Garlic production costs and profitability analysis: the case of Kastamonu Province, Turkey

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Abstract

This study was conducted to determine production cost of garlic cultivation in Taşköprü district of Kastamonu province of Turkey. While the questionnaire data obtained from 84 garlic producers in Taşköprü district of Kastamonu province constituted the primary material, data obtained from domestic and foreign sources and public institutions and organizations constituted the secondary material of the study. The questionnaire data covered the production year of February-August 2021. The average garlic production area of the participant producers was identified as 20.61 decares, cost of 1 kg of garlic was identified as 1.11 USD and the net profit was calculated as 10.48 USD/da.

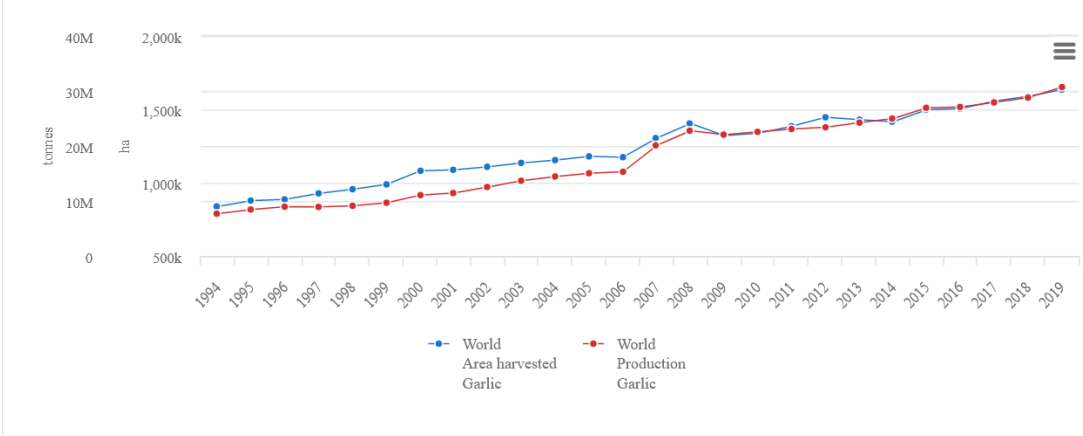
Keywords: Garlic. Production cost. Kastamonu. Net profit.

1. Introduction

Garlic belongs to *Amaryllidaceae* family and is widely used and consumed for culinary and medicinal purposes. Garlic, originated from Central Asia, is a biennial plant (Eric, 2010, Vavilov, 1951, Hong Chong and Etoh, 1996). Today, it is grown on 1634634 ha

land area worldwide (FAOSTAT, 2021). It is estimated that there were about 800 garlic varieties worldwide (Eric, 2010).

According to FAO data, garlic constitutes 2.7% of the vegetable production areas of the world in 2019. In 2019, garlic was produced in 101 countries. Garlic cultivation areas increased by 2.9% as compared to the previous year and reached approximately to 1.6 million hectares. In the same year, amount of production increased by 6.6% as compared to the previous year and realized as 31 million tons. Of world garlic fields, 50.7% are located in China, 21.9% in India and 4.4% in Bangladesh.



Production/Yield quantities of Garlic in World + (Total) 1924-2019

According to the world garlic trade data, in 2019, exports were approximately 2.83 billion dollars (for 2.28 million tons) and imports were 2.51 billion dollars (for 2.19 million tons). A decrease (4.7% in imports, 3.0% in exports) was seen in international garlic trade in 2019 as compared to 2018. China with about 1.7 million tons was the leading garlic exporter country in 2019.

