Tea Productivity Analysis and its Determinants: Implications for Higher Production and Cost Savings with Different Farm Sizes

Reception of originals: 04/16/2019
Release for publication: 07/21/2020

Shamsheer ul Haq (Corresponding Author)
Ph. D. Scholar in Ondokuz Mayıs University
Institution: Ondokuz Mayıs University, Department of Agricultural Economics Adress: Faculty of Agriculture, Ondokuz Mayıs University, 55139, Samsun, Turkey.
E-mail: shamsheer213@hotmail.com

Pomi Shahbaz
Ph. D. Scholar in Ondokuz Mayıs University
Institution: Ondokuz Mayıs University, Department of Agricultural Economics Adress: Faculty of Agriculture, Ondokuz Mayıs University, 55139, Samsun, Turkey.
E-mail: pomi1781@gmail.com

Ismet Boz
Prof. Dr. in Ondokuz Mayıs University
Institution: Ondokuz Mayıs University, Department of Agricultural Economics Adress: Faculty of Agriculture, Ondokuz Mayıs University, 55139, Samsun, Turkey.
E-mail: ismet.boz@omu.edu.tr

Abstract

Tea demand is increasing rapidly both in domestic as well as in international markets. The growing demand of tea requires an increase in its production in a sustainable way. Therefore, enhancing tea productivity of present tea farms is the most feasible solution due to land scarcity and unavailability of required climate conditions. The primary purpose of this study was to analyze the factors that influence tea productivity, and cost of production on the basis of different farm groups. A total of 138 tea growers were selected by using stratified sampling technique from the extensive tea cultivation area of Rize province, Turkey. Cobb-Douglas model of production was used to analyze the factors affecting the tea productivity. Despite of having considerable cost of production differences, the return among farm categories was not too different from each other. The small and medium farmers were using higher quantity of fertilizer and also had older tea orchards as compared to large farmers. The results of the statistical model depicted that farmers who accessed their land on the share basis have a positive effect on the tea productivity. Farm size and age of the tea orchards were found negatively associated with tea productivity. Labor hiring and participation of tea farmers in agriculture training programs were positively affecting the productivity of tea farms. Therefore, regular training programs with great focus on management practices and awareness about the side effects of extravagant use of chemical fertilizer to the ecosystem should be organized by government agencies.

Keywords: Tea farming. Productivity. Production costs. Farm ownership. Determinants.

1. Introduction

The demand of agricultural commodities is growing rapidly due to increase in global population. Tea is an important agricultural commodity and a large segment of rural population in tea producing countries is engaged in tea enterprise. Therefore, increased agricultural production has the potential to strengthen the economy of rural families and reduce the poverty of rural areas (Koirala et al., 2014). Turkey is the fifth largest tea producing country after China, India, Kenya, and Srilanka (Worldatlas, 2016) but its share in international tea export market is minimal. Turkey has the highest per capita tea consumption (6.96 pounds) in the world (Ferdman, 2014). Even though domestic tea production fully meets national needs but country's share in international tea export market is minimal as compared to other major tea producing countries. The export share in international market can be enhanced in two ways i) decreasing domestic tea consumption ii) increasing total tea production. Disturbing domestic tea market for export purpose is not a feasible solution economically. For this reason, increasing tea production is a more viable solution. Tea production can be enhanced either by increasing land under tea cultivation or by increasing productivity of present tea farms. Increasing land area under tea cultivation is very hard due to land scarcity and more importantly tea plants can be grown only under certain climatic and soil conditions. Therefore, improving tea productivity of present tea enterprises is the most feasible solution both socially and economically.

