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Effects of Different Types of Labor Hiring on Economic Performance and Efficiency of Farms in Kaş District of Antalya Province, Turkey

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ABSTRACT

The purposes of the study were: (i) To comparatively estimate the economic performance and productive efficiency of owner and sharecroppers in Kaş District of Antalya Province in Turkey, (ii) To find out the factors affecting the profitability of owner operators and sharecroppers, and (iii) To formulate the policy options in the light of findings. Research data were collected from randomly selected 58 owner operators and 45 sharecroppers by using questionnaire. Cluster analysis was performed to select similar sharecropper and owner operator in terms of farmers' profile, farm income, and land size. Data envelopment analysis (DEA) was used to estimate the efficiency measures. Research result showed that labor cost of sample farm had largest share in total farm expenses. The tomato and pepper yield of sharecroppers were higher than that of owners. Net farm income of owner operator and sharecroppers per hectare were $44518.3 and $51248.8, respectively. The mean technical, allocative and economic efficiency of owner operators were 0.724, 0.729 and 0.528, respectively, while that of sharecroppers was 0.851, 0.598 and 0.509, respectively. Sharecroppers had higher technical efficiency score compared to owners, but reverse was the case for allocative and cost efficiency scores. According to the research findings, farmers can increase their technical competence, if both owner operator and sharecropper improved their skills by participating in training and extension programs. Implementing performance-based earning systems may accelerate improving farmers' technical capability. Reorganizing of farm and controlling marketing cost may also be beneficial for increasing economic efficiency in the research area.

Keywords: Data envelopment analysis, Greenhouse production, Production cost, Sharecropping, Technical efficiency.

INTRODUCTION

Labor is one of the most significant inputs in agricultural production (Rufai *et al*., 2018). In agricultural production, labor costs have an important share in total production costs. How it is measured and valued is critical for establishing the cost of producing agricultural commodities and accurately defining labor's relative share of the total cost of production. Knowing the values of labor force is important in terms of controlling input usage and planning works. Since the labor in agriculture is critically important, many previous researchers examined it. In literature, some previous studies have focused on values of labor utilization in agricultural farms (Çolak and Erdoğan, 1991; Evcim, 1990; Özkan and Kuzgun, 1996; Yılmaz, 1996; Esengül *et al.*, 2007; Çanakçı, 2009). In other dimension, some research explored the share of labor in total production cost. These studies reported that labor costs constituted about 20-50% of

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total production cost. Several studies have been carried out to reveal detail information about labor use in farms (Esengül, 1987; Isıtan, 1990; Ünver, 1992; Tatlıdil, 1992; Peker, 1993; Özkan, 1993; Şahin and Yıldırım, 2002; Dedeoğlu and Yıldırım, 2006). On the other dimension, some researchers used the labor as a restriction when eliciting optimum farm plan (Cinemre, 1990; Tatlıdil, 1992; Kızıloğlu, 2001; Şahin and Miran, 2008). After entering the millennium, research related labor has moved up to different dimension. The agricultural labor has been modeled econometrically in some studies (Benjamin *et al*., 1996; Günden, 2005; Malchow-Møller and Svarer, 2005; Takasaki, 2007), while some studies have focused on labor productivity in connection with rural development (Grantham, 1993; Hunt, 2000).

Tenant pattern has spatially differed worldwide. The forms of farm labor in agricultural production are completely based on hired labor, tenant contract, exchange, and unpaid family labor (USDA, 2016). Three major categories of farm labor were proposed such as hired labor without farm ownership claims, unpaid farm labor and salaried farm labor having ownership claims and sharecropping. Sharecropping is the way of farming in which a landlord gives a share to shareholder to cultivate the land under fixed sharing arrangements. In most of the developing countries, the agrarian structure is such that the land distribution is skewed, and the proportion of small farmers is huge, as a result, sharecropping has emerged as the widespread phenomenon (Anwar *et al*., 2002; Braido, 2006). The performance of sharecropping contracts highly depends on the type of contract, resource allocation and incentives provided by the owners to sharecroppers and contract length (Dacnet, 2007). For a long time and in many different countries, much of agricultural production has taken place under sharecropping, in which a tenant supplies his labor (and perhaps some of the other inputs) in return for a share of the crop (Reid, 1977).

Up to now, many researchers have focused on the relationship between productivity and tenant pattern and tested the Marshallian inefficiency (Bell, 1977; Shaban, 1987; Laffont and Matoussi, 1995; Sadaulet *et al*., 1997; Holden and Bezabih, 2008; Kassie and Holden, 2008; Jacoby and Mansuri, 2009; Ghebru and Holden, 2012; Deininger and Goyal, 2012). The production efficiency could be different in alternative cultivation arrangements because of the differences in their objectives and interests. It is commonly believed that the production efficiency of owner operators and sharecroppers slightly differ, and owners are believed to be more efficient in their production than sharecroppers (Chaudhuri and Maitra, 2006; Khan *et al*., 2008). It is, however, also believed that the sharecropping contracts can yield better returns depending on the contract arrangements of costs and returns. Cost sharing and existence of off farm employment opportunities have positive impact on the share received by the sharecroppers, thus have implication on the efficiency of share cropped farms (Delgado *et al*., 2003). There has been still limited information on production efficiency of owner operators and sharecroppers using parametric or non-parametric methods in literature. Especially, lack of information on the relationship between tenant pattern and efficiency in the production under cover and in greenhouse is an acute problem. Very limited information on the relationship between tenant pattern and efficiency measures motivated this study.

