living area, meeting with the extension workers year-round and satisfaction from the sale method of potato had positive effect on the level of technical efficiency of potato farmers. Based on the results, the qualitative and quantitative betterment in extension training programs coupled with DAP fertilizer and animal manure can be the managerial measures.***

Keywords: About Four Key Words or Phrases in Alphabetical Order, Separated by Commas.

I. INTRODUCTION

In today's world, one of the human apprehensions is to provide food requirements. In order to achieve food security, in addition to adopting desirable policies and possessing sufficient resources, the production of agricultural products should be somehow to meet the needs of the society.

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Agriculture is one of the most important and fundamental pillars of suppling human life on the earth. By cultivating agricultural plants, humans are able to prepare all kinds of their required foods [24]. The level of production of agricultural products in the current situations of a country is one of the most important factors in creating power and stability inside the country and at the international level. Therefore, the analysis of the quantity of production and favorable use of agricultural production resources will be the focus of agricultural policies that seek to increase domestic production through the optimal use of resources [13].

Potato is one of the major food resources (crops, grown in more than 100 countries of the world, as it is considered the fourth most valuable plant in the world food system after wheat, rice and corn in terms of production. Also, among other food plants, it has a special place, a source of starch,

Carbohydrates and vitamins in its composition and also it is economically valuable [3]. According to the report of the World Food and Agriculture Organization (FAO) in 2020, the amount of potato production in the world was approximately 3, 597, 1403 tones and the area under cultivated was 1, 6494,810 hectares of land which is an average yield of 2.180 tons per hectare [19]. The biggest producers and consumers of potato in the world are China, Russia, India, the United States of America, Ukraine, England, Germany, Poland, Bangladesh and Iran, and Afghanistan is in 52nd rank among the above-mentioned countries. According to the report of the World Food and Agriculture Organization, the per capita consumption of potato in the world is 32.41(kg), which indicates the high per capita consumption of potato in the world [9].

Agriculture in Afghanistan is one of the most important sectors for economic growth and development as well as one of the main sources of the country's income. More than 80% of Afghanistan people live in villages and most of their productions depend on agriculture and livestock and making a living through it. According to the latest statistics in 2017, the share of the agriculture sector in Afghanistan in the GNP is 23%, which is in the second place after the industry (51.6). As 80% of the people of Afghanistan are engaged in agriculture directly and indirectly. However, this sector allocates a small percentage of the income, which indicates the traditionality of the farming process in this country [21].

Potato in Afghanistan is one of the main items of agricultural products and a major part of the daily food of people, especially poor households.

Studies by the World Food and Agriculture Organization in Afghanistan have shown that potato yields are 2 to 7 times higher than wheat. Farmers not only consume potato as their food, but also sell some to the market to meet family needs [3]. According to the statistics and report of the Food Agriculture Organization (FAO), in Afghanistan, 53,674 hectares of land under potato cultivation are estimated with a production amount of 855,396 tones, and the average yield per hectare of land is about 16 tones [19]. Potato in Afghanistan has strong domestic markets and seasonal fluctuations in import and export. The per capita consumption of potato for each citizen of Afghanistan is estimated 25.7 kg, That indicates the low level of potato consumption compared to the per capita consumption of potato in worldwide [9].. Bamyan province is one of the largest producers of potato and produces more than 50% of potato needed in the country. This product has been considered as an important source of income for the majority of Bamyan potato growers [28]. and it has the ability to compete with imported in the countries of the region [20]. According to the report of the Directorate of Agriculture and Livestock of Bamyan Province has 18,400 hectares of cultivated land with a production rate of 349,028 tones, and the average production per hectare is estimated 18.96 tones, which indicates a high percentage of production in the country [18].

Potato production in Bamyan, due to the dominance of traditional agriculture, has always faced successive droughts, lack of water, small holder land, frost, and low quality of agricultural soils [25]. Lack of access to financial resources, lack of suitable storage houses, low prices, low export compared to production, lack of food safety, as well as incorrect and unfavorable utilization of production factors have caused potato growers not to utilize their products reasonable on average [12].

