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Research Article

Optimal Economic and Resource Use Efficiency Analysis of Groundnut Production in Punjab, Pakistan

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Abstract

This study was carried out to investigate resource use efficiency in groundnut production and to identify and analyze groundnut production and marketing constraints in district Attock. This study was based on the primary data of 150 groundnut growers for the year 2021-22. The Cobb-Douglas production function has been carried out in the functional analysis and resource use efficiency has been used to measure the productivity of resources used in groundnut production. The results of the Cobb-Douglas production function analysis revealed that there are 64.6 percent variations in Groundnut yield collectively explained by all eight independent variables. The model obtained an F-value of 32.145, which was highly significant. The results of resource use efficiency revealed that the ratio of MVP to MFC was less than 1 for human labor X_1, machinery power X_2, transportation X_4, manures X_5, and fertilizer X_6. The ratio of MVP to MFC for farm X_3 was greater than 1 which shows the under-utilization of resources. The significant constraints of the production and marketing of groundnut are lack of adaptability of improved varieties, climate change, high input cost, no support price mechanism, limited markets, and lack of processing units, etc. On the basis of the results, the study recommends using an optimum level of inputs and using improved technology, and HYVs. Initiatives should be taken to raise the area of groundnut crops, and plant processing units and assure better support price mechanisms to achieve maximum productivity.

Keywords: Groundnut, Production, Marketing, Cobb-Douglas, Resource use efficiency, Constraints analysis

Introduction

The Groundnut (*Arachis hypogaea* L.) or Peanut is an essential cash crop and food crop of the Kharif season worldwide. It is also an excellent source to fulfil the requirement of edible oil and vegetable protein. Groundnut is generally grown in arid, semi-arid, tropical, subtropical, and warm temperate climates. Sandy-loam, deep and well-drained soils are suitable for better crop growth, consisting of calcium and, to an extent, organic matter. For better production, the pH of the soil must be at 5.0 to 6.2, and the suitable temperature for better growth of a plant is 25-30^{0}C (Kapopo and Assa, 2012). Groundnut is used for multiple beneficial purposes (Adinya, 2009; Woodroof, 1983). Groundnut is rich in nutrients which contains about 11% carbohydrate, 45% oil, 5% water, 2% ash, and 30%

protein (Adinya, 2009; Awoke, 2003; Baraker et al., 2017; Kumar and Popat, 2010).

Groundnut crop is mainstream oilseeds and cultivated on about 28 million hectares in more than 100 countries (Bruinsma, 2017; Ncube & Maphosa, 2020; USDA, 2021). Global production projected 47.7 million tons (USDA, 2021), 95 per cent of which occurred in developing countries (FAO, 2011). China, India, Nigeria, and the US are the primary producers of groundnut, where India taking first place in terms of total area and second place in terms of production. China is the world's largest groundnut producer, with 17.5 million tons production, followed by India with 6.7 million tons production, Nigeria with 3.9 million tons production, and then the USA with 2.78 million tons production (USDA, 2021). Out of the entire world's groundnut production, about 50% is contributed by two major Asian countries, India and China (Rehman et al., 2015).

In Pakistan, groundnut is mainly concentrated in the Potohar region (barani areas of Pakistan), consisting of the Chakwal, Jhelum, Rawalpindi, and Attock districts. In Pakistan, the total cultivation area under the groundnut crop is 98 thousand hectares, and the total annual production is 90 thousand metric tons with an average yield of 0.9 metric tons per hectare. Punjab produces more than three-quarters of the product, accounting for 85 per cent of total production, while KPK and Sindh follow Punjab, accounting for 10 per cent and 5 per cent of the total output, respectively (PARC, 2021).

According to PARC (2021), groundnut is a significant source of oil and protein. Its nut is rich in protein (25-28 per cent) and oil (43-55 per cent). Its oil includes approximately 22 per cent linoleic acid and 61 per cent oleic acid and is regarded as one of the best vegetable extracts for human use. Groundnut is essential and economically significant and improves soil potency by supplying nitrogen to the soil. Peanut oil is one of the most refined cooking oils characterized by a high smoke point and is preferred for use in ghee, margarine, shortening, and salad oil. Peanut is also an excellent resource of vitamins and involves a high quantity of thiamine, niacin, and riboflavin (Aweke et al., 2020).