But tea farmers are facing a number of problems which limit the ability of tea farmers to enhance tea productivity. These include both management and production related problems. Özcan and Yazıcıoğlu (2013) listed a set of problems affecting tea productivity such as aging, delay in the renewal of tea plants, land fragmentation, high production costs, illegal entry of tea, and severe fluctuations in tea processing sectors. The small tea growers are facing problems such as low product price, late payment, and lack of solidarity organization (Sakli, 2011). Except these factors farm size, farmers' socioeconomic characteristics, land fragmentation, and resource ownership also affect crop productivity (Tauer, 1995; Chattopadhyay and Sengupta, 1998; Heltberg, 1998; Weir, 1999; Rahmana and Rahman, 2009; Chand et al., 2011; Savastano and Scandizzo, 2017; Shahbaz et al., 2017). Topsoil depth, tea age, fertilizer, and organic matter are other important factors to consider in tea productivity (Anandacoomaraswamy et al. 2001). In addition, the amount of labor hired, land under tea cultivation, the number of bushels, and off-farm income are also vital factors affecting the tea productivity (Kiprono et al., 2011).

Beside these socio-economic, organizational, technological and environmental issues, farm ownership (owned or tenure) is also considered a vital determinant of tea productivity.

Therefore, the formal and informal methods of accessing the land for farming have a crucial role in enhancing the income of rural households and agricultural productivity (Carter & Olinto, 1998; Deininger & Jin, 2005; Yao, 2007).

Although productivity is a prime concern, analyzing the factors that affect the crop productivity can facilitate benefitting from the high economic profit without disturbing the environment. Therefore, the primary objective of this study was to analyze the effect of different farm variables specially farm size and land ownership on tea productivity with socioeconomic and environmental factors. The practices associated with cost savings were also explored in this study with different farm sizes. The specific objectives are given below;

- To explore the socioeconomic characteristics of the tea growers based on farm size groups;
- To determine cost and profitability of the tea growers based on farm size groups;
- To determine the factors affecting tea productivity.

2. Literature review

Productivity is defined as the ability of production factors to produce output. Enhanced productivity cannot only stimulate economic growth but it can also improve the overall welfare of the society especially in developing world. It is the productivity difference which separates this world into developed and developing nations. The productivity level is very high in developed countries as compared to developing and underdeveloped countries. But developing countries have an opportunity to minimize this productivity gap through catch up affect. World economists always keep on tracking productivity level of different sectors and enterprises of economy by conducting research all over the world. Agriculture is one of the important sectors providing food security to the society. Agriculture productivity is defined as the ratio of agricultural output to the agricultural inputs (labor, land) (Haq et al., 2017).

Literature available on agricultural/farm productivity indicates following factors which affect the agriculture productivity;

- Socio-economic factors;
- Quality and quantity of used inputs;
- Mechanization;
- Degree of commercialization;
- Organizational structure.

Socio-economic factors include variables like age, gender, type and level of education, family size, farm experience, farm size, availability/access to credit, and off-farm income. The literature about the relationship of farmer gender and productivity presents mix results. Mathijs and Vranken (2001) found that presence of female farmer is positively associated with the productivity. On the other hand, Fakayode et al. (2008) found that male farmers have positive relation with the productivity. These differences are attributed mainly to the cultural differences. The farmers with higher level of education can have better understanding of farming and skill to handle their farms more efficiently (Rao et al., 2004). Adewuyi (2002) also stated a positive relationship between productivity and education. Younger farmers are more open to adopt technological changes as compared to older farmers (Kılıç et al., 2020; Shahbaz et al., 2020). Hadley (2006) found an inverse relationship between productivity and age of the farmer. Large farmers have an opportunity to achieve economies of scale and they can achieve inputs more easily (Hadley, 2006; Latruffe et al., 2004; Zhu et al., 2008) and at lower prices as they buy in bulk quantity. Moreover, large farmers also have more resources. On the other side, small farms have an advantage that they do not have organizational issues and labor involved in agriculture activities have the motivation to directly benefit from profit opportunities (Buckwell and Davidova, 1993; Eaton and Shepherd, 2001). Farm size and its performance have U-shape (Latruffe et al., 2005). There is always a time lag between crop cultivation and harvesting. Thus, during this period farmer need income from other sources not only to buy agricultural inputs but also for other living expenses and Evans and Ngau (1991) described positive affect of off-farm activities on the agricultural output.