Therefore, solving the above-mentioned challenges requires a scientific, systematic and documented study of rooting and providing logical solutions to these challenges whose results can be useful and beneficial for producers, policymakers as well as those who involved in commercial activities. The prevalence of traditional agriculture in developing countries has led to the low performance of product if developing countries do not change the manner of their agricultural practices; surely, they will gradually lose their ability to provide food and will have to resort to other countries to meet the needs of their growing population [13]. In this regard, one of the basic measures to increase the performance of agricultural products and make cultivation more economical in these countries is to emphasize concepts such as efficiency and productivity. In general, technical efficiency means that by using a certain amount of input, get the maximum amount of product. To improve efficiency, the optimal use of resources in the agricultural sector, including water and land resources, is very necessary [17]. To increase the production performance and income of producers through the correct and optimal use of existing factors, the most suitable solution is to improve the technical efficiency of farmers. Considering the growing population of Afghanistan and the limitation of increasing the cultivated area, it is very necessary to emphasize on increasing the yield per unit area and neglecting it may cause many problems in the food supply of the people in the coming years and the country lead to more dependence [24].

In the field of technical efficiency and factors affecting it researches have been conducted inside and outside the country in various activities. Among them. Investigated the technical efficiency of potato seeds by using a random frontier model in Badakhshan province of Afghanistan. The results showed 76% inefficiency in potato seed production. The lack of knowledge, high price of quality seeds, the adoption and spread of technologies to obtain on high yielding varieties makes cultivation practices more limited [26]. Conducted research to investigate crops diversity and farm level technical efficiency in Afghanistan by using stochastic frontier production function. Based on the obtained results, the average technical efficiency is 71.9%. Access to extension services, farm size, ownership, oxen and tractors by the farm household and regional variables were important factors that significantly affected technical efficiency [1]. Investigated research to measure the technical efficiency of canola farmers and determine the effective factors in Tabriz County, Iran. The results of stochastic frontier analysis showed that the average technical efficiency of canola growers was 80%, accordingly, it can be said that if canola growers use current technologies more efficiently, the canola production can increase up to 20% if managerial principles are followed. Furthermore, the level of education, training course number and cultivated area showed negative effects on technical efficiency [8].

Studied the aim of analysis technical efficiency of strawberries in the Sheikhupura region of Punjab, Pakistan by using the stochastic frontier production function approach. According to the results, the average technical efficiency of farmers was recorded as 64%. Also, the variables of fertilizer land preparation, pesticide and labor hours had a positive effect and age had a negative effect on technical efficiency [27]. Conducted a study with the aim of investigating the relationship between technical efficiency and area cultivated in rain fed wheat farms of Ahar County by using Cobb-Douglas stochastic frontier function.

The obtained results indicated that the average technical efficiency of the region was equal to 64.5% and the variables of area under cultivated, herbicide, phosphorus fertilizer, having highly educated brains and on time field agricultural operations had a significant effect on technical efficiency [30]. Evaluated the technical efficiency in potato production of Vietnamese by using stochastic frontier analysis approach. The results of the research showed that the level of technical efficiency is lower than 66% on average. Furthermore, experience had a significantly negative effect on of technical inefficiency levels. While the variables of sex, age, and heads households had a positive effect on technical inefficiency [31]. Evaluated the technical efficiency of Irish potato and the factors affecting it in Molossab city, Kenya, by using stochastic frontier Cobb-Douglas production function approach. The results of the study indicated that the average technical efficiency was 70.7%.

Variables of land, seed, fungicides and fertilizer had a significant effect on potato production [16]. Conducted research to investigate the technical efficiency of Irish potato in Nigeria by using the stochastic frontier production function approach. The findings of the research indicated that none of the Irish potato growers have operated at the production frontier (efficient level) [10]. Focused in analysis of the technical efficiency of Household Vegetables by using the stochastic frontier production function approach, calculated the average technical efficiency of 64.6%. Based on the results of the technical inefficiency model, the variables of age, experience, sex, use of agricultural loans and non-agricultural income were the variables affecting technical efficiency [29].