Presently, in Pakistan, peanuts are consumed as roasted nuts. A negligible amount of the groundnut yield is processed for confectionery purposes. There is no oil extraction of groundnuts on an industrial basis. There are minimal groundnut markets, so any surge in its production will lead to a decrease in prices until substitute markets are developed. There is no support price mechanism for produce which leads to abnormal fluctuations in prices every year. So, to boost its production, domestic groundnut oil extraction units and markets will be required (PARC, 2021).

But even though the peanut or groundnut is a formidable source of edible oil, little effort has been put into its processing to boost the economy and support people's livelihood. The government is clueless about the situation and does not perceive to address the gravity of the circumstances (Dhakku, 2015). There is a dire need to pay attention to the production, processing, and marketing of groundnut.

There is a scope to increase the country's groundnut production as this will decrease its import for edible oils requirement and the increased yield, raises exports of confectionery nuts, improves diet quality, and also improve cash income of smallholders (Kapopo and Assa, 2012). In Pakistan, its yield is consistently decreasing during the last decade because of population growth, decreased annual rainfall, and fluctuations in prices (Abdalla, 2000). The reduction in precipitation to produce groundnut may be due to below-average rain

and drought. Erratic rains result in late planting, which lowers yield because of ailments and poor pod filling. Production can be nourished by using better varieties and innovative practices (Minde et al., 2008).

According to Minde et al. (2008), the most crucial issues in groundnut cultivation are the high prices of inputs, unappealing pricing, and a lack of water availability. The decrease in groundnut production may be attributed to several challenges that smallholder farmers must overcome. These include the less use of high-yielding varieties, decreasing soil fertility due to poor crop management and insufficient fertilizer application, a lack of extension services, and a clash between labor supply and demand (Kumwenda and Madola, 2005; Minde et al., 2008). According to (Kumwenda and Madola, 2005), low producer prices are amongst the most important marketing challenges faced by farmers. The prices of seeds tend to rise as the planting season arrives. Some of the other issues found were a lack of knowledge, difficulties in obtaining capital for exporting, a lack of support services, and a lack of marketing experience. Another issue that was found was a lack of access to marketplaces in rural regions as a result of inadequate road infrastructure. Pakistan has an agriculture-based economy that provides job opportunities at a massive scale and significantly contributes to the national GDP. It is imperative to divert our synergies to this sector. Agricultural commodities are produced for multiple reasons, but we would affectively look into groundnut that has been ignored to work upon. Neglecting its resourcefulness, which is shown by the fact that it is the world's leading source of edible oil, nothing has been done to support it as a business.

Groundnut is the primary source of oil, protein, and vitamins. It also generates a cash income that contributes heavily to food security and alleviates poverty. As a legume, groundnut improves soil fertility and has a positive impact (Usman, 2016).

Therefore, the objectives of the study were to estimate resource use efficiency and resource productivity in groundnut production and to identify and analyze the problems faced in the study area and factors that directly or indirectly affect groundnut production and marketing.

Methodology

A multistage random sampling technique was carried out in selection of district, tehsils, villages and groundnut growers in order to achieve objectives. The major area under kharif groundnut production is expanded in Potohar region of Punjab. Attock district was selected purposively, because the groundnut crop become more popularize in this area and due to its quality and increasing area of cultivation and then out of six tehsils, three tehsils namely Pindi-gheb, Jand and Attock tehsils were selected on the basis of maximum groundnut cultivation area in these tehsils. For the selection of villages, five villages from each tehsil were selected randomly. Thus, total 15 villages were taken under the study and for the selection of Groundnut Growers, 10 groundnut farmers were taken from each designated village. Farmers was divided into three groups based on their land holding capacity viz, small (0 to 5 ha), medium (5 to 10 ha), and large (10 ha and more) farmers (Naidu et al., 2019; Qasim et al., 2016; Rawal et al., 2021).

This study was based on primary data. Primary data were collected from the year 2021-22 by using structured questionnaire and personal interviews with the assistance of well-designed and pre-tested schedules from the groundnut growers to meet the study goals (Idoko and Sabo, 2014; Rawal et al., 2021; Sapkota et al., 2020).

Tools of Analysis

Various methods for data analysis were employed according to study objectives.

