

## Factors Affecting Vegetable Farmers' Financial Condition and Income in Kaş District of Antalya Province, Turkey

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### Research Article

### ABSTRACT

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Vegetable agriculture, which has high investment capital and operating costs, plays an important role in the development of the country's economy. Vegetable production is the principal area of Turkish agriculture as vegetables have fulfilled the daily food requirements of humanity for ages. Multiple sampling techniques were used to collect data from 103 vegetable growers of Kaş district of Antalya through face to face surveys. Farmers were categorized into small and large size vegetable growers using cluster analysis. Financial ratios were calculated for vegetable growers to identify the areas which need improvement to make vegetable farms sound. Moreover, descriptive statistics along with a multiple regression model was used to analyze the data. The small size vegetable growers were found younger and more educated as compared to large size vegetable growers. Debt ratios of both vegetable size grower categories indicated that they have more assets as compare to their liabilities. The asset turnover ratio found small size vegetable growers more efficient in the use of their assets as compared to large size vegetable growers. While biological control precautions and fertilizer costs affect income negatively, it has been determined that agricultural experience and household size affect income positively and significantly. Therefore, the government should encourage vegetable size growers as they use environmentally friendly methods to produce safe and healthy food. In addition, large size vegetable growers with high agricultural experience need to benefit from training and extension services in order to increase their income by using new production methods.

## Antalya İli Kaş İlçesindeki Sebze Üreticilerinin Mali Durumunu ve Gelirini Etkileyen Faktörler

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Yatırım sermayesi ve işletme maliyetleri yüksek olan sebze tarımı ülke ekonomisinin gelişmesinde önemli rol oynamaktadır. Sebze üretimi, çağlar boyunca insanlığın günlük besin ihtiyacını karşıladığı için Türkiye tarımının başlıca alanıdır. Araştırma verileri Antalya ili Kaş ilçesindeki sebze yetiştiricilerinden çoklu örnekleme teknikleri ile belirlenen 103 sebze üreticisinden anket yoluyla elde edilmiştir. Tarım işletmeleri, kümeleme analizi kullanılarak küçük ve büyük ölçekli sebze işletmeleri olarak kategorize edilmiştir. İşletmelerin iyileştirilmesi gereken alanların belirlenmesi için finansal oranlar hesaplanmıştır. Ayrıca, verileri analiz etmek için tanımlayıcı istatistikler ve çoklu regresyon modeli kullanılmıştır. Küçük işletme sahipleri, büyük işletme sahiplerine kıyasla daha genç ve daha eğitilidir. İşletmelerin borç oranları, yükümlülüklerine göre daha fazla varlığa sahip olduklarını göstermiştir. Varlık devir oranı, küçük işletmelerde büyük işletmelere göre daha verimlidir. Biyolojik mücadele önlemleri ve gübre maliyeti işletme gelirlerini olumsuz etkilerken, tarımsal deneyim ve

hane halkı büyüklüğü, işletme gelirini önemli ölçüde ve olumlu yönde etkilediği belirlenmiştir. Bu nedenle gelir kaybını göze alarak güvenli ve sağlıklı gıda üretmek için çevre dostu yöntemler kullanan işletmeler teşvik edilmelidir. Ayrıca tarımsal deneyimi yüksek büyük ölçekli sebze işletmelerinin yeni üretim yöntemlerini kullanarak gelirlerini arttırabilmeleri için eğitim ve yayım hizmetlerinden yararlanmaları gerekmektedir.

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## 1. Introduction

Fruits and vegetables have supported largely the daily food requirement of mankind for ages and even before man learned to grow cereal crops systematically (Naqvi, 2004). Agriculture consists of many subsectors and horticulture is one of them (Shahbaz et al., 2017a). Olericulture is a part of horticulture defined as the science of vegetable growing, dealing with the culture of non-woody (herbaceous) plants for food. Vegetables are leafy green, stem, and root or even flower stalk portions of an edible plant (Braun and Dlamini, 1994). Vegetables are rich in nutrients such as calcium, potassium magnesium, sodium, and vitamin A and C. So growing vegetables not only generate income opportunities for farmers but also a cheaper way to fulfill the body's necessary nutrient requirements those are also helpful in preventing certain diseases.