Past studies show that the technical efficiency components have been the interest of researchers as by doing these types researches; one can identify the current situation, assess the profitability of production and at the same time, reinforce the strengths and eliminate the weaknesses. The current study, therefore, deals with such objectives through focusing on the technical efficiency of potato farms and the influencing factors in Bamyan province and has presented the appropriate feasible strategies to enhance the technical efficiency in potato production. The results of study will assist the farmers to assess their farming activity precisely and academically so that they can make better decisions and improve their profitability from potato production.

II. MATERIAL AND METHODS

Efficiency has a long history in various sciences including agriculture. Measuring and efficiency analysis shows how decision-making units can use their resources and facilities in order to achieve the best performance and increase production at exact time [32]. Theoretical discussions related to efficiency Theoretical discussions related to efficiency Farrell Was raised first by Farrell. Farrell defines technical efficiency as the maximum output production given a certain level of input. According to the definitions, efficiency is divided into three categories, technical, allocation and economic. Technical efficiency is obtaining the maximum product with a certain amount of production factors. Farrell used the concept of production frontier to measure efficiency [7]. to estimate the efficiency, two parametric methods are used, including the stochastic frontier production function (SFA) and data envelopment analysis (DEA [6]).

Unmethodical ways such as data envelopment analysis was peremptory and all of deviations of efficient frontier attribute inefficiency, the random frontier model separates the occurring inefficiency into factors under the control and outside the control of the farmer [14]. Stochastic frontier production function can be defined as follow:

$$Y_i = f(X_i, \beta)\exp(\varepsilon_i) \quad i = 1, 2, \ldots N \qquad (1)$$

In equation (1), Yi represents output level of potatoes for the ith farm in kgs/ ha, $f(X_i, \beta)$ is a suitable cobb- Douglas production function of vector, X_i of inputs used in production of potato in units/kg for the ith farm, βi are the unknown parameters which is to be estimated, ε_i is an error term the composed of two components:

$$\varepsilon_i = V_i - U_i \qquad (2)$$

In equation (2), Vi is a random error either associated with measurement error in the production of potato reported or the effects of those variables which are excluded from the production function that changes caused by factors outside control of farmers such as weather, pests, and diseases, and has a normal distribution with a mean of zero and a variance of N (0,σ2v). the Ui is assumed to be a non- negative truncated half normal, N (0,σ2u) is a random variable associated with farm- specific factors, which shows that ith farm is hardly attaining the maximum efficiency of potato production, so the Ui is associated with the technical inefficiency and has a value between zero and one, Therefore, Ui represents the surplus of frontier production from real production at a determined level of input consumption [2].

The contribution of the variance of the inefficiency component to the total variance (γ) can be calculated by using the following equation.

$$\gamma = \frac{\sigma^2 u}{\sigma^2 v + \sigma^2 u} \qquad (3)$$

In equation (3), γ is the contribution of inefficiency in the variance of the total residual, whose value is between zero and one. In case of occurring such situations, the ordinary least squares will be preferable to the maximum likelihood method [5]. Finally, the technical efficiency is obtained by following equation [15].

$$TE_i = EXP(-U_i) \qquad (4)$$

Therefore, In the present study to estimate the technical efficiency of potato growers, the specified empirical model of Cobb-Douglas production function stochastic frontier is given as follows:

$$\ln Y\_i = \beta 0 + \beta 1 \ln \text{land} + \beta 2 \ln \text{labor} + \beta 3 \ln \text{seed} + \beta 4 \ln \text{phos} + \beta 5 \ln \text{manure} + Vi - Ui \qquad (5)$$