Functional analysis

The Cobb-Douglas production function, which offers particular diminishing, increasing, or constant returns, is the best appropriate for evaluating resource productivities, according to empirical data from previous studies. Thus, according to (Choudhary et al., 2017; Devi et al., 2020; Jelliffe, 2020), the data were functionally analyzed by using the following approach:

$Y = a. X_1^{b1}. X_2^{b2}. X_3^{b3}. X_4^{b4}. X_5^{b5}\ldots.. X_n^{bn}. e^{\mu}$

Where;

The dependent variable is represented by the letter 'Y'.

The independent resource variables are denoted by the letters 'Xi's'.

A constant or an intercept is represented by 'a'.

The regression coefficients are denoted by the letters 'bi'.

This function generates regression coefficients, which are also known as production elasticities, remain constant regardless of the input level in each case. The sum of all coefficients i.e., 'bi's', shows the returns to scale. According to (Kapopo & Assa, 2012), when expressed in logarithmic terms, this function transforms into the following linear function:

$\log Y = \log a + b_1 \log X_1 + b_2 \log X_2 + \ldots b_n \log X_n + \mu \log e$

Where;

Y= Groundnut yield per hac (kg/ha)

a = constant / intercept

X_1 = Human labor (man days)

X_2 = Machinery cost (Rs/kg)

X_3 = Farm size

X_4 = Transportation cost

X_5 = Manures

X_6 = Fertilizer cost (kg/ha)

X_7 = Seed cost (Rs/ha)

X_8 = Other working capital cost (Rs/ha)

μ_i = Disturbance Term

bi = Regression coefficient

A production function analysis has been carried out in order to calculate the productivities of resource variables. The production function has been determined by using an SPSS software, and the values of R (coefficient of multiple correlation), R^2 (coefficient of multiple determination), coefficients, standard errors of regression, and 'F' statistics have been calculated in order to evaluate the overall significance level of the production function and regression coefficients as well.

Estimation of Resource Use Efficiency

Pawar et al. (2016a) reached to conclusion that the resource use efficiency would be measured by the ratio of marginal value products (MVP) to Marginal factors cost (MFC), which must be equal to 1. (Devi et al., 2020; Sapkota et al., 2020).

The resource use efficiency (r) was estimated as;

r = MVP / MFC

where,

If r=1, this indicates that resources are being used effectively, i.e., MVP=MFC=1.

If r is positive, it implies that resources are overutilized i.e., MVP > MFC

If r is negative, it shows that resources are underused i.e., MVP < MFC

Estimation of MPP and MVP

- Marginal value of product (MVP) has been calculated by using the following formula:

$$MVP = MPP \times P_y$$

- Marginal physical productivity (MPP) of inputs has been worked out by following formula:

$$MPP = bi \frac{\bar{Y}}{\bar{X}i}$$

Where;

MPP = Marginal physical product

$\bar{Y}$ = Arithmetic mean of output Y

$\bar{X}i$ =Arithmetic mean of i^{th} input

bi = Regression coefficient of i^{th} input

Constraints in production and marketing of groundnut

Analysis of problems in production and marketing of groundnut faced by farmers were ranked according to frequency and percentage.

Results and Discussion

Demographic Profile of Groundnut Growers of District Attock

This section covers the general features of sample farmers that may have significant impact on decision-making process. It contains their educational status, age, family size, source of income, operational land holding, livestock ownership, implements and machinery ownership and cropping pattern in respected area (Rawal et al., 2021; Rout et al., 2018; I. Usman et al., 2013). Therefore, it is necessary to obtain an overview of demographic information of the chosen groundnut growers in district Attock, is provided as follows:

Age of Farmer

In the overall farm size, the percentages of selected farmers lie within the age group of up-to 25 years, 26-35 years, 36-45 years, 46-55 years and above 56 years was 3.33%, 44%, 21.33%, 17.33%, and 14% respectively. The largest proportion i.e., 44% of overall farmers belonged to the age group of 26-35 years followed by 21.33% belonged to the age group of 36-45 years, 17.33% to the age group of 46-55 years, 14% to the age group of above 56 years and 3.33% belonged to the age group of up-to 25 years. In case of small, medium and large

farmers, majority of small farmers (18.67%) belonged to the age of 26-35 years, and majority of the medium (16%) and large farmers (9%) belonged to the same age group of 26-35 years. The average age of groundnut farmer was 41.25 years which means mostly farmers were adult and belonged to age group of 36-45 years.