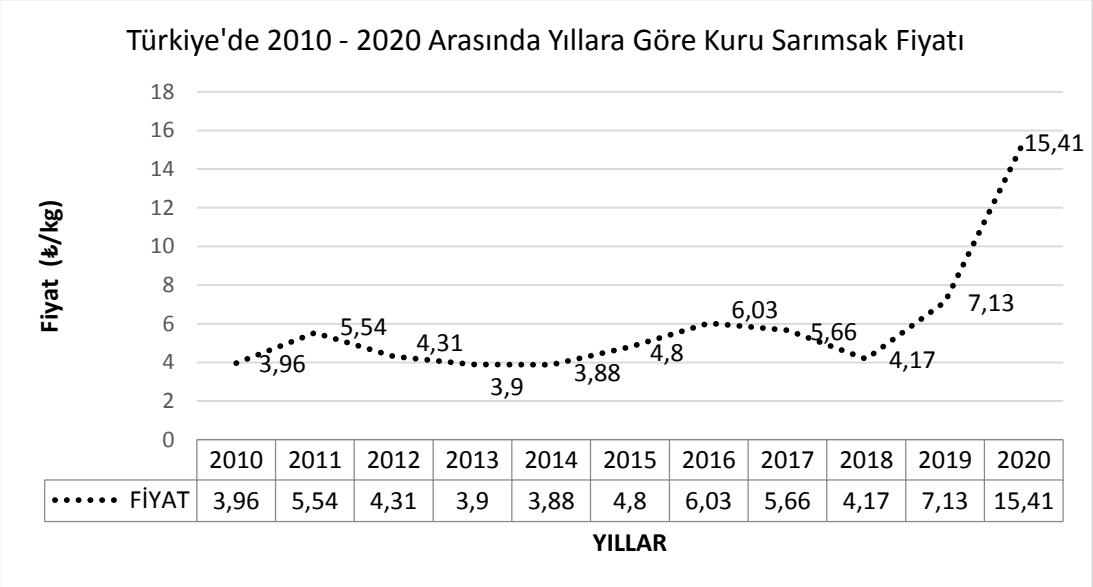
In Turkey, dry garlic cultivation area was approximately 12.67 ha in 2020. As comapred to 2019, sowing area increased by 1.82% in 2020. Kastamonu province with 25.6 thousand decares (21.3%) is the leading garlic producer of Turkey. Kastamonu province was respectively followed by Gaziantep with 20.4 thousand decares, Aksaray with 12.3 thousand decares and Kahramanmaraş, Tokat and Balıkesir provinces. In 2020, more than 145 thousand tons of garlic (116.8 thousand tons of dry 28.6 thousand tons of fresh garlic) were produced in Turkey. Kastamonu and Gaziantep provinces were the leading garlic producer provinces of Turkey. In 2020, around 23 thousand tons dried garlic were produced in Kastamonu and 22.1 thousand tons in Gaziantep. Kahramanmaraş with 14.3 thousand tons ranked as the third and

it was respectively followed by Aksaray, Tokat and Konya provinces (4th, 5th and 6th) (TÜİK, 2021a).

Considering the amount of production, it can be stated that Turkey's garlic export was quite low. In 2020, the total export was around 61 tons and the total import was about 16,600 tons. As of the first four months of 2021, 73.8% of garlic exports were made to TRNC, 14.2% to Moldova, 8.4% to Syria, the export was 29 tons with a trade value of 54 thousand dollars. Again, as of the first four months of 2021, the total import was approximately 4,300 thousand tons and the trade value was approximately 4,6 million dollars. About 95.7% of garlic imports were made from China, 3.3% from Iran and 1.0% from Syria (Anonymous, 2021).

Producer income stability is largely designated by price equilibrium of agricultural products. Like many other agricultural products, garlic prices are highly affected by supply-demand movements. There have been great fluctuations in garlic prices in recent years. When the last ten-year course of prices was examined, ups and downs were seen and it is noteworthy that the price has increased almost four times from 2010 to 2020 (TUIK, 2021b).

Kastamonu province meets about one-fifth of Turkey's garlic production (19.68% with 23 tons of production in 2020). Kastamonu province is located in the coastal regions of the Black Sea and has a temperate climate overall and a steppe climate in the inner sections. The province receives most of the precipitation in spring or winter. In Taşköprü district, where garlic production was intensely practiced, soils are moderately limey, mostly clay-loam in texture and slightly alkaline (Taban et al., 2004). Kastamonu garlic thus has been registered as “Taşköprü Garlic” (Turkish Patent Institute, 2009).



Kaynak: TÜİK, 2021

Garlic is an important agricultural product in the world and in Turkey, thus should be handled in different aspects with scientific research projects. In this research, unit product cost calculations were performed with the use of data obtained through questionnaires made with agricultural enterprises engaged in garlic cultivation in Kastamonu Taşköprü district. Technical and economic problems encountered in cultivation and marketing of the product were also put forth and recommendations were provided for the solution of existing problems.

2. Literature Review

Many cost studies (Demircan et al, 2022; Uzundumlu et al, 2022; Subaşı et al, 2022; Oruç and Gözener, 2021; Semerci, 2018) of different products have been conducted in different regions of Turkey. There are very few studies on the cost of garlic. Previous studies conducted on garlic production in different regions of the world were summarized below:

Aşkan and Dağdemir (2015) studied cultivation and production quantities covering the period 1995 – 2014 and fluctuations and measurement of fluctuations in garlic prices in 2003 – 2014 period and calculated marketing margins based on current and real prices. Producer and consumer chain indices were also calculated according to real prices and compared with annual inflation rates. Fluctuation rate was calculated as 0.75% for producer prices and 3.62% for consumer prices. It was concluded that garlic exhibited severe fluctuations in terms of production and price in Turkey.

Akan and Ünüvar (2017) examined the importance of production and trade of garlic, which is a highly demanded vegetable due to its nutritional values and medicinal properties and investigated the problems of transportation to foreign markets and solutions to these problems. Economic importance of newly introduced processed garlic products was also assessed. Adequacy of production in Turkey was evaluated and it was concluded that current production of the country could meet entire demands. It was also indicated that there was an increase in Turkey's garlic export over the years.