In equation (5), Yi is the output of potato production in ith farm (kg), ln refers the natural logarithm, β_0 is constant term, $\beta_1 - \beta_2$ regression coefficients to be estimated, land, cultivated area (ha), labor, total labor man-day, amount of seeds kg/ha, phos is amount of phosphors fertilizer kg/ha and manure, amount of animal manure/ha. The determinant of technical inefficiency model is estimated as follows:

$$ui = s_0 + \sum_{r}^{n} = 1\, S_r\, D_r \qquad (6)$$

In equation (6), U_i is the error term of technical inefficiency of the production unit, s_0 the constant coefficient in inefficiency function, S_r is unknown parameters of the inefficiency function and D_r is the socio-economic variables of the potato growers, which are:

Di, imaginary variable of marital status (zero for unmarried farmers and 1 for married ones) D2, place of residence (zero for farmers living in the city and1 for farmers living in villages), D3 farmers' Meeting with extension agents throughout the year (zero, for farmers who have not met extension agents, 1, once to twice visit, 2, twice to three times visit, 3, three times to four times visit, 4, four times to five times visit, 5, five times to six times visit) and D4 farmers who are satisfied with the way of their potato sales. (1for satisfaction and zero for dissatisfaction). It should be mentioned that there are two ways to sell potato in Bamyan province: 1- selling the product at once 2- gradually selling the product.

III. DATA COLLECTION AND SAMPLE SIZE

Bamyan is one of the Central Provinces of Afghanistan, and the districts of this province areYakawlang, Kahmard, Sighan, Punjab, Wars and Shebar. Its total population is estimated approximately 495557 [23]. Bamyan borders the provinces of Samangan and saripul to the north, Baghlan, Parwan and Maidan to the east, Ghor to west, Ghazni and Daikundi to the south [4]. Since Bamyan is one of the poorest central provinces of Afghanistan in the central highland. it is known for having abundant water resources, cold and mountainous climate, fertile lands and excellent capacities, including propitious areas for potato cultivation compared to other agricultural products [11]. Among above- mentioned districts, Bamyan and Yakawlang are the most populous and the consumed by potato growers, fertilizer (DAP), animal manure required were collected using stratified sampling statistical population of the current study is the potato farmers of Bamyan and Yakawlang districts, whose number is reported 33,804 people. The sample size has been determined by the variance of the cultivated area using Cochran's formula to the number of 286 people. Among the total population, the number of potato growers in Bamyan center is 20652 people, and the Sample share is 175 people (61 percent). The total number of potato growers is 13152 tones, and the sample included 111 people (39 percent). In order to estimate Stochastic Frontier Function, Stata15 software has been used.