The production of vegetables is not only affected by socio-economic characteristics of the farmers such as (age, education, farming experience), farm characteristics (farm size, variable and fixed costs, and working capital) (Ugwumba, 2010; Oluwasola, 2015) as well as by many diseases caused by different microbial organisms (Türkten et al., 2017). These diseases not only decrease the production of vegetables and fruits but also increase the cost of production because the farmers use extensive chemicals (pesticides and insecticides) to overcome the loss due to different diseases. This excessive use of chemicals is creating environmental and health problems (Zengin, 1997; McFadyen, 1998). The diseases not only cause resource loss but also restrict the export of fruit and vegetables to other countries. The exports of fresh vegetables and fruits were returned back to Turkey from Russia in 2014 due to the presence of hazardous insects in vegetables (tomatoes) (Anonymous, 2015). This rise in the cost of production due to diseases, farm and management factors, etc. not only affects the farmer's economic situation but also weakens the financial soundness of the business. Disease identification, as well as management of the disease, is an important element for the successful cultivation of fruits and vegetables. Therefore, socio-economic characteristics (education and experience) help to identify and manage vegetable diseases. More environment-friendly measures should be used to control these microbial diseases (Türkten et al., 2017).

Vegetable production is the principal area of Turkish agriculture, and vegetable perishables constitute the backbone of the arena. Turkey is one of the largest producers as well as exporter of fresh fruits and vegetables. Most of the vegetables produced in Turkey are seasonal. It produced about 45 million tons of fresh fruits and vegetables and exported 31 million tons in the year 2021. Most of the farmers in Turkey grow tomatoes, cucumbers, green peppers, melons, green beans, squashes. Russia is the main

importer of Turkish fresh fruits and vegetables along with Iraq and Germany. Russian and Iraqi markets both together constitute 32 percent of total fresh fruits and vegetable exports of the country with 332 million dollars and 293 million dollars respectively. Ukraine, Saudi Arabia, and Belarus are the other important export markets buying from Turkey (Cahit, 2017).

Lots of studies have been conducted to assess the factors which affect the farm income of farmers (Ibekwe et al. 2010; Nzabakenga et al. 2013; Hasaan et al. 2015; Bongole 2016; Ceyhan and Canan, 2017; Haq et al. 2017; Shahbaz et al. 2017b; Canan and Ceyhan, 2021). Illiteracy, farm size, unavailability of credit facilities, farmer age, and distance from market emerged as the main determinants of farm income. Although a lot of studies have been conducted on factors affecting the overall farm income of farmers but only limited literature is available on factors affecting the income of vegetable growers.

In Turkey, 57% of the greenhouse area is covered by Antalya. Proximate, 65% of the greenhouse area in Antalya is sited in districts of Aksu, Kumluca, Kaş and Döşemealtı. Kaş is a special case in Turkey since the vegetable is the dominant production in greenhouses. Because of that, the district of Kaş was selected as a research area. Although a lot of studies have been conducted on factors affecting the overall farm income of farmers only limited information is available on factors affecting the income of vegetable growers. Therefore, this study intended to test the hypothesis of whether socio-economics characteristics affect the farm level financial conditions and income, or not. The primary and foremost objective of this study was to analyze those factors which affect the income of vegetable growers. Additionally, environmentally friendly methods to control the diseases and pest attacks that are being practiced in the study area were also considered to affect farm income. Further study was focused on the analysis of financial ratios to explore the vegetable grower's financial stability. This study may be the focus of future studies depending on the results of this research.