Production in greenhouse is very important agricultural activity in Turkey due to high level of productivity and contribution to the unemployment reduction. Greenhouses in Turkey covers 69.2 thousand hectares of land, 62.8 thousand hectares of which is allocated to vegetables production and 24% of vegetables has been produced in Antalya (TURKSTAT, 2016). Greenhouse farming is an important employment area. In Turkey, 30.6% of the population live in rural areas in Antalya. A large part of this population is working in the agricultural sector. Labor participation rate in Antalya is 56.4% and above the average of Turkey. Significant portion of the employees in agriculture are

sharecroppers. In Turkey, 57% of the greenhouse area is substituted by Antalya Province. Approximately, half of the greenhouse area in Antalya is sited in districts of Kumluca Aksu and Döşemealtı. Kaş takes the fourth place order in Antalya. Apart from the Kaş, owner operator is more common in production under greenhouses not only in all district of Antalya but also in other parts of Turkey. Kaş is a special case in Turkey since sharecropping is the dominant land tenure arrangements in vegetable production in greenhouses. That is why the district of Kaş was selected as a research area. Although the strong relationship between tenant pattern and farm level productivity and efficiency, there is little information related to the economic effects of tenant pattern on the productivity and efficiency level of greenhouse farms not only in Turkey but also all over the world. Therefore, this study intended to test the hypothesis of whether tenant pattern affects the farm level productivity and efficiency, or not.

The objectives of present study were to estimate cost of production of both owner operators and sharecroppers. The specific objectives of the study were: (i) To comparatively estimate the economic performance and productive efficiency of owner and sharecroppers in Kaş District of Antalya Province in Turkey, (ii) To find out the factors affecting the profitability of owner operators and sharecroppers, and (iii) To formulate the policy options in the light of findings. The study scope did not include the main drivers of Marshallian inefficiency in vegetable production under cover and in greenhouse, because the relationship between tenant pattern and productivity is not clear in the research area. This may be the focus of future study depending on the results of this research.

MATERIALS AND METHODS

Research Area

The research was conducted in the Kaş District of Antalya, Turkey. Kaş (pronounced 'Kash') is 168 km west of the city of Antalya. There are 5 town and 48 villages in Kaş. The map of the research area is depicted in Figure 1. The total agricultural land in Kaş is 22,536 hectares and 57% of it is irrigated. Total irrigated agricultural land has been allocated to cereals (65%), edible legumes (8%), industrial plants (0.8%), oil seeds (14%), tuber plants (0.007%), and fruit (13%). Vegetable production under cover is the basic economic activities in Kaş, where there are 5.1 hectares of glass greenhouses and 2.8 hectares of plastic greenhouses due to climatic suitability. Tomatoes (8%), peppers (8%), abergine (3%), and cucumbers (%1) are produced under greenhouses. The tomato

Figure 1. Map of Research Area.

production is 330,000 tons per year, while that of pepper is 50,000 tons (TURKSTAT, 2016). Kaş has a special importance in Turkey since sharecropping is dominant land tenure arrangements in vegetable production in greenhouses. Therefore, the main reason of examining the district of Kaş is that nearly half of the greenhouse operators is sharecroppers in Kaş. Sharecroppers supply labor, skills, and knowledge, while owners supply land access, all agricultural tools, machinery, irrigation tools and working capital in the research area. The pattern of sharecropping in Kaş is based on 20/80 sharing arrangements. When comparing the patterns of sharecropping in the research area with other countries in Central Asia, there are many similarities apart from sharing arrangements. In 19th century, tenants supplied labor, while owners supplied farmland, agricultural tools, water, inputs, and food in central Asia. The patterns of output allocation varied spatially. In general, half of the production was allocated to tenants in the most common form. The basic incentives for the tenants were using agricultural infrastructure of landlord in this century. Changing world has produced different patterns of tenants in central Asia. In 20th century, tenants supplied inputs, labor and agricultural tools, while owners supplied only land. Harvest was divided equally among shareholders. The incentives of tenants have also changed. Cost reduction, risk sharing, and joint work became a basic incentive of tenants. Beginning from the 1990's, tenants supplied labor, skills, knowledge, and tools while owners supplied all production infrastructure such as land access, machinery and irrigation tools. The basic incentives for the tenants were gaining fixed wages and benefiting from byproducts. In central Asia, hybrid sharecropping was found in both Uzbekistan and Kazakhstan based on 50/50 and 30/70 sharing arrangements, often related to rights for second cropping. The free land or the land available after the first crop is given to workers to plant any crops they want (Mukhamedova and Pomfret, 2019).

Research Data

Research data were collected from two different target groups such as owner operators and sharecroppers by using face-to-face questionnaire during the production period of 2015. Optimum sample size for owner operators was calculated by using simple random sampling method. In calculation of the optimum sample size, the precision level and confidence level were 10 and 99%, respectively. Based on the results of simple random sampling, 58 owner operators out of 1080 were randomly selected using random numbers. Regarding the sharecroppers, structured questionnaires were administered to all sharecroppers (45 farms) in Kaş.

The variables measured in the study were divided into two broad groups such as farmer's characteristics (age, education level, farming and greenhouse cultivation experience, and working time at farm) and farm characteristics (family size, operational land, tomato and pepper land, prize, yield, farm income, variable cost, fixed cost, total production cost, labor costs, and sharecropping costs).

Measuring and Comparing the Economic Performance of the Sample Farms

The classical economic analysis procedure was followed when calculating the annual economic performance of the farms managed by owner operator and farms sharecropper. The production value, gross farm income, gross margin and net farm income were used as an indicator for economic performance. Production value was calculated by multiplying the quantity of the produced field and animal product with corresponding prices of the products. The rent of the building, which was 5% of the value of building, and the off-farm income were summed to reach gross income. Total production costs were expressed as the amounts used per hectare. Total production costs were divided into two groups: variable and fixed costs. The variable cost included

costs for seed and seedling, manure, pesticide, irrigation, electricity, version planting, fuel, marketing, shattering-solarization, frost protection, shading, insect netting, rope, labor, and biological control cost. Besides, depreciation, family labor, sharecropper, greenhouse, building, machinery depreciation and building repair were included into fixed costs. Gross margin was calculated by subtracting variable costs from gross production value. Net farm income was found by subtracting total production cost from gross income. The straight-line method was used when calculating depreciation cost.