Table 1 shows the frequency and percentage distribution of respondents according to age.

S.No.	Age (years)	No. of respondents			Overall
		Small land	Medium land	Large land	
1.	Up-to 25	1 0.67%	3 2%	1 1%	5 3.33%
2.	26-35 yrs	28 18.67%	24 16%	14 9%	66 44.00%
3.	36-45 yrs	14 9.33%	13 9%	5 3%	32 21.33%
4.	46-55 yrs	20 13.33%	6 4%	-	26 17.33%
5.	56-above yrs	18 12%	3 2%	-	21 14.00%
6.	Total	81 54%	49 32.67%	20 13.33%	150 100%

Educational Status of Farmers

Table 2 shows the distribution of respondents based on the educational level of groundnut growers. Education is the crucial factor that effect the skills and provide ability to analyze and solve problems. Producer's awareness and knowledge levels can be measured by their educational status since higher education helps them to grasp advanced methods, agricultural technology, and their potential use on farms to increase profitability. It was observed that the highest proportion of overall farmers that was 28% were education up-to high school followed by 27% were educated up-to primary level, 20% were educated up-to college level, 19% were illiterate and only 6% of the farmer were at university level.

Farmer's *Average Family Size and its Composition*

The table 3 shows the details about selected family's average size and composition. The size and structure of a family provide information about the available labor force and indirectly suggest the family's consumption demands. The table reveals that at overall level the average size of the family was 7.3 individuals including 56.16% males and 43.83% females. In case of small, medium and large size of land holdings the average family size was 41.09%, 31.50% and 27.39% respectively. In case of large holding family composition was found to be 0, but in case of small and medium land holding family labor were used on different farm practices.

Table 2. Educational statis of respondents.

S.No.	Education	No. of respondents			Overall
		Small land	Medium land	Large land	
1.	Illiterate	20 13.33%	9 6%	-	29 19%
2.	Primary	24 16%	16 10.67%	-	40 27%
3.	High School	14 9.33%	20 13.33%	8 5.33%	42 28%
4.	College	17 11.33%	4 2.67%	9 6%	30 20%
5.	University	6 4%	-	3 2%	9 6%
6.	Total	81 100%	49 100%	20 100%	150 100%

Table 3. Distribution of Farmer's average family size and its composition.

S.No.	Particulars	No. of respondents			Overall
		Small land	Medium land	Large land	
	Family size	F %	F %	F %	F %
1.	Male	1.7 23.28%	1.3 17.80%	1.1 15.06%	4.1 56.16%
2.	Female	1.3 17.80%	1.0 13.70%	0.9 12.32%	3.2 43.83%
3.	Total	3 41.09%	2.3 31.50%	2 27.39%	7.3 100%
	Family Composition				
1.	(Male) Average farm worker	1	1	-	
2.	(Female) Average farm worker	1	-	-	

Source of Income of Farmers

The table 4 shows that among the selected farmers agriculture was the most common occupation. Agriculture was identified as the primary source of income for farmers in the study area. Furthermore, some of the respondents chosen for the research were involved in other occupations, such as farming, dairy and poultry, government job, private jobs and other non-agricultural services. In order to get findings, the farmer's income sources have been divided into different categories (i.e., farming, farming-cum business and farming-cum services) as shown in Table 4. The table revealed that highest proportion 46% of overall farmers adopted farming as well as other non-agricultural services (like government job or private job) as a source of income, while 33.33% of overall farmers were linked with farming and business and the 20.67% farmers were adopted farming as a primary source of income.

Table 4. Income sources of respondents.

S.No.	Occupation	No. of respondents			Overall
		Small land	Medium land	Large land	
	Frequency Percentage	F %	F %	F %	F %
1.	Farming	22 14.67%	9 6%	-	31 20.67%
2.	Farming-cum business	18 12%	20 13.33%	12 8%	50 33.33%
3.	Farming-cum services	41 27.33%	20 13.33%	8 5.33%	69 46%
4.	Total	81 100%	49 100%	20 100%	150 100%

Land Use Pattern of Sampled Farmers

Land is one of the most essential assets for producers. The table 5 displays data on the land use patterns in the respective study area. At overall level the total average land holding was 6.0422 hectares, followed by small size group 3.676 hectares, medium size group 10.26641 hectares and large size group 22.8157 hectares respectively. The overall average area under groundnut cultivation was 4.0403 hectares, where the average area under groundnut cultivation in small size group was 2.46 hectares followed by medium 6.8442 hectares and then large 15.266 hectares respectively. The total land holdings of sampled farmers have been cultivated and came under irrigated area. Non-agriculture use of land of sampled respondents was not seen under study area.