## **2. Materials and Methods**

### *2.1. Research Area and Sample Selection*

Multiple sampling techniques were used in sample and area selection as used by many researchers (Abid et al. 2015; Shahbaz et al., 2017c). First, the Antalya province of Turkey was selected as a study area due to its major share in vegetable production of the country. Antalya province produced 28 percent of the total vegetables of Turkey in 2016 (TUIK, 2016). Antalya consists of 19 districts. Then, from these provinces, the Kaş district was selected as the study area. This district is situated in the west and 168 km away from Antalya. The Kaş district has 48 villages where the vegetable is grown at a larger size. The total agricultural land of Kaş district is 22.53 thousand hectares. Both biological and chemical methods are applied by farmers at their vegetable farms to control different diseases. The list of 1080 farmers were obtained and data were collected from 103 farmers through well-prepared questionnaire and face to face interviews. When calculated the optimum sample size, the precision

level, and confidence level were 10% and 99%, respectively. Fig 1 is showing a map of the study area. This study was conducted in 2016-2017.



**Figure 1.** Map of study area

During data collection, the variables in the research were divided into two categories (socio-economic and farm costs, expenditures of vegetable growers). The demographic characteristics included age, schooling years, farming experience and family size, etc. of the vegetable grower. The farm characteristics included total farm size, yield, costs, working capital, etc. for research analysis.

### *2.2. Categorizing Vegetable Growers*

Cluster analysis was used to make homogeneous categories of vegetable growers. The respondent included in the same group possess similar characteristics (Hair et al., 1998). A similar method had been used by the different researchers to classify the respondents having the same characteristics to compare the different variables (Tümer et al., 2011; Ul Haq et al., 2016). Cluster analysis (K-mean method) was used to divide farmers into two categories and named as small and large size vegetable growers. For cluster analysis, the manager's profile, landholding, and profitability were used. The age used as manager profile which is considered one of the main demographic features as man learns everything with age. The 2nd important variable considered in grouping was the area under vegetable crops. A larger area under vegetable is an important indication of resources and assets. Benefit cost ratio and return on equity were considered as business profitability indicators.

### *2.3. Statistical Analysis*

Descriptive statistics such as frequency, average, percentage were used to describe the socio-economic characteristics of vegetable growers for comparison among these categories. An independent sample t-test was used to check the significance of variables between different vegetable grower categories. Further, financial ratios (equity ratio, debt ratio, liquidity ratio asset turnover ratio, etc.) were also

calculated because it helps vegetable growers to know their financial standing and which areas should be worked on to have better income.

At last, a multiple linear regression model was used to assess the effect of socio-economic characteristics and environmentally friendly diseases and pest control methods (Beetle Bug method and other biological methods) on the income of vegetable growers. Ugwumba (2010) and Oluwasola (2015) also used a similar method in their study. The general form of the model is given below.

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12} \mu)$$

More specified form of model is

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \beta_{10} X_{10} + \beta_{11} X_{11} + \beta_{12} X_{12} + \mu$$

Where

$\beta_0$  = Intercept

$\beta_1 - \beta_{12}$  = Coefficient

Y = Income of vegetable grower

$X_1$  = Age

$X_2$  = Schooling years

$X_3$  = Farm experience

$X_4$  = Household size

$X_5$  = Area under vegetables

$X_6$  = Irrigation cost

$X_7$  = Chemical cost (pesticide/ weedicide cost)

$X_8$  = Fertilizer cost

$X_9$  = Protection against frost (cost)

$X_{10}$  = Bug beetle use cost

$X_{11}$  = Biological control measures cost

$X_{12}$  = Working capital

$\mu$  = Error term

### 3. Results and Discussion

#### 3.1. Vegetable Grower Categories

Based on the cluster analysis's results, 51 and 52 farmers were included in small and large size vegetable grower categories respectively. The farmer categorization on the basis of cluster analysis. According to the table, 49.5% of farmers were included a small size group of vegetable growers. Both

groups were having the farmers with the same characteristics and one farmer of a group is independent of the farmer of another group.