In this study, farm owner operators were compared to sharecroppers in terms of measured variables. Student t test was used to test the mean of two farm groups. Before comparison of these two farm groups, the distribution of the continuous research variables was tested whether they were normally distributed, or not, by using Kolmogorov Smirnov test.

Efficiency Model for Sample Farms

Cluster analysis was used to select similar farms form the farm groups of owner operators and that of sharecroppers in order to set ceteris paribus conditions. The profile of farm managers, which was created by compounding variables such as age, education, experience in agriculture, the variable of greenhouse production area, and the variable of return on equity were included in the cluster analysis. Based on the results of the cluster analysis, we determined that 23 owner operators' farms and 24 sharecropper farms were similar. Then, we used them for measuring the efficiency measures and comparison.

Data Envelopment Analysis (DEA), a nonparametric method for estimating efficiency measures, was followed to calculate efficiency scores due to producing good results with limited data and having flexibility when determining the best functional form and distribution of error term for production frontier function (Coelli *et al*., 2005). Since Stochastic Frontier Analysis (SFA) requires a large sample size to estimations comparing to DEA, the study preferred to adopt DEA model to estimate efficiency measures. The distance between input–output ratio of the examined farm and the input–output ratio of farm on frontier is attributed to the relative efficiency. When estimating the production efficiency measures, the relative efficiency approach suggested by Farrell (1957) was adopted in the study. Input-orientated efficiency measurement was preferred due to high control capability of the sample farmers over their inputs rather than their outputs. Economic efficiency of sample farms consists of Technical Efficiency (TE) and Allocative Efficiency (AE). TE is a measure of operators' ability to transform inputs to output, while AE is an indicator of an operators' ability to use production factors in optimal proportions considering their respective prices. TE was divided in two components of Scale Efficiency (SE) and Pure Technical Efficiency (PTE). PTE reflects the management success of operator, while SE is a measure of distance to optimum production scale. The Farrell measure equals 1 for efficient operator, and then decreases with inefficiency (Farrell, 1957).

Based on the suggestions of Charnes *et al*. (1978) and Banker *et al*. (1984), we assumed that each farm produced tomato and/or pepper (Yi) using the most important inputs of fixed cost and variable cost (xi*). Input oriented efficiency scores under Variable Return to Scale (VRS) were estimated by running the linear programming depicted below:

$$\text{Minimum } \lambda., \; xi^{*}\, wi^{T} (x_i^{*})$$
$$\text{Subject to } -y_i + Y\lambda \geq 0$$
$$x_i^{*} - X\lambda \geq 0$$
$$\lambda \geq 0$$

In the above equation, w_i is the vector of an input price for i-th farm; T, Transpose of function, and x_i^{*}, input price, with output level, y_i, minimum cost of input level was calculated via linear programming for each

farm. This equation revealed the minimum cost under Variable Return to Scale (VRS). Cost Efficiency for each farm was estimated by using the formula of (CE)= $(w_i^T \times x_i^*)/(w_i^T \times x_{i)}$. Allocative Efficiency was calculated by using the formula of AE= CE/TE (Coelli *et al*., 1998). DEAP 2.1 package program which was developed by Coelli (1996) was used for the estimation of efficiency level.

Statistical Analysis

The Student's t-test was used to test the hypothesis that means of owners and sharecroppers were equal in terms of research variables when comparing the tenant patterns. Before performing t-test, Kolmogorov Simirnov normality test was used for checking whether each research variable was normally distributed. Statistical tests were performed with the Statistical Package for the Social Sciences (SPSS).

RESULTS AND DISCUSSION

Research results revealed that the typical farmers was 49 years old, with 7 years of schooling, on average. There were statistically significant differences between the groups in terms of farming experience, greenhouse cultivation experience and working time at farm ($p<0.05$). Based on the research findings, it was clear that sharecroppers had much more agricultural and greenhouse cultivation experience than the owners. This finding confirmed the results of previous study conducted by Hassan *et al*. (2016) in Pakistan. However, our finding related to experience did not confirm the results of Ul Haq (2019), who stated that experience level of sharecroppers of tea farmers was lower compared with the owners in Rize Province of Turkey. In the research area, the education level of owner operators was higher than the sharecroppers ($P< 0.10$). Our findings related the education corroborated with the results of Hassan *et al*. (2016), while the reverse was the case for Ul Haq (2019). The mean family size of owner operator and sharecropper was about 4 persons ($P> 0.10$). The results of comparative analysis showed that the amount of farmland differed depending on farm groups ($P< 0.01$). The size of farmland in owners' group was smaller compare to sharecroppers in the research area. Incoherent results were reported in some previous studies (Hassan *et al*. 2016), while the results of the study conducted by Ul Haq (2019) corroborated with the research finding related farmland. In the research area, the average land allocated by owner operator to tomato and pepper production was 0.5 and 0.3 hectares, respectively, while that of sharecropper was 1.6 and 0.9 hectares, respectively ($P< 0.05$). The production value of tomato at owner operator farms was greater than that of sharecroppers ($P< 0.05$). Regarding the crop yield, the tomato and pepper yield of sharecroppers were higher than that of owners (Table 3). This finding corroborated with the statement of fixed-rent tenancy gives the right incentive to achieve higher productivity suggested by Marshall. Similarly, Ul Haq (2019) suggested that the productivity level of the sharecroppers was higher than that of the owners. However, Ahmed and Billah (2018) stated that output of owners was larger compared to sharecroppers in Bangladesh.