Fertilizers are an important source of nutrients required for plant growth. Similarly, application of agro-chemicals (pesticides, herbicides and weedicides) in recommended quantity is also essential for better productivity. Excessive or lesser use of these chemicals than recommended quantity will have severe negative effects on agricultural productivity. Adewuyi (2002) and Oladeebo (2006) both emphasized on importance of proper usage of these chemicals. Apposite application of inputs is no doubt an important element for better productivity but more important is the quality of used inputs. This is one of the major constraints pointed out by previous studies, which is mostly faced by small farmers (Abubakar, 2006). Tractor is basic machinery in agriculture now a day required to perform different tasks of cultivation, harvesting and transportation of crops. Therefore, use of machinery such as tractors and tube-wells is also positively associated with the productivity (Otitoju and Arene, 2010).

Commercialization raises the cash earnings which enable farmers to purchase required quantity and high quality inputs (Latruffe et al., 2004; Mathijs and Vranken, 2001). Organizational factors include availability of extension services and membership of farmer organizations/cooperatives. Extension services play an important role in adoption of innovations and in problem solving of the farmers. Carroll et al. (2009) and Ahearn et al. (1998) found a positive relationship between productivity and extension services.

3. Material and Methods

3.1. Study area and sample size

The occupation of thousands of the rural families in Rize, Trabzon, and Artvin is tea farming. In addition, 90 percent of the area in Rize province is under tea cultivation, contributing 78 percent to the total country production (RTB, 2014). More than 200 thousand families are involved in tea enterprise in the different forms of land tenure (owner, shareholder, renter, etc.) or as employees of tea processing firms (Aylangan, 2011). As Rize province mainly contributes to the tea production of the country, the three main tea producing districts were selected as the study area, and the lists of the tea growers were obtained from the agriculture department of the province. The tea farmers were arranged according to their land holding under tea cultivation. The land under tea cultivation was used to decide the three strata. In the first stratum, the small farmers having land of less than 5 decares under tea cultivation were included. In the second stratum, the medium farmers having land of 5 to 10 decares were included. The third stratum consisted of large farmers having land of 10 or greater than 10 decares. The stratified sampling technique was applied, and the following formula proposed by Yamane (2001) was used to determine the final sample size. The similar way was adopted by Boz (2015) and ul Haq and Boz (2019).

$$n = \frac{N \sum N_h S_h^2}{N^2 D^2 + \sum N_h S_h^2}, D^2 = \frac{e^2}{t^2} \qquad \text{Eq.1}$$

In equation 1,

n = sample size,

N = population of tea growers in main strata,

N_h = number of tea growers in each stratum,

S_h= standard deviation within each stratum,

D^2 = expected variance,

e = accepted error from mean, and

t = *t* value corresponding to the accepted confidence interval.

The optimal sample size was 138 tea farmers with an error allowed of 3 percent at 95 percent confidence level at which the *t* value is 1.645. This number was then proportionately distributed among all strata to determine the number of farmers from each stratum.

3.2. Statistical Analysis

The farmers were compared on the basis of farm size, namely, small, medium, and large farmers. The normally distributed variables were analyzed by one-way analysis of variance. When variables were not normally distributed, logarithmic transformation was performed and the Kolmogorov-Smirnov normality test was applied. The categorical variables were tested using the chi-square test when the observed frequency was lower than 5 percent, and then, Fisher's exact test was used.