### 3.2. Socio Economic Characteristics of Sampled Categories

The different socio-economic characteristics of small and large size vegetable growing farms are given in Table 1. The small size vegetable growers are younger in age (41.12 years) as compare to large vegetable growers (57.10 years). The difference in age between these two categories was found statistically significant. The larger farmers are relatively more experienced (28.46 years) than small size vegetable growers (15.69 years). The difference in farming experience was also found statistically significant. The small size vegetable growers have more family labor (4.08 persons) available for work in comparison to large size vegetable growers (3.88 persons) of family size was not found statistically insignificant.

**Table 1.** Socio- economic characteristics of sample vegetable growers

Characteristics	Small size vegetable growers	Large size vegetable growers
Age* (Year)	41.12 (6.94)	57.10 (5.05)
Education (Year)	7.27 (3.02)	6.31 (2.92)
Experience* (Year)	15.69 (7.74)	28.46 (10.27)
Family Size (Number)	4.08 (1.21)	3.88 (1.31)

Values in parenthesis are standard deviation. (\*) shows significance level at 1 %

### 3.3. Farm Characteristics of Sampled Categories

The farm earnings and expenditures of both sampled categories are given in Table 2. The large size vegetable growers have more area under vegetable cultivation as compare to small size vegetable growers. The larger size vegetable growers have more variable costs (12451.59 dollars) as well as fixed costs (15470.84 dollars) per hectare as compared to small size vegetable growers. But there is not much difference in the net income of both small and large size vegetable producers. In fact, small size vegetable growers earn more income (17171.56 dollars) with less cost than large size farmers (17150.42 dollars).

**Table 2.** Farmer's income and expenditures (US \$ per Hectare)

	Small size vegetable grower	Large size vegetable growers
Area (hectare)	0.71 (0.85)	0.98 (2.38)
Gross income	39022.92 (39841.45)	45072.85 (81444.87)
Variable costs	8592.47 (9177.19)	12451.59 (29644.35)
Fixed costs	13258.88 (10276.16)	15470.84 (24503.58)
Total costs	21851.36 (18723.77)	27922.43 (53443.73)

Gross margin	30430.44 (32632.63)	32621.26 (53287.01)
Net income	17171.56 (25730.57)	17150.42 (30062.74)

### 3.4. Financial Standings of Vegetable Growers

Financial ratios are very important in any business as they show how a business is performing and indicate areas which need improvement. Solvency ratio shows the ability of vegetable growers to meet long term obligations or requirements. Higher equity ratio (0.82) of large vegetable growers indicates that more of investment in agriculture comes from their own assets as compared to small vegetable growers (0.77). Although, both categories have more assets as compare to their liabilities (loan from bank etc.) but the small vegetable growers have more debt ratio (0.10) as compare to large vegetable growers (0.07) which indicate that they rely more on debt as compare to large vegetable growers. Both categories are not using their assets very efficiently as indicted by lower values of asset turnover ratio. Comparison among return on assets ratios of small and large vegetable producer indicated that the small vegetable growers are using their resources more efficiently as compare to large vegetable producers. This result is also supported by the comparison of BCR ratio. The benefit cost ratio of large vegetable growers is smaller as compare to small vegetable growers which indicate that the large farmers are earning less income per dollar as compare to small vegetable growers from vegetable cultivation.

**Table 3.** Analysis of vegetable growers' farm business financial conditions

Financial ratios	Small size vegetable growers	Large size vegetable growers
<b>Solvency Ratio</b>		
Equity Ratio	0.77	0.82
Debt Ratio	0.10	0.07
<b>Liquidity Ratio</b>		
Quick Ratio	1.81	2.80
<b>Efficiency Ratio</b>		
Asset turnover ratio	0.16	0.13
<b>Profitability Ratio</b>		
Return on Asset Ratio	0.05	0.04
Benefit Cost Ratio (BCR)	1.78	1.61