Based on the results of the economic analysis, total production expenses per hectare for owner operator and sharecropper groups were $49317.9 and $35804.2, respectively. The difference between sharecroppers and owners in terms of total production expenses was statistically significant at 1% level. Results suggested by Ul Haq (2019) for tea farmers in Turkey and Hassan *et al*. (2016) for wheat farmers in Pakistan differed from our finding. Ul Haq (2019) and Hassan *et al*. (2016) stated that total production expenses of sharecroppers were larger than owners. About 66% of the total production expenses was fixed cost, while 34% of it was variable cost in both

owner operator and sharecropping. There were statistically significant differences between the owner operator and sharecropper farmers in terms of labor cost and sharecropping payment at farm ($P< 0.01$). In the research area, labor cost of owners was higher compared to sharecropper. This finding confirmed the results of Ul Haq (2019) and Hassan *et al*. (2016) (Table 1).

Capital structures of the sample farms are depicted in Table 2. Total assets of the owner operators and sharecroppers per hectare were \$409472.7 and \$479549.8, respectively. In addition, the current debt of sharecroppers was higher than that of owner operators. There were statistically significant differences between the farm groups in terms of total assets and current debt in the research area ($P< 0.01$). Total asset and debt per hectare of sharecroppers was larger than that of owners. In both groups, the share of the equity was approximately 91% and difference between them was statistically insignificant (Table 2).

Annual economic performances of the sample farms are depicted in Table 3. Production value of sample farms per hectare was \$66174.2, on average. All farms benefited from government support per hectare by \$946.0 for biological pest control, \$324.3 for bumblebee and \$29.7 for fertilizer, fuel. The mean gross farm income of owner operator and sharecropping per hectare were \$69843.8 and \$58052.3, respectively, in the research area. Regarding the net farm income, farms owner operators gained lower net farm income compared to sharecropping ($P< 0.01$). Net farm income of owner operator and sharecroppers per hectare were \$44518.3 and \$51248.8, respectively (Table 3). Our finding related to net farm income confirmed the results of Ul Haq (2019). However, the reverse was the case in Pakistan. Hassan *et al*. (2016) stated that the net revenue of sharecroppers was larger compared to owners.

The efficiency measures varied depending on the tenant pattern in the research area. Efficiency analysis showed that the mean technical efficiency scores for owners and sharecroppers were 0.724 and 0.851, respectively. Sharecroppers had better technical efficiency scores than that of owner operators ($P< 0.05$). The positive relationship between technical efficiency and tenant pattern found in the study corroborated with the statement of Marshallian efficiency. Similarly, Sadoulet *et al*. (1997) in Philippines and Kassie and Holden (2008) in Ethiopia reported the positive relationship between productivity and sharecropping. They stated that sharecropping gave the right incentive to achieve higher productivity and efficiency. However, some previous studies pointed out the presence of Marshallian inefficiency. Ghebru and Holden (2012) in Ethiopia and Holden and Bezabih (2008) in Ethiopia showed the presence of Marshallian inefficiency. Also, some studies conducted in India, Tunisia and Pakistan explored least partial support for Marshallian inefficiency (Bell, 1977; Shaban, 1987; Deininger and Goyal, 2012; Laffont and Matoussi,1995; Jacoby and Mansuri, 2009). Jacoby and Mansuri (2009) inferred that the presence of unobserved plot-level characteristics and the endogeneity of contract choice were potential sources of bias in the background of exploring least partial support for Marshallian inefficiency. Based on the results of the decomposition of technical efficiency, the basic technical inefficiency source was pure technical inefficiency for both owner operator and sharecroppers, meaning that managerial performance of operators in the research area was lower than expected level (Table 4).

Based on the scores of scale efficiency, 52.2% of owner operator and 91.7% of sharecroppers had increasing returns to scale. The percentage of the owners who had decreasing return to scale was 34.8%, while that of sharecroppers was 8.3%, indicating that the scale of approximately one-third of owners was larger than optimum scale. As expected, none of the sharecroppers had constant returns to scale. However, 13.0% of the owner operator had constant returns to

Table 1. Socio- economic characteristics of sample farmers.

	Owner		Sharecropper	
Farmers' characteristics	Mean	Std dev	Mean	Std dev
The age of the farm operator (Year)	48.1	11.0	50.6	8.6
Education level of the farm operator (Year)*	6.4	2.5	7.3	3.5
Farming experience (Year)***	19.8	10.8	25.1	11.0
Greenhouse cultivation experience (Year) ***	17.6	8.3	23.9	10.9
Working time at farm (Months per year) **	9.9	0.4	9.4	1.7
Farm characteristics				
Family size (Person)	4.1	1.2	3.8	1.4
Farmland (ha)***	0.4	0.4	1.3	2.6
Land allocated to tomato (ha)**	0.5	0.4	1.6	2.8
Land allocated to pepper (ha)**	0.3	0.3	0.9	0.3
Tomato price (¢ kg^{-1}) **	297.3	114.2	270.3	98.1
Pepper price (¢ kg^{-1})	621.6	126.2	621.6	211.3
Tomato yield (kg ha^{-1})	203787.9	30285.9	205000.0	20163.8
Pepper yield (kg ha^{-1}) **	111400.0	17767.0	121666.7	43550.7
Tomato production value (\$ ha^{-1}) **	60586.1	22572.3	55411.5	18367.5
Pepper production value ((\$ ha^{-1})	69246.2	31131.0	75628.0	34172.7
Labor cost (\$ ha^{-1}) ***	27886.2	21777.3	6052.8	5363.4
Shareholder payment (\$ ha^{-1}) ***	0.0	0.0	13438.8	6760.2

*** P< 0.01, ** P< 0.05, * P< 0.10.

Table 2. Capital structures of the sample farms.

