

IMPACT OF FARM SIZE ON AGRICULTURE PRODUCTIVITY IN DISTRICT HYDERABAD, SINDH

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ABSTRACT: The present study analyses the impact of farm size on agriculture productivity in district Hyderabad. Data was collected from three villages. Results reveal that large farmers average age of farmers was 45 years and had more than 25 years farming experience. Further results indicated that per acre average cost realized by the large farmer was highest Rs. 37,202, while medium farmer paid Rs.34717, although small farmer incurred Rs.34439 and very small farmers spent Rs.33,326 rupees on different inputs/activities cost including i.e. land preparation, seed, fertilizer, farm yard manure, weedicide, irrigation, harvesting, threshing, packing, loading unloading and transport. The result describes that the large growers were earning highest average revenue Rs. 59520, while Medium grower were earning 53590 rupees, Small grower were earning 51980 rupees per acre. According to the data it was found that large growers were earning highest net return Rs.59520 rupees. The results further reveal that farm size has a significant impact on yield. The results indicate that farm size has significant impact on production cost; it shows that 1 unit increase in farm size Rs. 82.22 increase in production cost. The result more found that farm size has a positive significant impact on returns with 1 unit (one acre) increase in farm size results Rs. 254.89 increase in returns.

Keywords: Farm size, productivity, agriculture, cost.

INTRODUCTION

In Pakistan agriculture is considered as backbone of its economy. Agriculture sector in this country shares a significant contribution in economic and social well-being of the nation through its contribution 19.53 in gross domestic production [1]. Agriculture also significantly contribute in improvement of standard of living of rural population. The race between rapidly growing of population and supply of food is such a real grim. A large area of Pakistan is under various crops. Wheat is the basic staple food for the population of Pakistan and has a significant status as a nutritional food. Wheat contributes 2.1 percent in gross domestic product (GDP) and 10.0 percent value added in agriculture. The area under wheat crop cultivation is decreased by 0.2 percent (9180 thousand hectares) in 2015 as compared to previous year farm size (9199 thousand hectares). Wheat production was around 25.478 million tons in 2015, and decreased 1.9 percent during the previous year production of 25.979 million tons. During the last year the extraordinary water shortage and drought have more affected the wheat crop [2]. There are many factors behind the reduction of wheat production land fragmentation is one of the most important input reason of low yield. Land fragmentation in many countries is considered as bottleneck to modernization and productivity of agricultural sector. Literature [3] ; [4] highlighted that fragmentation of land is main barrier in the development of agricultural yields. Due to rapidly growing rural population and lack of alternate income generating sources, the land fragmentation is increasing in almost all provinces of Pakistan. In Sindh province of Pakistan majority of farmers are small farmers, having own lands less than 12.5 acres of land and are facing many problems which are faced by small farmers in almost all developing countries [2]. In Pakistan land fragmentation and small farm size are assumed hindrance to higher yield of many crops including wheat. In Pakistan it is tradition that elders distribute their assets including land among their heirs. Same piece of land is again divided among the next generations and as result population pressure enhance on land and land fragmentation increases with the passage of time. This ultimately effect on output of land [5]. In Pakistan, there are 6.62 million farms are cultivating crops on 20.44 million

hectares of land. About 86 percent of the farms are categorized has small farms (below 5 hectares), but they account only 44 percent of the total farm area. Medium farms (5-10 hectares) make up 19 percent of the total farm area and constitute about 9 percent of the total number of farms. Large farms (above 10 hectares) are only 5 percent of the total number, but occupy 37 percent of total farm area. In Sindh, there are 1.07 million farms, comprising 4.33 million hectares of arable land. About 82 percent of the farms are categorized has small farms (below 5 hectares), but they account only 41 percent of the total farm area. Medium farms (5-10 hectares) make up 16 percent of the total farm area and constitute about 10 percent of the total number of farms. Large farms (above 10 hectares) are 8 percent only of the total number, but occupy 43 percent of total farm area [6]. The problems of the fragmentation include the fact that fragmentation makes protection and supervision of the land difficult, it entails long distance, problem of transporting agricultural implements and products, working loess in hours and results in small and uneconomic size of operational holdings [7]. Land fragmentation also increase peril of disputes among neighbors [8].

Problem statement:

Fragmented or small land holdings are also reason of difficulties to cultivate certain crops, and growers refuse or prevent from changing to more profitable crops. Small farmers are getting low yields and these low yields are may be due to land fragmentation. Small farmers have less access to agriculture credits and are unable to invest in productive resources and spend their life at subsistence level and as result they are caught by the vicious circle of poverty [9]. Wheat is an important cash crops in Pakistan therefore increasing land fragmentation can have adverse impact on income of farmers. There is information gap regarding the impact of land fragmentation or farm size on farm productivity and socioeconomic conditions of farmers in Sindh and current study will contribute in providing the information regarding small farmers of wheat crop in District Hyderabad, Sindh.