3.3. Factors Affecting Tea Productivity

Factors affecting tea productivity were assessed using the Cobb-Douglas production function model. The model was adopted from the study of Shahbaz et al. (2017). Several variables were considered, but tea production in Rize province is highly dependent on fertilizers, which is just an input being used in crop cultivation. Other inputs include labor consisting of family and hired labor. The R^2 is expected to be extremely low in this model because of the less number of inputs that can be considered for tea productivity. Furthermore, farm structure and farmer's decision variables were considered to affect tea productivity. The general form of the model is given below:

$$Y = f(X_i, D_j) \quad \text{Eq. 2}$$

In Eq. 2,

Y = tea production per unit of land (decares),

X_i = vector of the quantitative variable, and

D_j = vector of qualitative variables.

$$Log\,Y = \beta_o + \beta_1 LogX_1 + \beta_2 LogX_2 + \beta_3 LogX_3 + \beta_4 LogX_4 + \beta_5 LogX_5 + \beta_6 LogX_6 + \beta_8 D_1 + \beta_9 D_2 + \beta_{10} D_3 + \beta_{11} D_4 + \beta_{12} D_5 + \beta_{13} D_6 \quad \text{Eq.3}$$

Note: The dependent variable is calculated as described by the Dube and Guveya (2014).

In equation 3,

X_1 = total land,

X_2 = number of parcels,

X_3 = age of orchard,

X_4 = fertilizer (kilogram per decare),

X_5 = age of farmer (years),

X_6 = family labor (number),

D_1 = farm ownership (1 for owned, otherwise 0),

D_2 = hiring the labor (1 for farmer hired the labor, otherwise 0),

D_3 = off-farm occupation (1 for yes, otherwise 0),

D_4 = soil testing (1 for farmer tested the soil, otherwise 0),

D_5 = erosion risk (1 for erosion risk at farm, otherwise 0), and

D_6 = participation in agricultural training (1 for farmer participated, otherwise 0).

4. Results and Discussion

4.1. Frequency and Percentage of Farmers

Table 1 shows the highest percentage of small farmers. In addition, 39.13 percent, 28.99 percent, and 31.88 percent were small, medium, and large farmers, respectively. Furthermore, Yüksek et al. (2013) revealed similar results with a majority of small farmers in the study area.

Table 1: Frequency and percentage of farmers.

Farmers	Frequency	Percentage	Valid Percentage	Cumulative Percentage
Large Farmers	44.00	31.88	31.88	31.88
Medium Farmers	40.00	28.99	28.99	60.87
Small Farmers	54.00	39.13	39.13	100.00

4.2. Characteristics of Farmers

Table 2 shows the average age comparison of the farmers. In addition, it displays that the difference between the ages of farmers is insignificant, and small farmers were younger with 47.63 years than medium and large farmers. A considerable difference was observed in the education level of the farmers. The small farmers were highly educated compared with other farmers. Similarly, an insignificant family size was observed over the farm categories; however, the large farmers had large household size. The small and large farmers were having more university graduates in their family than medium farmers, whereas the medium farmer had more family members having an off-farm occupation. A considerable difference was observed in the total family income of farmers. The medium farmers had a yearly family income of US $ 10,305.33, followed by large farmers (US $ 9,520.00) and small farmers (US $ 6,894.35). The medium farmers had considerably higher experience than the other farmers.

Table 2: Farmers' Characteristics

Characteristics	Small Farmers Mean	Medium Farmers Mean	Large Farmers Mean	p-Value
Age (Years)	47.63 (12.01)	52.98 (13.82)	49.52 (9.87)	0.11
Education (Years)	10.02 (4.15)	8.25 (4.16)	8.2 (4.05)	0.05*
Household Size (No.)	4.57 (1.79)	4.43 (1.53)	4.95 (1.93)	0.36
University Graduated Family Members (No.)	1.15 (1.12)	0.88 (0.94)	1.09 (1.12)	0.45
Family Members with off-Farm Occupation	1.11 (1.09)	1.40 (1.34)	1.34 (1.48)	0.51
Total Family Income (US $)	6,894.35 (4248.33)	10,305.33 (8501.65)	9,520.00 (7053.73)	0.03*
Tea Farming Experience (Years)	28.59 (11.94)	36.13 (13.23)	32.70 (12.03)	0.01*

