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Role of Agricultural Services Providers (ASPs) in enhancing the productivity of crops in District Faisalabad

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Abstract

Keywords

ASPs,
Income,
Farmers,
Productivity,
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Faisalabad,
Punjab-Pakistan

The study was conducted to analyze the farm mechanization rental services; to investigate the role of Agricultural Services Providers (ASPs) for increasing the productivity of crops, income of farmers and socio-economic characteristics of the respondents in District Faisalabad. Primary data were collected through well organized and pre-tested questionnaire, from 150 respondents. Appropriate statistical and econometric techniques were performed to quantify the impact of Agricultural Service Providers (ASPs) on the productivity of crops and farm income. Various financial approaches net present value and cost-benefit ratio were carried out to check the economic viability of agricultural implements and strength of the business of ASPs. Agricultural service providers showed highly significant impact on farmers' productivity and the farmers not availing rental implement services faced high yield gap. However the farmers providing these rental services showed positive impact on their livelihood and income.

Introduction

Mechanized farming is necessary to advance the agriculture sector. Cultivation and harvesting of crops through agricultural machines increase the productivity, quantity and quality of crop yield. Rural people depend upon agriculture as informal labors; work force in agro-based commercial enterprises, deals with agricultural produce and as rent service providers. One of the main cause of low productivity among smallholding farmers are the need of farm power (labor economic tools and implements, animal and mechanical power) and significantly access to it (7). Farm power hold every

type of power inputs in farming and the commercialization of its commodities, ranging from individual inputs, animal traction power, and engine drive technologies, jointly with related tools and equipment's. Lack of availability and access to farm power by smallholder farmers is a key factor that leads to a decline in production and consequently farm output (4). Rental services play a vital role such as soil preparation, planting, spraying, threshing, storing, transportation, provision of seed and fertilizer in economy. Rental service enterprises offer numerous

opportunities in favor of small-owner farmers in rural areas to expand and raise their income. Small landholders can capable towards building their agricultural and growing practices more competent as well as profitable through using rental and hire services. These types of practices can lead to reduce their production costs and consequently rising income and profit margin. The utilization of these hire services also develops their efficiencies into both harvest and post-harvest practices and speed up in marketing, selling and advertising operations enabling more rapidly money inflows to the farm production. Low farm productivity and output is also due to unavailability of farm inputs in time. Late sowing of crops can cause high penalties to the farmers in terms of loss in production. Animal as well as tractor drawn direct planters permit the farmers to cultivate seeds or apply fertilizer in uncultivated field covered heavily with vegetation. In view of the fact that these machines are highly expensive to be bought by individual farmers at subsistence level, it would benefit greatly if ownership is tied with rental service supply (6). In Pakistan especially, in Rawalpindi and Sheikhpura, the rental implements services are normally rendered by customary larger-scale farmers and the most frequently services provided are for land preparation, hand and tractor drawn spraying, crop planting and wheat, rice threshing (5). However the study had been planned to analyze the farm mechanization rental services and to investigate the role of Agricultural Services Providers (ASPs) for increasing the productivity of crops, income of farmers and socio-economic characteristics of the respondents in District Faisalabad.

Materials and Methods

The study was conducted to analyze the farm mechanization rental services and to investigate the role of Agricultural Services Providers (ASPs) for increasing the productivity of crops, income of farmers and socio-economic characteristics of the respondents in District Faisalabad. The crops selected for this study was wheat and sugarcane. The data was collected from 150 farmers through personal contact and interview according to well organized and pre-tested questionnaire. Out of 150 respondents, 100 were farmers who get agricultural services and 50 were those who were providing agricultural services e.g. tractor driving for ploughing, leveling, transportation, harvesting, threshing (12, 13, 14). However analyzing the effect of agricultural services on the productivity of crops, Cobb Douglas production function was used and yield gap was calculated for the adopter and non adopter of

agricultural services. In specific form, equation can be written as.

$$Y_i = \alpha_0 X_i^{\alpha_1} e^{\alpha_2}$$

$$\ln Y = \alpha_0 + \alpha_1 \ln (\text{Cultivator}) + \alpha_2 \ln (\text{Rotavator}) + \alpha_3 \ln (\text{Disc Plough}) + \alpha_4 \ln (\text{Laser Leveler}) + \alpha_5 \ln (\text{Harvester}) + \alpha_6 \ln (\text{Timely Available}) + \alpha_7 \ln (\text{Satisfaction}) + \mu_i$$

Cost benefit analysis were used to calculate the net income, gross margin and net returns of the agricultural service provider for his services.