Objectives:

Specific objectives of the study are as under;

1. To investigate the impact of farm size on productivity of wheat in the study area.
2. To explore the effect of farm size on socioeconomic conditions of farmers in the study area.

MATERIALS AND METHODS

This section describes that how the data were collected and analyzed in order to fulfil objectives of the study and to investigate the impact of farm size on productivity of wheat in District Hyderabad, Sindh

Sample size and sampling procedure

Wheat Farm size in Acres		Village 1 No. respondents	Village 2 No. respondents	Village 3 No. respondents
<5 acres	Subsistence farm	5	5	5
5-10 acres	Small farm	5	5	5
11-25 acres	Medium farm	5	5	5
>25 acres	Large farm	5	5	5
Total		20	20	20

Initially an informal survey of growers of wheat was carried out in the study area in order to pretest the questionnaires for used to interview 60 respondents.

METHODOLOGY

Data analysis. Initially the data were arranged and organized and all data were tabulated and analyzed to meet the objectives through computer software Excel and SPSS, (Statistical package for social sciences). Average, percent, were calculated and then regression analysis was done through SPSS and STATA.

To analyze the results of present study the descriptive statistics was used to find out the percentage and frequencies of different characteristics of Wheat growers.

Average was calculated by using following formula:

$$x = \frac{\sum x!}{n}$$

The estimation of returns was developed by using the following formula:

$$AR = (AQS \times APr)$$

Where ;

AR = Average Return/Revenue.

AQS = Average Quantity Sold.

APr = Average Price per unit.

Average Net returns were estimated by using the following formula:

$$ANR = AR - AC$$

Where ;

ANR = Average Net Returns

AV = Average Revenue

AC = Average Cost

Percentage was calculated by using following formula

$$P = \frac{F}{N} \times 100$$

Percentage calculated in the simple table for the purpose of comparison.

Where;

F= Frequency/Sample Respondents

N= Population/ Total Number of Respondents

Regression is considered as an important statistical technique for studying the relationship between two or more variables. Another important aspect of this technique is that it helps to estimate the values of one variable for the given values of the other variables. Regression investigates

For this study both primary and secondary data were collected. The primary data were collected through face to face interviews from the wheat growers in the study area and secondary data were collect from (review literature). District Hyderabad and union council (Sanwan khan Gopang) selected purposively while villages (1. Dariya khan Naheo, 2. Aabri, and 3. Sukhio Dahri) households were selected by multistage random sampling. In first stage 3 villages were selected randomly. In second stage total number of 20 farmers of wheat were selected from each village, sampling was done into following categories:

the dependence of one variable, conventionally called the dependent variable, on one or more variables called the independent variables. It provides an equation to be used for predicting the average values of the dependent variable for the known values of the independent variables. When we study the dependence of variable on a single independent variable, it is called a simple regression.

$$Y_i = \beta_0 + \beta_1 X_i$$

Where;

Y_i is the dependent variable that we are trying to predict

X_i is the independent variable that we are using to predict Y

β_0 is the intercept/ constant term

β is the slope

To investigate the impact of farm size on yield or physical productivity we used the regression analysis.

$$\text{MODEL 1: } Y_i = a + \beta X_i + \varepsilon$$

Physical productivity or yield = $a + \beta$ Farm Size + ε

Where:

Y_i = Dependent variable = yield

X_i = independent variable = farm size

a = intercept

β = Slope on independent variable

ε = Error term

To investigate the impact of farm size on production cost we used the regression analysis.

$$\text{MODEL 1: } Y_i = \beta_0 + \beta_1 X_i + \varepsilon$$

Production cost = $\beta_0 + \beta_1$ Farm Size + ε

Where:

Y_i = Dependent variable = production cost

X_i = independent variable = farm size

a = intercept

β = Slope on independent variable

ε = Error term

To investigate the impact of farm size on Returns we used the regression analysis.

$$\text{MODEL 1: } Y_i = \beta_2 + \beta_3 X_i + \varepsilon$$

Returns $\beta_2 + \beta_3$ Farm Size + ε

Where:

Y_i = Dependent variable = Returns

X_i = independent variable = farm size

a = intercept

β = Slope on independent variable

ε = Error term

RESULTS

The general characteristics (age, education, family size, earning members and farming experience) of the sample respondents are presented in Table-1. Age is an important indicator which influence the efficient allocation of resources. More aged people are more skillful and experienced than the less age people. According to the data it was found that large growers bearing highest years of age on average 45 years it means they are older and having more experience on average 25 years that's why they emerging in agriculture and achieving desirable output

Table-1 General characteristics of the sample respondents.