Figures in parentheses are standard deviations. (*) shows significance level at 5%

4.3. Participation Level of Farmers

Previous studies reveal the importance of cooperative membership, explaining the positive effect of adoption of new technologies and innovations, enhancing the empowerment of weak farmers in the market, and also providing the pathways for poverty reduction (Bibby and Shaw, 2005; Kolade and Harpham, 2014; Ahmed and Mesfin, 2017). Furthermore, this study explains that farmers have a membership of local cooperatives who are working to help tea growers in any possible manner. Table 3 shows that the highest percentage of large farmers had a cooperative membership, followed by medium and small farmers. Similarly, large and medium farmers were engaged in the administrative activities related to the village, whereas 66.67 percent of the small farmers were participating in the village administration issues.

Table 3: Participation Level of Farmers **(Percent)**

	Large Farmers	Medium Farmers	Small Farmers	p- value
Membership of Local Cooperative				

No	40.74	40.00	27.27	0.33
Yes	59.26	60.00	72.73	
Family Participation in Village Administration				
Yes	33.33	25.00	25.00	0.57
No	66.67	75.00	75.00	

4.4. Farm Characteristics

Table 4 describes the farm characteristics. The large farmers with high decares of land were also dividing their land into more parcels than other farmers. The small farmers had older tea orchards than the other categories. The economic age of tea orchards is 50 to 60 years (Özcan ve Yazicioğlu, 2013). The tea growers now need to start replanting the tea orchards for maintaining the sustainable tea production. The farm structure of medium farmers is highly sloppy and also has a high altitude.

Table 4: Farm Characteristics

	Small Farmer	Medium Farmer	Large Farmer	p-value
No. of Parcel	3.67 (2.22)	5.28 (3.78)	6.64 (3.36)	0.00*
Age of Orchard (Years)	42.42 (14.96)	38.93 (15.05)	35.01 (12.02)	0.04*
Slope of Orchards (%)	40.81 (16.43)	41.88 (14.22)	38.64 (19.04)	0.66
Altitude (m)	306.02 (271.16)	381.80 (319.36)	315.95 (282.13)	0.42
Distance between Farm and product Receiving Point (m)	1,003.70 (790.50)	1,086.25 (862.32)	1,260.34 (1074.79)	0.37

Figures in parentheses are standard deviations. * shows significance level at 1%

4.5. Tea Productivity and Farmer Categories

Table 5 shows the variation in tea productivity among different farmer categories. The total average land held by the large farmers was 16.14 decares, by the medium farmers was 7.25 decares, and by small farmers was 3.18 decares. The labor productivity per day to harvest the tea leaves was higher for large farmers than others. The medium farmers were benefiting from the high yield per decare, but it was not considerably different from that harvested by large and small farmers.

Table 5: Tea Productivity and Farm Size

	Small Farmers	Medium Farmers	Large Farmers	p-value

Land (Decare)	3.18 (1.17)	7.25 (1.12)	16.14 (7.60)	0.00*
Labor Productivity (Kg/Day/Decare)	259.46 (63.67)	243.65 (56.20)	263.75 (72.65)	0.33
Yield Per Deacre (Kg)	1,437.50 (448.37)	1,572.50 (439.69)	1,559.77 (448.48)	0.26

Figures in parentheses are standard deviations. * shows significance level at 1%. **(10 decares = 1 ha)**

4.6. Gross Margin and Return to Management

Table 6 explains the profitability analysis of tea farmers. The large farmers were benefiting from the high margin and the returns to management. They were spending US $ 190.38 per decare and earning a return of US $ 849.47 per decare. The small farmers were making less expenditure but were getting similar returns. A considerable difference exists only in variable costs. It indicates that large farmers should control their expenditure; as small farmers have similar returns with low expenditure on inputs. Returns to the management show the total farm costs together with family labor compensation and own capital opportunity cost (Ul-Haq et al., 2016).