Net income, gross margin and net returns were calculated by following formula.

$$\text{Net Income} = \text{Gross Income} - \text{Total Cost}$$

$$\text{Gross Margin (GM)} = \text{Total Revenue (TR)} - \text{Variable Cost (VC)}$$

$$\text{Net Returns (NR)} = \text{Total Revenue (TR)} - \text{Total Cost (TC)}$$

Results and Discussion

The regression results from wheat yield were shown in table-1 respectively. The results of the production function indicated that wheat yield can be increased by increasing the use of cultivator, rotavator, disc plough that showed significant impact on crop productivity. Services of these implements were available by agricultural service providers which prove that agriculture service providers showed positive impact in enhancing the productivity of crops. Results showed that timely availability of implements and satisfaction level of farmers with these services also had significant impact however in this study R square value was found to be 0.843. This implies that combined effect of cultivator, rotavator, laser leveler and other variables explained 84% of the variation in the yield of wheat crop while remaining 16% was due to other variables not captured. These results are in line with Pingali *et al.*, (1987) studied that financial services play a major role in agriculture service provision business as initial investment of mechanized implements might be high for various small scales ASP's farmer. Financial services are essential as they provide finance, money or any other product that required for service providers to establish a rental service business to purchase rental implements and these financial services are also beneficial to those ASP's who want to expand their existing business. For establishment of successful service provision business farmer have financially be able to invest for mechanized

implements, a financial infrastructure and take risk of this business as agricultural equipments and tools that have considerable costs. Bailey *et al.*, (2000) estimated that the impact of diverting the agricultural resources into equine services provision. This study used Cobb-Douglas production approach to determine the own price and income elasticity of demand for equine services as well as certain agricultural commodities. It was deduced that the demand for horse services was more elastic as compared to that for agricultural commodities. Farmers would be benefitted more in the long run if equine services were rendered in combination with conventional farm enterprise. Equine services had a plus point of having the known technology, particularly to a livestock farmer utilizing both land and labor. An additional gain from horse enterprises could be that these exist in a comparatively closed economy thereby limiting the potential competition. Jat *et al.*, (2006) prepared a comprehensive report in India, on the provision of Laser Land Leveling service as a pioneer way of resource conservation. This report realized a strong need for development and adoption of new resource conservation technologies in the context of escalating resource scarcity i.e., land, labor, capital and irrigation water. Rice and wheat crops were taken as major specimens to be examined under the utilization of better land-use practices particularly laser land leveling technique. The given technology (laser land leveling) put forward an immense potential for saving irrigation water, nutrients and agro-chemicals, healthier environmental quality and high crop grain output. In India, nearly 1000 farmers used the described technology, covering over 10,000 acres in western Haryana and Uttar Pradesh. The study estimated about 1.5 million hectares-meter of irrigation water could be saved by the adoption of laser land leveling technique to only 2 million hectares of area under rice-wheat system. It also saved the use of diesel up to almost 200 million liters in addition to reduction in emissions of Green House Gases emissions by 500 million kg. Laser leveling of land can revolutionize the mode of food production by improving resource use efficiency of important inputs leaving the productive resilience of the ecosystem undisturbed and harmless. Sims (2009) examined that the availability of agriculture machinery in developing countries. This study analyzed that in Pakistan, the