Variables	Very small Growers	Small Growers	Medium Growers	Large Growers
Years of Age	40	41	41	45
Years of education	5	6	6.6	7.6
Family size	8.6	10.6	11	10
Number of earning members in family	2	1.7	2.2	1
Years of farming/ experience	14.6	15	17.6	24.6

Total cost of production refers to all the expenditure incurred by the producer, during the process of producing wheat crop. In order to evaluate the resources allocated to wheat production in Hyderabad district of Sindh, the average amount on land, labor, capital and marketing expenses incurred by the various farm size groups in the study area were aggregated to find out the total costs of production as incurred by sampled growers. Table-2 shows the data regarding cost incurred by the sample respondents.

while average age of medium, small and very small growers were almost same.

It is expected that education has a positive effect on the behavior of farmers about the adoption of new innovations and improved technologies. When a survey of wheat farmers were conducted it was investigating that the growers of all categories were almost same and less educated. The average number of earning members of medium growers and very small growers were almost same, medium growers 2.2 members and very small growers 2 members while small growers 1.7 members and large growers on average 1 earning member in a family.

The result revealed that per acre average cost realized by the large grower was highest (37202 rupees), Medium grower paid 34717 rupees, small grower incurred 34439 rupees and very small grower spent 33326 rupees on different inputs/activities cost including (Land preparation cost, seed cost, fertilizer cost, farm yard manure, weedicide, irrigation, harvesting + threshing, packing, loading unloading and transport cost).

Table-2. Per acre average cost incurred by the sample respondents in study area.

Cost Components	Very small Growers	Small Growers	Medium Growers	Large Growers
Production Cost				
Cost of Land Preparation	5873	5913	6100	6980
Cost of seed	2845	2704	2835	2897
Cost of fertilizer	10380	11113	10530	10887
Cost of FYM	2400	3000	3425	3440
Cost of weedicide	1340	1347	1307	1408
Cost of Irrigation	1169	1238	1585	1383
Cost of Harvesting+ Threshing	6607	6346	6341	6317
Marketing Cost				
Cost of packing	1273	1185	1139	1703
Loading	176	173	171	165
Un-loading	176	173	171	165
Transportation	1087	1247	1113	1857
TOTAL	Rs. 33326	Rs. 34439	Rs. 34717	Rs. 37202

Per acre average revenue earned by the sample respondents is shown in Table-3. The result describes that the large growers were earning highest average revenue Rs. 59520,

while medium grower were earning 53590 rupees, Small grower were earning 51980 rupees and very small grower were earning on average 46032 rupees per acre.

Table-3. Average revenue earned per acre of wheat grower in study area.

Particular	Average 40 kg per acre	Average price per 40 kg Rs.	Avg. Revenue earned per acre (Rs.)
Very Small Grower	42	1096	46032
Small Grower	46	1130	51980
Medium Grower	46	1165	53590
Large Grower	48	1240	59520

markets Table-4 explores the result according to the per acre average net return earned by the sample respondents. According to the data it was found that large growers were earning highest net return (59520 rupees) it is because of

they have many sources (hiring more labor, use more inputs, better treatment of crop and sell their product at higher prices in special).

Table-4. Per acre net return earned by the sample respondents in study area.

Respondents	Average revenue/acre (A) Rs.	Average cost/acre (B) Rs.	Net return per acre (C) C=A-B Rs.
Very Small Grower	46032	33326	12706
Small Grower	51980	34439	17541
Medium Grower	53590	34717	18873
Large Grower	59520	37202	22318

Impact of farm size on agriculture productivity

Table-5 shows that physical yield or physical productivity in relation to the increase in the farm size (acre) also increases. The results further reveal that farm size has a

significant impact on yield. It shows that 1 unit (one acre) increase in farm size results 0.142 maunds increase.

Table-5. Regression results for yield per acre and farm size (dependent variable yield per acre and independent variable farm size).

Independent variable	Coefficient	Std. Error	t- Statistics	Prob.
Constant	43.3553	1.01141	42.87	0.0000
Farm Size	0.14228	0.04884	2.91	0.0051

Table no.6 shows that the production cost increases in relation to the increase in farm size (acre). The results further show that farm size has significant impact on

production cost, it shows that 1 unit (one acre) increase in farm size Rs. 82.22 increase in production cost.

Table-6. Regression results for production cost per acre and farm size (dependent variable production cost per acre and independent variable farm size).