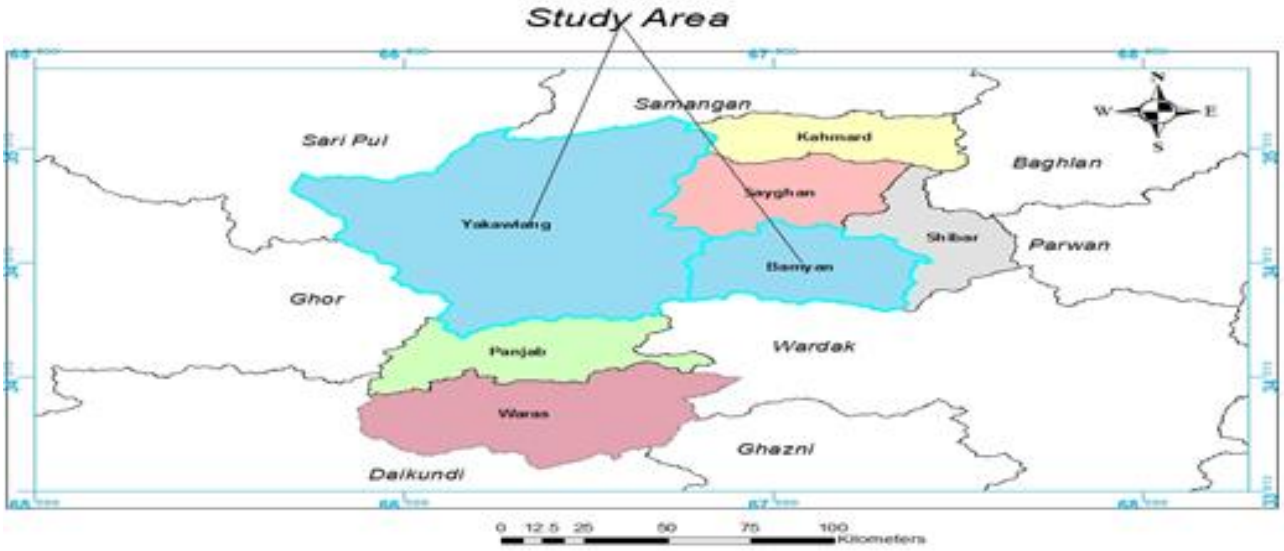

Fig. 1 Map of a Study Area

IV. RESULT AND DISCUSSION

The descriptive statistics of output productions and used inputs has been reported in table (1). According to the table13474.8 kg average potato has been produced. Average area under cultivation of potato growers is 0.8(ha). The average amount of local seed consumed by potato growers, Fertilizer (DAP), animal manure and urea fertilizer is 2083.5, 329.4, 113825.9 and 631.3 kg per hectare respectively. On average, majority of Farmers use animal manure and urea fertilizer in their field and a little of them use DAP fertilizer. Likewise, the average number of labors had been 46.1 per day.

Table 1: The Descriptive Statistics of the Amount of the Potato Produced and Inputs Used in Production Process

Variables	Mean	Minimum	Maximum	Std. Dev
Under cultivated area(ha)	0.8	0.1	3	0.5
Amount of production (kg)	.813474	1050	42000	8189.5
Amount of local seeds(kg)	5.2083	245	25200	2091.7
Amount of DAP Fertilizer(kg)	329.4	0	2800	3.369
Amount of animal manure(kg)	9.113825	0	1288000	6.164897
Amount of Urea fertilizer(kg)	631.3	50	3300	528.4
Labor worker force(man-days)	1.46	25	111	14.9

Source: finding research

Table (2) shows the descriptive statistics of the individual and social characteristics of Bamyan potato farmers. According to the table, the average age, farming experience, and potato growing experience are equal to 40.75, 19.46 and16.63 years. The average number of people under household head's farmers, number of family members, the number family Members being engaged in agriculture and potato growing are equal to 5.89, 7.99, 3.40 and 3.40 people. The mentioned statistics indicates that all farmers' families grow potato as a crop in the field. In addition, the results of Table (2) show that farmers have the most experience in potato cultivation.

Table 2: The Descriptive Statistics of Individual and Social Characteristics of Bamyan's Potato Growing Farmers

Variable	Average	Minimum	Maximum	Std. Dev
Age (Year)	40.75	13	83	14.3999
Experience Farmers (Year)	19.46	1	60	13.229
Experience Growers Potato	616.63	1	50	11.573
Number of household head	5.89	1	19	4.024
Number of Family	7.99	1	26	3.401
Number of Family Members Working in Agriculture	3.66	1	12	2.397

Source: finding research

Table (3) shows the descriptive statistics of imaginary and ordinal variables of Bamyan potato growers. According to the table below, 16.1% of the studied populations are single and 83.9% of them are married. According to living and residence, 12.6% of farmers live in the city and 87.6 % of them live in village. 87.8% of the farmers have not Meeting the extension agents during the year and only 0.8% of them have visited the extension agents once or twice. and also, 53.3% of farmers are illiterate and don't have education. Also 53.3% of farmers are illiterate and lack education and only 5% of them have university education. also, storage management training programs have not been yield for 11.9% of the farmers. 77.2% of them were satisfied with selling potato and 22.8% of them were not satisfied. Only 22.9% of farmers have used certified seeds. Similarly, 97.9% of Bamyan potato growers have their own houses and only 1.2% of them have rented houses. 83.2% of the studied farmers are heads of families and only 12.2% of potato growers believe being relationship between the education level and farming. relationship between the education level and farming not to Not to mention that about 95.1% of farmers are heads of families and only 12.2% of potato growers believe being Level and farming. not to mention that about 95.1% of farmers' main reasons for growing potato is family consumption and selling in the markets.