	Owner		Sharecropper	
Capital items	Mean	Std dev	Mean	Std dev
Noncurrent assets (\$ ha^{-1})*	326533.2	232371.3	345064.2	230490.8
Total land capital (\$ ha^{-1}) **	137616.9	92946.9	184159.7	57203.5
Land improvement (\$ ha^{-1}) **	8550.4	4647.4	9208.0	2860.2
Building capital (\$ ha^{-1})	142725.0	223638.7	148474.0	213812.5
Greenhouse capital (\$ ha^{-1}) *	37099.2	3112.7	2614.0	1820.1
Machinery capital (\$ ha^{-1}) *	541.7	876.6	608.5	549.3
Current assets ((\$ ha^{-1})*	82939.5	99510.9	134485.6	131173.8
Field inventory-stock (\$ ha^{-1})	17362.5	4946.4	12921.5	2622.4
Stock (\$ ha^{-1})***	420.6	1676.5	2512.5	5689.6
Cash money (\$ ha^{-1})***	57615.1	96401.1	110132.2	128135.6
Borrowed money (\$ ha^{-1})***	7541.3	9333.8	8919.4	6307.1
Total assets (\$ ha^{-1})***	409472.7	270101.8	479549.8	285134.0
Current debt (\$ ha^{-1})*	31503.7	89832.2	45499.7	68887.2
Equity (\$ ha^{-1})**	377969.0	267928.1	434050.1	260576.3
Total liability ((\$ ha^{-1})*	409472.7	270101.8	479549.8	285134.0

*** P< 0.01, ** P< 0.05, * P< 0.10.

scale. Scale efficient owner operators had higher farm income than that of sharecroppers due to scale advantageous (Table 5).

Net farm income of owner operator farms and sharecroppers having increasing return to scale per hectare were \$39682.6 and \$46433.3, respectively. Similar situation was the case for decreasing return to scale scenario. Net farm income of owner operator farms and sharecroppers having decreasing return to scale per hectare were \$24247.1 and \$31092.6, respectively (Table 5).

Regarding the allocative and economic efficiencies, owners had larger allocative and economic efficiency scores compared to sharecroppers. The mean allocative efficiency scores for owners and

Table 3. Annual economic performances of the sample farms.

Economic variables	Owner		Sharecropper	
	Mean	Std dev	Mean	Std dev
Crop production value (1) (($ ha^{-1})**	66174.2	29547.3	57381.2	27754.9
Off farm income (2) ($ ha^{-1}))	2634.8	19512.2	0.0	0.0
Total agricultural support (3) ($/ha)***	1034.8	453.2	671.1	437.0
Gross farm income (4= 1+2+3) ($ ha^{-1})**	69843.8	42608.8	58052.3	29013.2
Total production expenses (5) ($ ha^{-1})***	49317.9	23223.0	35804.2	10552.8
Net output (6= 4-5) ($ ha^{-1})	20165.9	46231.4	22248.1	21795.1
Family labor (7) ($ ha^{-1})***	26216.4	18227.8	6052.8	5363.4
Agricultural income (8= 6+7) ($ ha^{-1})***	46382.3	21741.0	28300.9	12364.9
Variable costs (9) ($ ha^{-1})***	16965.1	6097.5	11326.6	2611.5
Fixed costs (10) ($ ha^{-1})**	32352.8	20561.6	24477.6	10084.0
Gross margin (11= 1-9) ($ ha^{-1})	49209.1	30620.7	46054.6	27652.1
Opportunity cost of equity (12) ($ ha^{-1})	27662.2	46231.4	29671.8	21795.1
Net farm income (13= 1-5+12) ($ ha^{-1})	44518.3	37902.6	51248.8	21750.5
Cost-benefit ratio (%)	1.6	1.1	1.6	0.4
Return on asset (%)**	8.3	12.5	7.5	7.0
Return on equity (%)	6.7	29.6	9.1	9.2

*** P< 0.01, ** P< 0.05, * P< 0.10.

Table 4. Efficiency scores associated with tenant pattern.

	Owner		Sharecropper	
	Score	Std dev	Score	Std dev
Technical Efficiency (TE)**	0.724	0.187	0.851	0.103
Allocative Efficiency (AE)**	0.729	0.197	0.598	0.116
Economic Efficiency (EE)**	0.528	0.259	0.509	0.083
Scale Efficiency (SE)**	0.876	0.119	0.575	0.176
Pure Technical Efficiency (PTE)**	0.634	0.153	0.489	0.111

** P<0.05.

Table 5. Summary of returns to scale results for sample farmers.[a]

		Number of the farms		Farm income ($ ha^{-1})		Variable cost (($ ha^{-1})		Fixed cost (($ ha^{-1})		Net income (($ ha^{-1})	
		N	%	Mean	Std dev	Mean	Std dev	Mean	Std dev	Mean	Std dev
Owner	CRS	3	13.0	133213.8	130293.3	15026.3	1261.8	22427.8	22334.8	80849.2	40148.9
	DRS	8	34.8	34114.8	10785.9	18631.7	3533.5	30494.1	19042.8	24247.1	13407.6
	IRS	12	52.2	46556.4	12035.1	13280.9	1554.2	25301.9	14906.2	39682.6	21294.4
Sharecropper	DRS	2	8.3	17863.7	4765.8	17504.5	4096.1	16303.4	1910.3	31092.6	15010.6
	IRS	22	91.7	39749.0	25033.4	10797.0	922.7	26339.2	9580.2	46433.3	24526.1

[a] CRS: Constant Returns to Scale, DRS: Decreasing Returns to Scale, IRS: Increasing Returns to Scale.

sharecroppers were 0.729 and 0.598, respectively, while that of economic efficiency were 0.528 and 0.509, respectively. Even though owner operator had better efficiency scores, their net profit was relatively low due to having less total production expenses compared to owner operator. It was clear based on the results of the efficiency analysis that the reason behind the low-level allocative and economic efficiency was weakness of operators in monitoring the input markets in both groups in the research area (Table 4).