rental implements services were normally rendered by customary larger-scale farmers and the most frequently services provided were for land preparation, tractor drawn spraying; crop planting and threshing of various crops. These rental services were widely available in all over the country and benefitted farmer productivity as well as service provider livelihood. Alabadan (2010) examined the review using the Federal Capital Territory Tractor hiring subsidy service scheme in Nigeria. In this scheme the Government gave subsidized tractors to the service providers and service provider gave rental services to the farmers at low rates. It was recorded that most farmers who engaged hired tractors for tillage paid between N-3,000ha⁻¹ and N-4,000ha⁻¹ for ploughing, harrowing or ridging instead of the official charge of N-1,500ha⁻¹. This scheme benefitted both farmers and service providers. Farmer income increased by using time saving and modern technology. The maintenance practices and repairs done centrally in a workshop operated by the Ministry of Federal Capital Territory Department of Agriculture. Adamopoulos (2011) analyzed that the role of transportation services in the development of two-sector (agricultural & non-agricultural) economies using cross-country transport productivity disparities. This study employed a multi-sector general equilibrium model which assumed that transport labor productivity was responsible for growth. Then the role of transport productivity disparities to cross-country income gaps was evaluated quantitatively. It was shown that low transport productivity can intensify the resource allocation leading to low output per worker within and between agricultural and non-agricultural sectors. These results are in line with Yueqing (2012) who reported that endogenous relation between farm mechanized investment decision and off-farm services in China. A survey was conducted on 453 households in Anhui Province using the theoretical model. Empirical results show that farm machinery investment and farm labor inputs are gross complement relatively than alternatives when mechanized services are available in the market. Therefore, farmers were more likely to reduce their off-farm service time due to small-sized machinery. Additionally due to substitution effects of market machinery services, an increase in off-farm services was more likely to reduce the possibility of possessing small sized machineries.

Table 1 showing the summary Statistics of Regression Analysis of Agricultural Services for Wheat Crop

| Variable | Estimate | Std. Error | t-value | p-value |
|---------------------|----------|------------|---------|---------|
| Constant | 32.350 | 1.076 | 30.061 | 0.000 |
| Cultivator | 0.720 | 0.243 | 2.968 | 0.004 |
| Rotavator | 1.340 | 0.299 | 4.481 | 0.000 |
| Disc plough | 0.628 | 0.220 | 2.860 | 0.005 |
| Laser Leveler | 0.594 | 0.247 | 2.403 | 0.018 |
| Timely Availability | 0.620 | 0.330 | 1.879 | 0.064 |
| Satisfaction | 1.882 | 0.368 | 5.112 | 0.000 |

| Indicators | Coefficients |
|----------------------------|--------------|
| R | 0.918 |
| R Square | 0.843 |
| Adjusted R Square | 0.832 |
| Standard Error of Estimate | 0.879 |
| F-statistic | 80.44 |

Adopter and non-adopter of rotavator services

Rotavator played important role in ploughing operations of farmers. The purchasing cost of rotavator was high compared to other agricultural implements, so most farmers used rotavator services on rental basis. Farmers gave rotavator services take a high return. Table-2 showed that yield gap between farmers who adopt rotavator services for wheat crop compared to farmers not used rotavator services. Calculations showed that frequency of farmers using

rotavator services was 22 and their average yield is 38.95 monds acre⁻¹ while the frequency of farmers who did not use rotavator services was 68 and their average yield is 35.75 monds acre⁻¹. Yield difference between adopter and non-adopter of rotavator services was 3.20. Results concluded from the calculations prove that rental services of rotavator showed positive impacts on the yield of crop, so the role of service providers was significant in enhancing the productivity of crops.