Table 3: The Descriptive Statistics of Imaginary and Ordinal Variables of Bamyan Potato Growers

Variable	Classification	Frequency	Percentage
Marital Status	Single	46	16.1
	Married	240	83.9
Living Area	City	36	12.6
	Village	250	87.4
Talk to with Extension Agent	None	251	87.8
	Times,1-2	23	8.0
	Times,2-3	7	2.4
	Times,3-4	3	1.0
	Times,4-5	1	0.3
	Times,5-6	1	0.3
Education Level	Illiterate	161	53.3
	Elementary	28	9.8
	Intermediate	33	11.5
	High School	33	11.2
	14th Grade	17	5.9
	Bachelor's degree	11	3.8
	Master Degree	4	3.4
Storage Management Training Programs	Yes	34	11.9
	No	252	88.1
Satisfaction with the Sale of Potatoes	Yes	220	77.2
	No	65	22.8
Using of Certified Seed	Yes	37	22.9
	No	249	87.1
House	personal	6	97.9
	Tenant	280	2.1
Head of Household	Yes	238	83.2
	No	48	16.8
The degree of Education Linkage with Agriculture	None	225	87.7
	Very low	15	5.2
	Less	9	3.1
	Average	26	9.1
	High	8	2.8
	Very high	3	1.0
Potato Growing Reasons	Family Consumption	6	2.1
	Family consumption and sales	272	95.1
	Only sales for to market	8	2.8
The total number of farmers		286	100

Source: finding research

The results of estimating Cobb-Douglas production function of the stochastic frontier along with the inefficiency function have been indicated (4). The obtained results show that the variables of under cultivation area (hectare), labor (man-day), quantity of seeds (kg), amount of phosphorus fertilizer (kg) and amount of animal manure (kg) have a significant effect on potato production. Thus, it means that one percent increase in the amount of use of mentioned inputs will respectively eventuate increase in potato production by 0.355, 0.215, 0.330, 0.127 and 0.215 %. Evaluating the variables used in the inefficiency function indicates that the marital status variable (change from celibacy to matrimony) has a negative effect on technical inefficiency (positive effect on technical efficiency). This is due to the fact that married farmers ask more relatives and acquaintances to cooperate and assist at the time of cultivation and harvesting of potato than unmarried farmers, and they carry out agricultural operations with a better-quality. Habitat has a negative effect on inefficiency (positive effect on efficiency). Farmers living in the villages and near their fields are able to have more efficient by providing timely agricultural inputs, including irrigation, within the set time than their fellowships. The more often the farmers visit with the extension agents, the more likely they Will get higher efficiency quantities. Efficiency in production is realized when the farmer's products are based on scientific principles and based on agricultural sciences.

Visiting with the extension agents provides a platform for teaching numerous and new knowledge and experiences related to potato production. Therefore, the attendance of the farmer as much as possible in such visiting is a good opportunity to improve technical efficiency and as a result, more production and income. Based on the stated issues, factors such as improving the quality of agricultural operations, agriculture based on science and the realities of the region and the farm, familiarity with new equipment and technologies, diseases identifying and pests and methods of prevention and combating them and other skills that the farmer gets after meeting with extension and development agents, The existence of a positive relationship between the frequency of meetings with extension agents and the improvement of technical efficiency makes it reasonable. Finally, satisfaction with the way of potato sales has a positive effect on technical efficiency. Obviously, the more farmers are satisfied with the sales prices, the more motivation they will get to increase the quantity and quality of their products.