Table 5. Distribution of operational land use pattern.

S. No.	Land use pattern	No. of respondents			Overall
		Small land	Medium land	Large land	
1.	Total land holding (in hectares)	3.676401	10.26641	22.815795	6.0422868
2.	Total area under Groundnut production (in hectares)	2.460568	6.844273	15.26673	4.0403304
3.	Total cultivated area	3.676401	10.26641	22.815795	6.0422868
4.	Irrigated area	3.676401	10.26641	22.815795	6.0422868
5.	Unirrigated area	-	-	-	-
6.	Non-agriculture use	-	-	-	-

Livestock Ownership of Sampled Farmers

The Table 6 shows the average number and percentages of livestock and other poultry birds available to sampled farmers in the respective study area. The table revealed that the highest proportion of cows and buffaloes (i.e., 15%) were seen in medium size group of land holding, followed by large and then small. Mostly Sheep were seen in large size group and goats were concentration in medium size group, where the highest proportion of poultry (i.e., 57%) was seen in small size group followed by large size group (i.e., 44%) and then medium (i.e., 41%).

Table 6. Distribution of Livestock ownership of farmers.

S. No.	Livestock	No. of respondents			Overall
		Small land	Medium land	Large land	
1.	Cow	1.73 11%	2.1 15%	1.91 14%	1.87 12.42%
2.	Buffalo	1.77 11%	2.15 15%	1.83 13%	1.90 12.82%
3.	Sheep	1.83 11%	2.06 14%	2.07 14%	1.94 13.09%
4.	Goat	1.84 11%	2.18 15%	2.08 15%	2.01 13.57%
5.	Poultry	9.30 57%	5.97 41%	6.23 44%	7.09 47.87%
6.	Total	16.47 100%	14.46 100%	14.12 100%	14.81 100%

Owned Machinery and Implements of Sampled Farmers

The Table 7 shows the average number and percentages of owned machinery and implements available to sampled farmers in the respective study area. The table reveled that greatest proportion of land machinery was seen in large size group of land holders, where 36.67% were farm implements followed by cultivator 31.3% and then tractor and thresher, 17.33% and 15% respectively. In case of small size group no one have their owned machinery or any other implement for farm practices. In case of medium size group there were only few farmers who had their own cultivator and other farm implements but no tractor and thresher were seen there too.

Cropping Pattern on Sampled Farms in District Attock

The Table 8 shows the cropping pattern of groundnut producers in selected areas of district Attock. Cropping pattern is the part of area under which different crops grown annually with respect to area specifications (like space and time). The table reveals that out of the total area, majority of the area were covered under kharif crops that was 718.51556 hectares followed by Rabi crop area 330.0302 hectares in study area. The Groundnut and Wheat were the major kharif and rabi crops grown in 606.04 hectares and 159.12 hectares of area in district Attock. The main reason of the higher concentration of Groundnut and Wheat was the rain-fed area. Chickpea and maize were the next major crops grown in 112.22 hectares and 63.24 hectares of area. Therefore, the results of demographic characteristics supported the outcomes of previous studies by (Akter et al., 2015b; Devi et al., 2020; Rawal et al., 2021; Rout et al., 2018; Sonvanee, 2015; I. Usman et al., 2013; Zekeri & Tijjani, 2013).

Table 7. Distribution of Owned machinery and implements of farmers.

S. No.	Machinery and implements	No. of respondents			Overall
		Small land	Medium land	Large land	
1.	Tractor	-	-	0.52 17.33%	0.52 17.33%
2.	Thresher	-	-	0.45 15%	0.45 15%
3.	Cultivator	-	0.64 48.48%	0.94 31.33%	0.94 31.33%
4.	Other farm implements	-	0.68 51.51%	1.10 36.67%	1.10 36.67%
5.	Total	-	1.32 100%	3.00 100%	3.00 100%

Table 8. Distribution of cropping pattern in selected area.