Table-2 showing adopter and Non-Adopter of Rotavator Services

| | |
|--|--------------|
| Adopter Farmers of rotavator service | 22 |
| Non-adopted Farmers of rotavator service | 68 |
| Average yield of adopters (monds acre⁻¹) | 38.95 |
| Average yield of non-adopters (monds acre⁻¹) | 35.75 |
| Yield gap | 3.20 |

Adopter and non-adopter of land laser leveler services

Laser land leveling an ideal intervention for improving water application efficiency and enhancing crop yield. Laser land leveler showed some positive impacts e.g. it saving in irrigation time from 25.1 to 32.1%. Increase in irrigated area by 34.5-42.0%, Improvement in crop yields from 10.7-12.9%. Reduction in farm culture-able waste land by 2.10% and facilitation in better crop stand, uniform moisture availability and enhanced fertilizer use efficiency. Table-3 showed that

the yield gap of adopter and non-adopter laser leveler service farmers for wheat crop. Calculation showed that frequency of farmers using land laser leveling services was 28 with average crop yield 39.34 monds acre⁻¹ while the frequency of farmers not availing laser leveling services was 62 and their yield was 35.22 monds acre⁻¹. Yield gap between the adopter and non-adopter of laser leveler services was 4.12. Result concluded that rental services of laser land leveler showed positive impact on crop yield as well as the moisture condition of the land.

Table-3 showing Adopter and Non-Adopter of land laser leveler Services

| | |
|--|--------------|
| Adopter Farmers of laser leveler services | 28 |
| Non-adopted Farmers of laser leveler service | 62 |
| Average yield of adopters (monds acre⁻¹) | 39.34 |
| Average yield of non-adopters (monds acre⁻¹) | 35.22 |
| Yield gap | 4.12 |

Cost benefit analysis of agricultural services provided by ASPS

Cost benefit analysis used to estimate the income received by the agricultural service providers from their rental services e.g. tractor, cultivator, rotavator, disc harrow, land laser leveler, ridger, threshers and other implements. From the table-4 showed the highest returns i.e., Rs.37182 monds acre⁻¹ per season of wheat obtained by rotavator and those ASPs who provided the services of rotavator were most benefitted. Then subsequently cultivator, thresher, disc

harrow, ridge maker, and land laser leveler were also used to earn profit. This study showed that farmers having land laser leveler and thresher earn more income because these implements were not at hand to every service provider. Service providers having more implements getting maximum return. The total revenue earned by ASPs calculated to be Rs. 22986.61 monds acre⁻¹. The total cost comprised of variable cost (VC), Fixed Discounted Cost (FC) and other costs. The VC constitutes the cost of diesel and other costs consist of depreciation costs.

Table 4 showing cost benefit analysis for ASPs in Wheat Season (Unit=PKR)

| Implement | TR | VC | FC | TC | Gross Margin | Net Income |
|---------------------------|---------------|-----------------|----------------|-----------------|---------------------|-------------------|
| Tractor | 0 | 83459.16 | 13520.32 | 96979.48 | -83459.16 | -96979.48 |
| Cultivator | 45876 | 23357.92 | 3033.64 | 26391.56 | 22518.08 | 19484.44 |
| Ridge Maker | 46556 | 16363.52 | 3140 | 18757.74 | 30192.48 | 27798.26 |
| Disc Harrow | 52398 | 13302.4 | 2380 | 15696.62 | 39095.6 | 36701.38 |
| Rotavator | 72878 | 30319.2 | 5285.35 | 35604.55 | 42558.8 | 37182.00 |
| Thresher | 12700 | 6142.85 | 15418.95 | 21561.81 | 6557.15 | 8861.81 |
| Land laser leveler | 9090 | 3232 | 1608.54 | 3392.18 | 5858 | 5697.82 |
| Others | 3500 | 727.45 | 900 | 1627.45 | 2772.55 | 1872.55 |
| Total | 242998 | 176904.5 | 45286.8 | 220011.4 | 66093.5 | 22986.61 |

Conclusion

At the end it is concluded that ASPs showed positive significant impact on crop productivity. However wheat productivity highly dependent on agricultural service providers and important factor is timely availability of implements and satisfaction. The study proved that farmer having more implements can earn maximum return however rotavator, Laser land leveler and thresher were highly returned implements. It is

therefore recommended that government should ensure the easy access of credit for agricultural service providers and farmers to increase the use of modern technologies and to improve technical knowledge of service providers about farm machinery by strengthen the agriculture research institute and extension services. Agricultural services providing units should be established in each union council to ensure timely availability of farm implements on rent at adequate prices.

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