CONCLUSIONS

In this research, the socio- economic characteristics, capital structures and annual economic performance of sharecropping and owner operator in vegetable production in greenhouse were compared. The results of the study suggest that economic performance and productivity of owner operator was lower than that of sharecroppers due to high production cost. Therefore, owners' net income was low compared to sharecroppers, resulting in having lower level of technical efficiency. Regarding productivity and technical efficiency, it was clear that there was no Marshallian inefficiency in the research area since productivity and technical efficiency level of sharecroppers was higher than the owner ones. However, the reverse was the case for the allocative and economic efficiency scores. In the light of the research finding, if inefficient sharecroppers reduced their input cost by 49% in vegetable production, sharecroppers would become economically full efficient. The labor cost of owners was about twice that of farms sharecroppers in the research area and this made the owners turn to sharecropping as a special tenant pattern. The study also explored the need of increasing production scale of farms to reach optimum production level, indicating that land size affected the landlord switching preference to sharecropping. In this context, the provision of low-cost crop management technologies and labor use may also be helpful to reduce production cost. Based on the results, it can be recommended that there need appropriate support of the government and community as well to improve the productivity of agricultural land via increasing labor use efficiency. Also, farmers can increase their technical competence, if both owner operator and sharecropper improved their skills via participating in training and extension programs. Implementing performance-based earning systems may accelerate improving farmers' technical capability. Reorganizing farm and controlling marketing cost may also be beneficial for increasing economic efficiency in the research area. Future studies focusing on the tenant patterns in a detail and main determinants of economic inefficiency.

REFERENCES

1. Ahmed, M. F. and Billah, M. M. 2018. Impact of Sharecropping on Rice Productivity in Some Areas of Khulna District. *Bangladesh Journal of Agricultural Research*, **43(3):** 417-430.
2. Anwar T.S., Qureshi, K. and H. Ali. 2002. Landlessness and Rural Poverty in Pakistan. *Pak. Dev. Rev.*, **35(4):** 1-20.
3. Banker, R. D., Charnes, A. and Cooper, W. W. 1984. Models for Estimating Technical and Scale Efficiencies. *Manage. Sci.,* **30:** 1078-1092.
4. Bell, C. 1977. Alternative Theories of Sharecropping: Some Tests Using Evidence from Northeast India. *J. Dev. Stud.,* **13(4):** 317-346.
5. Benjamin, C., Corsi, A. and Guyomard, H. 1996. Modelling Labor Decisions of French Agricultural Households. *Appl. Econ.,* **28(12):** 1577-1589.
6. Braido, L. H. B. 2006. *Insurance and Incentives in Sharecropping.* In: "*Forthcoming in Competitive Failures in Insurance Markets*", (Eds.): Chiappori, P-A. and Gollier, Ch. Working Paper Version, MIT Press.
7. Çanakcı, M. and Akıncı, İ. 2009. Antalya İli Sera Sebze Yetiştiriciliğinde Uygulanan