Table 6: Gross Margin and Return to Management

	Small Farmers	Medium Farmers	Large Farmers	p-value
Variable Cost	120.93 (117.04)	172.24 (137.35)	190.38 (141.80)	0.02*
Gross Income	751.43 (230.45)	805.53 (225.19)	849.47 (312.50)	0.17
Gross Margin	630.51 (243.79)	633.29 (274.99)	659.10 (312.43)	0.86
Return to Management	410.93 (252.54)	413.89 (298.54)	466.71 (321.23)	0.58

Figures in parentheses are standard deviations. * shows significance level at 5%

4.7. Land Value Addition, Old Age Index, and Labor Hiring

Table 7 describes the land value of different categories of farmers. The value addition of land is the value of the product after deducting the payments of all intermediate inputs such as fertilizers and pesticides (Haq and Boz, 2017). No considerable difference exists in the value addition of land in each category. The large farms had high-value addition of land. The old age index is the ratio of the number of family members above 60 years to the total number of family members working at the farm. The highest old age index was found for farms of medium farmers, whereas the similar index was assessed for large and small farmers. A considerable difference was found in the quantity of chemical fertilizers applied per decare and the number of labor hired for different orchard management activities. This result shows that the small farmers were applying more fertilizers than the other farmers. The large farmers were hiring more labor during the whole tea season than the other farmers.

Table 7: Land Value Addition, Old Age Index, and Labor Hiring

	Small Farmers	Medium Farmers	Large Farmers	p-value
Value Addition of Land ($)	692.78 (241.36)	758.55 (222.42)	803.29 (319.08)	0.12
Old Age Index	0.20 (0.32)	0.33 (0.41)	0.20 (0.35)	0.14
Chemical Fertilizer Quantity	126.30 (67.64)	100.23 (43.32)	98.89 (60.56)	0.04**
Labor Hired	0.52 (1.06)	1.15 (1.41)	1.73 (1.97)	0.00*
Family labor	2.24 (0.97)	2.05 (0.87)	1.65 (1.09)	0.01*

Figures in parentheses are standard deviations. (*) and (**) significance level at 1% and 5%, respectively

4.8. Factors Influencing Tea Productivity

The model was significant at 1 percent significance level. The variables that were included in the model explained 21 percent of the total variation in tea productivity. The signs of the variable were as expected, except the sign of farm ownership. A considerable effect of age of orchard, family labor, age of farmer, farm ownership, and labor hiring, and farmers' participation in agricultural-related training was observed on tea productivity. The impact of farm size was negative on tea productivity, which may be because of the sloppy area, as the land of one farmer increases the management of tea orchards becomes difficult. This result is in line with that found by Dube and Guveya (2014) who explained that increase in land under tea reduces the tea productivity. In addition, as farmers divide their land into a large number of parcels, it has a negative influence on tea productivity. Moreover, Dutta et al. (2010) described the adverse effects of numerous parcels on productivity. The age of orchard is considerably impacting tea productivity. Farmers need to replant the orchards before reaching their economic life. Furthermore, 1 percent increase in the age of the respondent increases the tea productivity by 0.2 percent. This may be because of the farmer's experience of tea cultivation with growing maturity. Chen et al. (2009) explained that the older farmers use inputs efficiently as they are more experienced.

Furthermore, 1 percent increase in the fertilizer application increases tea productivity by 3 percent. As several family members are working at the farm and handling their orchards, this has a considerable positive impact on productivity. Therefore, 1 percent increase in family labor enhances the tea productivity by 10 percent. Family labor is an alternative resource available for farm operations during peak season when the availability of labor becomes scarce (Dhungana et al., 2004; Rahman and Rahman, 2008). In addition, hiring labor is an essential variable when they are required for farm operations and when family labor is not available. Similarly, hiring labor has a considerable positive impact on tea productivity.