S. No.	**Cropping pattern**	**Overall area in hectares**
	Kharif	
1.	Groundnut	606.04956 hectares
2.	Maize	63.242 hectares
3.	Mash	49.224 hectares
	Total area	718.51556 hectares
	Rabi	
1.	Wheat	159.1242 hectares
2.	Chickpea	112.226 hectares
3.	Lentil	58.3321 hectares
	Total area	330.0302 hectare

Results of Cobb-Douglass Production Function

The Cobb-Douglas type production function, which is explained in the methodology, was used in this study to investigate the resource productivity in groundnut farming.

Table 9. Results of Cobb-Douglas production function in Attock District.

S.No.	Variables	Regression Coefficients (bi)	p-value (significance level)
1	Intercept (a)	3.978* (.881)	.000*
2	Human Labor (X1)	.029^{NS} (.083)	.726^{NS}
3	Machinery Power (X2)	.010^{NS} (.069)	.890^{NS}
4	Farm size (X3)	.061^{NS} (.038)	.117^{NS}
5	Transportation (X4)	.061^{NS} (.096)	.522^{NS}
6	Manures (X5)	.060** (.027)	.027**
7	Fertilizer (X6)	.021^{NS} (.101)	.833^{NS}
8	Seed (X7)	.378* (.115)	.001*
9	Other working capital (X8)	.278* (.078)	.001*
10	R^2	0.646	
11	Standard error of estimates	.40068	
12	F-value	32.145*	.000*
13	No. of Observations	150	

(* and ** indicates significance level at 1% and 5%, ^{NS} indicates variable is not significant), (numbers in parenthesis are standard error of coefficients)

The Table 9 revealed that the value of R^2 pertaining to the groundnut's production data, was estimated 0.646 at the overall level which indicates that there are 64.6 per cent variations in Groundnut yield collectively explained by all eight independent variables under consideration. In contrast, the observed values of standard error of estimates (S) deviate from the regression line by an average of 0.40068 units which shows the observations are very close to regression line. The model obtained an F-value of 32.145 was highly significant at 1% level (p-value = 0.000) indicating that all predictor variables significantly explained the variance in the dependent variable at 1% level.

The values of regression coefficient of human labor X1, machinery power X2, farm size X3, transportation X4 and fertilizer X6 were seen positive and insignificant which shows that there was over utilization of these resources and there is need to decrease their usage. Where the values of regression coefficient of seed X7 and other working capital X8 were seen positive and highly significant which shows that there was efficient utilization of these resources and the value of regression of coefficient of manure X5 was positive and significant at 5% level which shows that there was under-utilization of input and there is need to increase its use to increase yield (Akter et al., 2015b; Devi et al., 2020; Jelliffe, 2020; Kapopo & Assa, 2012; Pawar et al., 2016b; Zekeri & Tijjani, 2013).

Estimation of resource use efficiency

To determine if the resources utilized in groundnut production were appropriately allocated, the allocative efficiency with regard to various resources was evaluated using the MVP to MFC ratio, and the findings are shown in Table 10.

The results of resource use efficiency revealed that the ratio of MVP to MFC was less than 1 for human labor X1, machinery power X2, transportation X4, manures X5 and fertilizer X6 which shows there were higher utilization of these resources and there is need to decrease their use in order to achieve maximum profitability. The ratio of MVP to MFC for farm X3 was greater than 1 which shows the under-utilization of resource, in order to maximize profit function, there is need to increase its use (Akter et al., 2015a; Devi et al., 2020; Pawar et al., 2016b; Sonvanee, 2015; Zekeri and Tijjani, 2013).

Table 10. Results of resource use efficiency in Attock District.