Tarımsal İşlemler ve İnsan İşgücü Kullanımı. *J. Agric. Machin. Sci.,* **5(2):** 193-202.
8. Charnes, A., Cooper, W. W. and Rhodes, E. 1978. Measuring the Efficiency of Decision Making Units. *Eur. Rev. Agric. Econ.,* **49:** 429-444.
9. Chaudhuri, A. and Maitra, P. 2006. Share Cropping Contracts in Rural India: A Note. *J. Contemp. Asia,* **30(1):** 99-107.
10. Cinemre, H. A. 1990. Şanlıurfa (Akçakale) Tarımsal Üretim Planlaması. Doktora Tezi, Fen Bilimleri Enstitüsü, Anakara Üniversitesi, 188s.
11. Coelli, T. 1996. *A Guide to DEAP Version 2.1: A Data Envelopment Analysis (Computer) Program.* CEPA Working Paper 96/08, Department of Economics, Universty of New England, Armidale.
12. Coelli, T. 1998. A Multi-Stage Methodology for the Solution of Orientated DEA Models. *Oper. Res. Lett.,* **23(3-5):** 143-149.
13. Coelli, T., Rao, D. S. P., O'Donnell, C. J. and Battese, G. E. 2005. *An Introduction to Efficiency and Productivity Analysis.* Springer Science & Business Media.
14. Çolak, A. and Erdoğan, D. 1991. Tarla Bitkileri Tarımında İnsan İşgücü Gereksiniminin, Mekanizasyon Açısından Değerlendirilmesi. Ziraat Fakültesi Yayınları No: 1207, Ankara Üniversitesi, Ankara.
15. DACNET. 2007. *Country-Wise Normal Area, Production and Productivity of Wheat: Wheat Production.* Directorate of Wheat Development, Ministry of Agriculture, Deptt. Agric. & Coop. Ghaziabad, Uttar Pradesh, India.
16. Dedeoğlu, M. and Yıldırım, İ. 2006. Emek Tarımsal Kalkınma Kooperatifine Ortak Işletmelerin Ekonomik Analizi. *Yüzüncü Yıl Üniversitesi, Ziraat Fakültesi, Tarım Bilimleri Dergisi (J. Agric. Sci.),* **16(1):** 39-48.
17. Deininger, K. and Goyal, A. 2012. Going Digital: Credit Effects of Land Registry Computerization in India. *J. Develop. Econ.*, **99(2)**: 236-243.
18. Delgado, C. L., Narrod, C. A and Tiongco, M. M. 2003. *Project on Livestock Industrialization, Trade and Social-Health-Environment Aspects in Developing Countries.* Final Research Report of Phase II. Submitted to Food and Agricultural Organization (FAO) of United States by IFPRI.
19. Esengül, K. 1987. Tokat İli Merkez İlçesi Tarım İşletmelerinde İşgücü Varlığı ve Değerlendirme Durumu Üzerine Bir Araştırma. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Cumhuriyet Üniversitesi, 87s.
20. Esengül, K., Gündüz, O. and Gülistan, E. 2007. Input-Output Energy Analysis in Dry Apricot Production of Turkey. *Energy Convers. Manag.,* **48:** 592-598.
21. Evcim, Ü. 1990 Tarımsal Mekanizasyon İşletmeciliği ve Planlaması Veri Tabanı. Ziraat Fakültesi Yayınları No: 495, Ege Üniversitesi, Bornova, İzmir.
22. Farrell, M. J. 1957. The Measurement of Productive Efficiency. *J. R. Stat. Soc. Ser. A Stat. Soc.*, **120(3):** 253-281.
23. Ghebru, H. H. and Holden, S. T. 2012. *Reverse Share-Tenancy and Marshallian Inefficiency: Bargaining Power of Landowners and the Sharecroppers' Productivity.* Centre for Land Tenure Studies Working Paper No. 02/12, Norwegian University of Life Sciences (NMBU).
24. Grantham, G. W. 1993. Divisions of Labor: Agricultural Productivity and Occupational Specialization in Pre-Industrial France. *Econ. Hist. Rev.,* **46(3):** 478-502.
25. Günden, C. 2005. Bireysel İşletme, Grup ve Bölge Bazında Uygulamaya Elverişli Esnek Üretim Planlarının Bulanık Çok Amaçlı Doğrusal Programlama Yöntemiyle Elde Edilmesi Üzerine Bir Araştırma: İzmir İli Torbalı İlçesi Örneği. Doktora Tezi, Fen Bilimleri Enstitüsü, Ege Üniversitesi, 441s.
26. Hassan, S., Mahmood, I., Qasim, M., Zahra, N. and Ali, M. 2016. Comparative Economics of Owner Operators and Sharecroppers In Wheat Farming Arrangements: A Case Of Rawalpindi District In Pakistan. *J. Agric. Res.,* **54(1).**
27. Holden, S. T. and Bezabih, M. 2008. Gender and Land Productivity on Rented Land in Ethiopia. "*The Emergence of Land Markets in Africa: Impacts on Poverty, Equity and Efficiency*". Resources For the Future Press, Routledge, PP. 179-196.
28. Hunt, R. C. 2000. Labor Productivity and Agricultural Development: Boserup Revisited. *Hum. Ecol*., **28(2):** 251-277.
29. Isıtan, D. 1990. A.Ü. Ziraat Fakültesi Araştırma Uygulama Çiftliği Sığır ve Kuzu Besicilik Faaliyetlerinin Ekonomik Analizi ve İşgücü İstekleri Üzerine Bir Araştırma. Yüksek Lisans Tezi, Fen Bil. Enstitüsü, Anakara Üniversitesi, 111s.