Farmers who accessed their land on a share basis had a positive effect on productivity. It may be because of shareholder's potential to manage the orchards at a reasonable level compared with owners because they need to share return after the sale of output. This sharing of performance puts pressure on shareholders to manage the orchards at an excellent level to receive a suitable return. A farmer having off-farm occupation has a positive effect on tea productivity. Evans and Ngau (1991) reported the favorable effects of off-farm activities on the agricultural output. In addition, they stated that off-farm activities are a source of income that may help farmers to cope with the farm risk and enables them to adopt new technologies to increase the agricultural production. If the farmland has soil erosion risk, then the tea productivity can be low. Similarly, Pimentel and Kounang (1998) described the negative effects of soil erosion on crop productivity. The farmers' participation in training related to agriculture has a positive impact on crop productivity. Cavatassi et al. (2011) reported that the participation in the training programs enhanced the yield with an increase in technology adoption and use of inputs.

Table 8: Factors Influencing the Tea Productivity

	B	Std. Error	p-value (Sig.)
Constant	3.34	0.14	0.00*
Farm Size	–0.01	0.04	0.77
Number of Parcels	–0.03	0.04	0.57
Age of Orchard	–0.20	0.07	0.01*
Fertilizer	0.03	0.02	0.14
Age of Farmer	0.002	0.001	0.06**
Family Labor	0.10	0.06	0.09**
Farm Ownership	–0.06	0.03	0.05*
Labor Hiring	0.05	0.02	0.02*
Off-Farm Occupation	0.01	0.02	0.55
Soil Test Performance	0.02	0.03	0.55
Erosion Risk	–0.02	0.02	0.34
Participation in Agri. Training	0.04	0.02	0.06**

(*) and (**) shows the significant level at 5% and 10%. F-value = 2.61

5. Conclusions and Recommendations

On the basis of the findings, tea growers were mostly small farmers with high education and less experience in tea cultivation. The medium farmers were earning the highest total yearly family income. In addition, they had more tea farming experience than small and large farmers. The large farmers were lowly educated and having considerably large land holding, which they divided into numerous parcels. The tea cultivation costs consist of expenditures on two inputs such as fertilizer and labor. The large farmers were spending considerably more on tea cultivation but did not get returns substantially higher than other farmers. Although they were applying low quantity of chemical fertilizers, they were hiring extensively more off-farm labor and substantially less family labor as compared with other farmers. On the other side, the small farmers had older tea orchards than other farm categories and applied high-level chemical fertilizers.

The results of Cobb-Douglas production function showed that the age of the orchards affects negatively the productivity of the tea crop. The negative and considerable effects of farm ownership were assessed on tea productivity. The age of tea farmer, family labor, and labor hiring have a considerably positive effect on tea productivity. The training regarding tea cultivation has significantly positive effect on crop productivity.

In order to decrease the costs of production, the small and medium farmers should replant the orchards to benefit more from tea productivity and also control the use of fertilizer for reducing the production costs. The large farmers should manage their variable costs, as they have high expenditure on labor. In addition, they should have family labor and reduce the labor hiring cost to benefit from high tea profitability.

To increase tea productivity, farmers should start to replant their old tea orchard that has considerable effect on productivity as well as cost. Regular training programs should be developed with the focus on management practices and side effects associated with heavy fertilizer application, to sustain environmental friendly and economically feasible tea cultivation.

The main contribution of this research to existing literature is the addition of tea productivity estimation and cost of production on the basis of the different farmer groups (small, medium and large). This addition in existing literature can be helpful for policy makers in the country to devise policies differently for these farmer groups to raise their productivity. The other important contribution includes the addition of land tenure factor (own, shareholder) in existing tea productivity determinants. This study not only contributes to the already present literature but it also paves a way for further research in this field by using other measures of productivity such as efficiency. It will enable policy makers to understand that which tea farm group is more efficient in using agricultural resources.

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