Independent variable	Coefficient	Std. Error	t- Statistics	Prob.
Constant	30977.4	670.362	46.21	0.0000
Farm Size	82.2296	32.3703	2.54	0.0138

Table no.7 shows that the returns per acre increased relation to increase in the farm size (acre). The results more found that farm size has a positive significant impact on

returns. It shows that 1 unit (one acre) increase in farm size results Rs. 254.89 increase in returns.

Table-7. Regression results for returns per acre and farm size (independent variable farm size in acre dependent variable returns).

Independent variable	Coefficient	Std. Error	t- Statistics	Prob.
Constant	16774.5	1509.45	11.11	0.0000
Farm Size	254.989	72.8881	3.50	0.0009

DISCUSSION

This research paper discusses the results of this study and compare them with previous studies. Agriculture is the dominate sector in the economy of Pakistan. Field crops, fruits, vegetables and livestock are the main income generating activities as well as sources of employment. Wheat is the basic necessity food for the population of Pakistan as nutritional food. Wheat contributes 2.1 percent in gross domestic product (GDP) and 10.0 percent value added in agriculture [2]. Age is an important indicator which influence the efficient allocation of resources. According to the data it was found that large growers bearing highest years of age on average 45 years it means they are older and having more experience on average 25 years that's why they emerging in agriculture and achieving desirable output while average age of medium, small and very small growers were almost same. The same results also found by [10] as he investigated that small farmers

were bearing 45 average years of age and large growers were aged on average up to 43.53 years old. Education is always considered as significant factor of understanding and learning skills. Education changes the behavior of human being in particular and living beings in general. Education changes moral character, thinking and decisions making regarding adoption of new technology, certified seed and fertilizer. The result revealed that the large growers were average 7.6 years of education whereas very small, small and medium growers were an average 5, 6, and 6.6 years of education, according to the [10] he investigated that the average years of education of small growers were 5.6 years which is almost same as compare to this study and the average years of schooling of large farmers were 7.6 years. Furthermore, the results show the average family size of head of household of wheat growers. It highlights that the number of family members of all categories were almost same, on average 11 members of medium grower,

10.6 members of small grower, and 10 members of large growers and on average 8.6 members of very small growers while according to the [11] he concluded that the maximum number of 64.5 percent family members of wheat growers were range from 5-8 members in a family of household. Total cost of production refers to all the expenditure incurred by the producer, during the process of producing and marketing of wheat crop. In order to evaluate the resources allocated to wheat production in Hyderabad district of Sindh, the average amount on land, labor, capital and marketing expenses incurred by the various farm size groups in the study area were aggregated to find out the total costs of production as incurred by sampled growers. The result revealed that per acre average cost realized by the large grower was highest (37202 rupees), Medium grower paid 34717 rupees, small grower incurred 34439 rupees and very small grower spent 33326 rupees on different inputs/activities cost including (Land preparation cost, seed cost, fertilizer cost, farm yard manure, weedicide, irrigation, harvesting + threshing, packing, loading unloading and transport cost). Whereas the [12] explored that small grower of wheat were disbursed 13600 rupees, medium grower incurred 14324 rupees and large grower realized 14437 rupees per acre. Their costs are less in amount as compare to this study it is because of their cost are including (Seed, ploughing, fertilizer, labor and irrigation). Per acre average revenue earned by the sample respondents revealed that the large growers were earning highest average revenue Rs.59520, while Medium grower were earning Rs.53590, Small grower were earning Rs.51980 and very small grower were earning less on average Rs.46032 rupees per acre. While average revenue per acre reported by the [10] the highest revenue of Rs.55915 earned per acre by the large growers, very small growers earned Rs.34625 per acre, small growers earned Rs.36863 and middle growers earned 35,099 rupees per acre respectively.

CONCLUSION AND RECOMMENDATION

Results of current study show that cost of production incurred by large growers is 7.5% and 6.6% higher as compared to small and medium framers respectively. Large growers earned more profit Rs. 22318 than very small growers Rs. 12706, small growers Rs. 17541 and medium growers Rs. 18873. It is because of the reason that large growers invest more on their farms therefore they earned more. It is suggested that large farm size enable farmers to invest more on their farms and earn more revenues. Regression results revealed that farm size had significant impact on yield of wheat. It showed that 1 unit (one acre) increase in farm size resulted in 0.142 maunds increase in yield. It is concluded that the large growers were more

efficient than very small, small and medium growers as they achieve higher per acre wheat yield. Hence, major finding of the study reveal that the large farmers are more efficient and productive, and as the farm size increases its yield as well as net revenue increases, if adequate capital is made available to small farmers, they have the potential of increasing their productivity.

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