30. Jacoby, H. G. and Mansuri, G. 2009. Incentives, Supervision, and Sharecropper Productivity. *J. Dev. Econ.*, **88(2):** 232-241.
31. Kassie, M. and Holden, S. T. 2008. Kinship, Tenure Insecurity, Input Use, and Land Productivity. "*The Emergence of Land Markets in Africa: Impacts on Poverty, Equity, and Efficiency*". Taylor&Francis Groups, Routledge, 197.
32. Khan M. J., Ahmad, S. and Saddozai, K.N. 2008. Economic Analysis of Wheat Profitability in Peshawar Valley, NWFP. *Pak. J. Life Soc. Sci.*, **6(2):** 112-117.
33. Kızıloğlu, S. 2001. Kuzgun Barajından Yararlanan Tarım Işletmelerinde Uretim Planlaması. *V. Ulusal Ekonometri ve İstatistik Sempozyumu,* 19-22 Eylül 2001, Adana) Bildirileri.
34. Laffont, J. and Matoussi, M. S. 1995. Moral Hazard, Financial Constraints and Sharecropping in El Oulja. *Rev. Econ. Stud.*, **62(3):** 381–399.
35. Malchow-Møller, N. and M. Svarer. 2005. Wage–Labor Activities by Agricultural Households in Nicaragua. *J. Dev. Stud.*, **41(7):** 1221-1246.
36. Mukhamedova, N. and Pomfret, R. 2019. Why Does Sharecropping Survive? Agrarian Institutions and Contract Choice in Kazakhstan and Uzbekistan. *Comp. Econ. Stud.*, **61(4):** 576-597.
37. Özkan, B. 1993. Aksu Sulama Projesi Alanına Giren Tarım İşletmelerinin Ekonomik Analizi ve Ürün Desenini Etkileyen Faktörler. Doktora Tezi, Fen Bilimleri Enstitüsü, Çukurova Üniversitesi, 215s.
38. Özkan, B. and Kuzgun, M. 1996. Antalya'da Pamuk Üretim Maliyeti ve Geliri. Akd. *Üniv. Ziraat Fak. Derg.*, **9:** 162-171.
39. Peker, K. 1993. Pasinler İlçesi Tarım İşletmelerinde Atıl İşgücünün Tespiti ve İşgücünü Değerlendirme İmkanları. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Atatürk Üniversitesi, 68s.
40. Reid Jr, J. D. 1977. The Theory of Share Tenancy Revisited-Again. *J. Polit. Econ.*, **85(2):** 403-407.
41. Rufai, A. M., Salman, K. K. and Salawu, M. B. 2018. Input Utilization and Agricultural Labor Productivity: A Gender Analysis. In: "*Building a Resilient and Sustainable Agriculture in Sub-Saharan Africa*", (Eds.): Shimeles A., Verdier-Chouchane A., Boly A. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-319-76222-7_4
42. Sadoulet, E., De Janvry, A. and Fukui, S. 1997. The Meaning of Kinship in Sharecropping Contracts. *Am. J. Agric. Econ.*, **79(2):** 394-406.
43. Shaban, R. A. 1987. Testing between Competing Models of Sharecropping. *J. Polit. Econ.*, **95(5):** 893-920.
44. Şahin, A. and Yıldırım, İ. 2002. Economic Analysis of Sheep Farms in Center Town of Van Province. *YYÜ, Zir. Fak. Tarım Bilimleri Derg.*, **12(2):** 47-52.
45. Şahin, A. and Miran, B. 2008. Tarım İşletmelerinde Üretim Dallarına Göre İşgücü Kullanımının Çok Boyutlu Analizi: Bayındır İlçesi Örneği. *Ege Üni. Ziraat Fak. Derg.*, **45(1):** 37-47.
46. Takasaki, Y. 2007. Dynamic Household Models of Forest Clearing under Distinct Land and Labor Market Institutions: Can Agricultural Policies Reduce Tropical Deforestation? *Environ. Dev. Econ.*, **12(3):** 423-443.
47. Tatlıdil, F.F. 1992. Konya İli Sulu ve Kuru Koşullardaki Tarım İşletmelerinde İşgücü, Döner Sermaye ve Traktör Güçlerine Göre Optimal İşletme Büyüklüğün Tespiti. Doktora Tezi, Fen Bilimleri Enstitüsü, Anakara Üniversitesi, 165s.
48. TURKSTAT, 2016. *Türkiye Bitkisel Üretim İstatistikleri.* T. C. Türkiye İstatistik Kurumu, Ankara.
49. Ul Haq, S. 2019. Factors Influencing Shareholder Farming System in Tea Production and Its Effects on Sustainability in Rize Province. PhD Thesis, Agricultural Economics, Institute of Science, Ondokuz Mayıs University, 160 PP.
50. Ünver, E. 1992. Tekirdağ İli Merkez İlçesi Tarım İşletmelerinde İşgücü Varlığı ve Kullanım Durumu Üzerine Bir Araştırma. Yüksek Lisans Tezi, Fen Bilimleri Enstitüsü, Anakara Üniversitesi, 87s.
51. USDA. 2016. *The National Agricultural Statistics Service (NASS).* Agricultural Statistics Board, United States Department of Agriculture (USDA), Released November 17, 2016.
52. Yılmaz, İ. 1996. Antalya İlinde Serada Domates, Biber ve Patlıcan Yetiştiriciliğinde Girdi Kullanımı ve Üretim Maliyetleri. *Çukurova Üniv. Ziraat Fak. Derg.*, **11(4):** 155-164.

اثر نوع استخدام کارگر روی عملکرد اقتصادی و کارآیی مزارع در ناحیه "کاش" در استان آنتالیا در ترکیه

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چکیده

اهداف این پژوهش عبارت بود از:(1) برآورد مقایسه ای عملکرد اقتصادی و کارآیی تولیدی (productive efficiency) مالکین و سهام داران (sharecroppers) در ناحیه "کاش" (Kas) در استان آنتالیا در ترکیه، (2) تعیین عوامل موثر بر سودمندی اپراتورهای مالک (owner operator) و سهام داران، و (3) تدوین انتخاب ها برای اتخاذ سیاست مناسب بر اساس نتایج به دست آمده. داده های این پژوهش با استفاده از یک پرسشنامه از 58 اپراتور مالک و 45 سهامدار جمع‌آوری شد. برای انتخاب سهامداران و اپراتورهای مالک که از نظر مشخصات کشاورزان، درآمد مزرعه، و اندازه زمین مشابه یکدیگر باشند، از تحلیل خوشه ای استفاده شد. در برآورد سنجه های کارایی ، روش تحلیل پوششی داده ها (DEA) به کار رفت. نتایج تحقیق نشان داد که هزینه کارگری مزارع نمونه بیشترین سهم را در هزینه های مزرعه داشتند. عملکرد گوجه فرنگی و فلفل سهامداران بیشتر از موارد مربوط به مالکین بود. مقدار درآمد خالص اپراتورهای مالک و سهام داران در هر هکتار به ترتیب برابر44518/3 و 51248/8 دلار بود. میانگین کارایی های فنی، تخصیصی و اقتصادی مربوط به اپراتورهای مالکین برابر بود با 0/74 ،0/729 و0/528 در حالیکه این اعداد در مورد سهامداران برابر 0/851، 0/598، و0/509 بود. سهامداران در مقایسه با مالکان امتیازکارآیی فنی بیشتری داشتند ولی درمورد کارآیی تخصیصی و اقتصادی این مقایسه بر عکس بود.. طبق نتایج به دست آمده، چنانچه هر دو گروه اپراتور های مالک و سهامدار در برنامه های آموزشی و ترویجی شرکت کنند و مهارت خود را بهبود دهند، خواهند توانست صلاحیت فنی خود را بیافزایند. اجرای سامانه کسب درآمد بر مبنای عملکرد ممکن است بهبود توانایی فنی کشاورزان را شتاب بخشد. تجدید سازماندهی مزرعه و کنترل هزینه های بازاریابی نیز ممکن است در افزایش کارآیی اقتصادی در منطقه مطالعه شده مفید باشد.