### 3.5. Factors Affecting Income of Vegetable Growers

The different potential factors affecting the income of vegetable growers are shown in Table 4. Farming experience, household size, and working capital affect the income of vegetable growers positively. The effect of the farming, household, and working capital on income was also found statistically significant. The increase in farming experience, household size, and working capital will increase the income of vegetable growers. Emenyonu et al. (2012), Awotide et al. (2012) also found similar results about the farm experience of vegetable growers. The area under vegetables also affects the income of their growers positively and significantly. The results regarding the area under

vegetables are in line with Oluwasola (2015). He stated that the income of vegetable growers increases as the farm size and farm expenditures of vegetable growers increases. It may be described as the experience of vegetable growers' increase; their ability to use resources more efficiently also increases. Moreover, the increased area means more resources available for the cultivation of vegetables which enable vegetable growers to use agricultural machinery which ultimately adds to the income of vegetables. Similarly, the significant positive effect of irrigation cost was also observed on the income of vegetable growers. The fertilizer and biological control cost affect vegetable income negatively and significantly. Nmadu and Ibiejemite (2007), Abdu and Musa (2007); Ajibefun and Abdulkadri (1999) reported similar findings of farm income in different enterprises. The biological pest control techniques are widely used in vegetable production but this biological control affects income negatively and significantly. Vegetable production decreases when biological disease control measures are applied as compare to when farmers which use pesticides to control different diseases. The other aspect of biological control is that it is more expensive than chemical control. Similar findings were found by Türkten et al. (2017) where biological disease control methods were found more expensive as compared to traditional or chemical control methods. The overall model was also found significant with R<sup>2</sup> value 0.95 and F-value 149.77.

**Table 4.** Income determinants of vegetable growers

	β's	Std. Error	t-value	Sig.
B <sub>0</sub>	-33066.61	46975.90	-0.70	0.48
Age of Farmer	-1039.62	871.23	-1.19	0.24
Education Level of Farmer	1837.28	2189.50	0.84	0.40
Farming Experience	1826.26	812.44	2.25	0.03**
Household size	9660.96	4782.79	2.02	0.05**
Area under vegetables	156673.21	21765.60	7.20	0.00*
Irrigation Cost	199.14	42.52	4.68	0.00*
Chemical Cost (pesticides)	-0.33	2.20	-0.15	0.88
Fertilizer cost	-4.88	1.40	-3.49	0.00*
Frost against protection cost	1.41	4.15	0.34	0.73
Bug Beetle Cost	-5.75	20.00	-0.29	0.77
Biological Pest control Expenditure	-3.13	1.43	-2.18	0.03**
Working Capital	2.47	0.92	2.68	0.01*

R<sup>2</sup> = 0.95; Adjusted R<sup>2</sup> = 0.94; F-value = 149.77 (p<0.001). (\*) and (\*\*) describes significance level at 1 % and 5 % respectively

#### **4. Conclusion**

Turkey is one of the main producers of vegetables in the world. The country earns billions of dollars from the export of these vegetables to Russia, Iraq, and Germany. But the production of vegetables is affected by many socio-economic factors such as age, schooling years, household size, and area under vegetable farming. The younger age of the small size vegetable growers shows that they are in an innovative production approach rather than the traditional production approach. This situation shows that small size vegetable growers have more profitable production by using new production techniques. Large size vegetable growers with high agricultural experience need to benefit from training and extension services in order to increase their income by using new production methods. Household size and farming experience affect the income of vegetable growers positively. Except for these socio-economic characteristics farm costs and earnings affect vegetable income both positively and negatively. Financial ratios indicate that small vegetable growers are more dependent on credit for vegetable cultivation as compare to large vegetable growers. Although the biological control is affecting the income of vegetable growers negatively the vegetable produced through this way is healthier than produced through chemical control (pesticides and weedicides). So the Turkish government should encourage e vegetable producers which use biological control methods in vegetable cultivation as the world is moving towards more healthy and safe food. By increasing the production of vegetables through biological control methods, the country could capture a large part of vegetable markets which is still vacant in the international arena.

#### **Statement of Conflict of Interest**

Authors have declared no conflict of interest.

#### **Author's Contributions**

The contribution of the authors is equal.

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