Table 4: The Results of Estimation of Frontier Production Function and Inefficiency Model

Variable	Coefficient	Std. Dev	Z-Statistics
Production Function			
Constant	5.730***	0.585	9.79
Area Under Cultivation (Hectare)	355***0.	0.087	4.08
Labor	215***0.	0.085	2.52
Amount of Seed	330***0.	0.064	5.13
Amount of Fertilizer (DAP)	127**.0	0.058	2.20
Amount of Animal Manure	215***.0	0.066	3.25
Inefficiency Function			
Constant	221.53	107.002	0.50
Marital Status	932*.-2	774.1	65.-1
Living Area	495**.-4	533.2	77.-1
Meeting with the extension agents throughout the year	806*.-1	249.1	45.-1
Satisfaction with the how sell potatoes	593*.-3	18.2	65.1

Source: finding res

Notes: ***, **, * denote the level of significance at 1, 5 and 10 percent respectively.

After estimation the Cob-Douglas production function of the stochastic frontier using the maximum likelihood method, the significance assumption of the parameter γ is checked. Since the calculated value of γ is equal to 0.90. Therefore, the superiority of the maximum likelihood method is confirmed by identifying the inefficiency in the model. The number of 0.90 shows that 90% of the inefficiency is related to the factors under the control of the farmers, which is a high number and indicates mismanagement among Bamyan potato growers. According to the estimated frontier production function, the technical efficiency of potato producers in Bamyan province, Bamyan and Yakawlang districts were Calculated which the result of it has shown in table (5). It is observed that the average technical efficiency of the studied area is about 71.5%. It means in case of optimal use of inputs and compliance with management principles, farmers can increase their technical efficiency by 28.5% on average. The lowest level of technical efficiency is equal to 26.9% and the highest is equal to 92.7%, indicating that the difference between the most efficient and the least efficient potato producers is 65.8%. According to table (5), only 1.04% of farmers have achieved technical efficiency more than 90%. It can be seen that none of the farmers was able to achieve full technical efficiency.

Table 5: Frequency Distribution of Technical Efficiency of Potato Farms Bamyan Province

Technical Efficiency scope	Frequency	Percentage	Cumulative Frequency
≤ 50	27	9.44	27
60-51	30	10.50	57
70-61	72	25.18	129
80-71	86	30.06	215
90-81	68	23.78	283
> 90	3	1.04	286
Average	71.5		
Range	65.8		
Minimum	26.9		
Maximum	92.7		
Standard Deviation	0.12		

Source: finding research

V. CONCLUSION AND RECOMENDATION

Bamyan is regarded as an important resource income due to producing more than 50% required potato of country and export of potato to neighboring countries. Therefore, according to the main role of potato production in livelihood of Bamyan residents, this study determined the technical efficiency of potato farms and factors influencing on it in Bamyan province. Therefore, the current study aimed to determine the technical efficiency of potato farms and the influencing factors in Yakawlang district and Bamyan center The required were collected using stratified sampling method by filling questionnaires through direct interviews with 286 potato farmers in 2019. To determine of potato production,

Cobb-Douglas Stochastic Frontier Production Function along with Inefficiency Function were applied. According to the obtained results of the estimation of the production function, such as area under cultivation, labor force, amount of seed, amount of DAP fertilizer and animal manure had positive and significant effects on potato production. In addition, based on obtained results of the inefficiency function, the variables of marital status (change from celibacy to matrimony), habitant (from city to village), visiting with extension agents throughout the year and satisfaction with the way of potato sales have a negative effect on inefficiency (positive effect on technical efficiency). The average technical efficiency of potato growers was also 71.5% which shows that the potato growers studied are able to improve their production by an average of 28.5% if they observe managerial principles.

The lowest level of technical efficiency of potato growers was evaluated equals 26.9% and the highest equals 92.7%. Considering the variable significance of visiting with extension agents, it is recommended necessary managerial planning to be done in relation to increasing the quantity and quality of training programs being organized by the agents. Organizing the mentioned courses according to the knowledge level of farmers and its compatibility with the realities of the studied areas and the available facilities can be among the effective actions to improve the technical efficiency of the potato growers through improving the level of knowledge and skills of the farmers. Considering the significance and positive effect of inputs such as (DAP) and animal manure in the amount of potato production, it is recommended to increase the amount of use of these fertilizers under the supervision of agricultural experts until it does not affect the health of the crop.

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