Variables	AM	bi values	MVP (pkr)	MFC (pkr)	r= MVP/MFC	Decision rule
Output (Y)	1075671					
Human Labor (X1)	70910.06	0.029	65.9873	800	0.0824	Over-utilization
Machinery Power (X2)	48245.05	0.01	33.4439	600	0.0557	Over-utilization
Farm size (X3)	68.25333	0.061	14420.3	1000	144.203	Under-utilization
Transportation (X4)	4712.107	0.061	2088.74	3000	0.6962	Over-utilization
Manures (X5)	128115.2	0.06	75.5651	120	0.6297	Over-utilization
Fertilizer (X6)	121852.7	0.021	27.8070	210	0.1324	Over-utilization
Seed (X7)	149863.9	0.378	406.972	400	1.0011	Efficiently utilized
Other working capital (X8)	64195.81	0.278	698.729	690	1.0010	Efficiently utilized

Constraint analysis in production and marketing of groundnut

One of the most crucial aspects of this research is to identify the constraints experienced by farmers regarding production and marketing of groundnut in respective area. In order to study the intensity of problem, the data regarding constraints in production marketing of groundnut in respective area were gathered from 150 sampled farmers (Qasim et al., 2016; Sapkota et al., 2020).

The constraints regarding groundnut production faced by farmers were ranked according to frequency and percentage in the Table 11.

Table 11. List of production constraints faced by farmers in district Attock.

Production Constraints				
S. No.	Problems	Frequency n = (150)	Percentage	Rank
1	Non-availability of improved seed quality	129	86%	II
2	High seed cost	77	51.33%	IV
3	High cost of hired labor	29	19.33%	VIII
4	Climate change	131	87.33%	I
5	High machinery cost	53	35.33%	VI
6	Non-availability of machinery on time	11	7.33%	IX
7	Lack of fertilizer availability	48	32%	VII
8	Lack of technical knowledge	69	46%	V
9	High prices of insecticides and pesticides	89	59.33%	III
10	Others	9	6%	X

The Table 11 revealed that according to majority of the farmers (87.33%), climate change is the major problem that is effecting groundnut production, followed by non-availability of improved seed varieties which is given ranked II by 86% farmers and then high prices of insecticides and pesticides is highlighted by 59.33% farmer (Qasim et al., 2016; Sapkota et al., 2020).

The constraints regarding groundnut marketing faced by farmers were ranked according to frequency and percentage in the Table 12.

Table 12. List of marketing constraints faced by farmers in district Attock.

Marketing Constraints				
S. No.	Problems	Frequency n = (150)	Percentage	Rank
1	Lack of transport facility on time	49	32.67%	IX
2	High transportation cost	109	72.67%	V
3	Poor market management	89	59.33%	VI
4	Price variations in market	115	76.67%	IV
5	No support price mechanism	121	80.67%	III
6	Storage problems	130	86.67%	II
7	Delayed payments	51	34%	VIII
8	Malpractices adoption by markets	79	52.67%	VII
9	Lack of processing of groundnut	131	87.33%	I
10	Others	27	18%	X

The Table 12 revealed that according to majority of the farmers (87.33%), lack of processing of groundnut is the major problem that is effecting groundnut marketing, followed by storage problem which is given ranked II by 86.67% farmers and then no support price mechanism is highlighted by 80.67% farmer (Akter et al., 2015a; Daudi et al., 2018; Ezihe et al., 2017; Idoko & Sabo, 2014; Jelliffe, 2020)

Conclusion

The results of Cobb-Douglas production function analysis revealed that the value of R-squared indicates that there are 64.6 per cent variations in Groundnut yield collectively explained by all eight independent variables. The model obtained an F-value of 32.145 was highly significant at 1% level. The values of regression coefficient of human labor X1, machinery power X2, farm size X3, transportation X4 and fertilizer X6 were seen positive and insignificant which shows that there was over utilization of these resources and there is need to decrease their usage. Where the values of regression coefficient of seed X7 and other working capital X8 were seen positive and highly significant which shows that there was efficient utilization of these resources and the value of regression of coefficient of manure X5 was positive and significant at 5% level which shows that there was under-utilization of input and there is need to increase its use to increase yield. The results of resource use efficiency revealed that the ratio of MVP to MFC was less than 1 for human labor X1, machinery power X2, transportation X4, manures X5 and fertilizer X6 which shows there were higher utilization of these resources and there is need to decrease their use in order to achieve maximum profitability. The ratio of MVP to MFC for farm X3 was greater than 1 which shows the under-utilization of resource, in order to maximize profit function, there is need to increase its use. Major constraints identified by farmers in production and marketing of groundnut was climate change, non-availability of improved seed varieties, high seed prices, no support price mechanism, lack of processing units, limited markets and storage problems.

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