Selen et al. (2019) analyzed the cost and profitability of garlic production in Taşköprü district, as well as the net income structure of the producers, net income, yield and cost/price changes over the years. Changes in net income and regional production levels were also evaluated comparatively with the other products. It was concluded that profitability of garlic cultivation increased continuously in 2016-2018 period in Taşköprü district.

Selen and Ünüvar (2020) evaluated garlic production in Turkey economically, as well as interpreted the data obtained through focus group meetings with garlic producers in Taşköprü district. Data were also used to evaluate the importance of garlic production, price fluctuations and the problems encountered by the producers. Within the scope of the study, it was stated that profitability of garlic production was high in the relevant focus group and this was expressed as one of the strong points of the product. It was suggested that product policy-specific studies should be carried out for protection of garlic in Taşköprü district and supports should be provided to encourage value added generation from the product.

Topçu (2019) evaluated the data obtained from 600 consumers in the TRA1 region and identified the quality traits effective in garlic consumption of the consumers. Principal Component Analysis (PCA) and Cluster Analysis were used to establish target consumer segments based on consumers' purchasing frequency. The target consumer segments were divided into three groups as those who consume garlic at a high level (intense), those who consume moderately (moderate) and those who consume at a low level (light). For all consumer profiles (intense, moderate and light), regional origin was identified as the first factor designating consumer satisfaction for quality. For intense and moderate consumer groups, two different garlic profiles originated from Taşköprü offered high satisfaction levels. For light consumer group, a garlic profile originated from Balıkesir provided high satisfaction levels. It was concluded that designing garlic profiles based on the region of origin, which maximizes the total benefit of homogeneous consumer groups will result in higher value added.

Gül et al. (2018) interviewed 105 producers to determine the garlic production cost and profitability of farmers in Kastamonu province. The data of 2014 production season revealed that average garlic cultivation area was 1.13 hectares and such an area constituted 18.2% of the total agricultural lands of the province. Average garlic yield was calculated as 8.208 kg/ha. It was also determined that 1412 hours of labor per hectare was used for garlic production and production cost of garlic was 3.22 TL. It was determined that 20% of the farmers were not able to make a profit from garlic production.

Bayraklı and Gül (2018) analyzed the current marketing system of garlic in Kastamonu province and examined the problems of producers, intermediaries and processors. In this sense, data were obtained from garlic growers, intermediaries and processors through questionnaires. The most important marketing channel for the farmers of the region was identified as traders. It was determined that garlic price was generally determined by the traders and the activities and number of members of the Garlic Producers Association,

established in 2010, were not at desired levels. It was emphasized that studies should be carried out for the protection of garlic, its promotion in the country and abroad should be increased and it was stated that farmers could achieve price stability by establishing cooperatives.

Samavatean et al. (2011) examined the energy balance between input and output per unit area for garlic in Iran's Hamedan province. Research data were collected through face-to-face interviews. It was determined that fertilizers had the greatest energy share (41.7%). Energy consumption per hectare for garlic was determined as 40307.89 MJ. Among the inputs, labor force constituted the greatest cost item (45%). The production cost of one hectare of garlic was calculated as $6969.11 (CBRT, 2022).

In a field trial conducted in study in Halaquan village in Qalubia Governorate region of Egypt, cost analysis and comparisons were performed for different injector types of irrigation system and nitrogen applications (Tayel et al., 2010).

3. Material and Method

Data obtained from the questionnaires made with 84 garlic producers in Taşköprü district of Kastamonu province constituted the primary material of the present study.

Taşköprü district of Kastamonu was selected as a research area because it is a very special region in terms of garlic cultivation. The statistical data required in the sampling phase of the study were obtained from the records of the District Directorate of Agriculture and Forestry. Out of a total of 114 villages of the district, the first 7 villages in terms of land size (6% of all villages) were included in the research. There are 167 garlic growers in the selected villages. Approximately 50% of the total number of producers was taken and it was decided to work with 84 producers. A questionnaire was applied to randomly selected producers through face-to-face interviews.

Besides the primary data obtained from the interviewed producers, results of previous scientific studies conducted in different regions on the present topic constituted the secondary materials of the research. The questionnaire forms used for data collection were prepared in accordance with the purpose of the research and the resultant data covered the production season of 2021.

For product cost, production costs were calculated for a production period; T.C. Ziraat Bank's crop production interest rate (8%) was taken into account in interest calculations and calculations were made over half the interest rate since it was assumed that variable costs

were spread over the production period (Kıral et al., 1999). The bare land value was calculated by taking 5% of the land purchase-sale value (Fidan, 2001). General administrative expenses consist of the expenses incurred for the management and administration of the enterprise, social services and common services related to all production activities of the enterprise. In garlic production, 3% of the production costs were taken as the general administrative expenses (Özkan and Kuzgun, 1997). The seeds, fertilizers and the other costs used in the production of garlic were calculated by multiplying the amounts used in production by the cost to the farm. In this study, the data for garlic cost analysis were arranged as to represent the production inputs for 1 decare area.

4. Results and Discussion

The average land area of participant producers was identified as 20.61 decares. Average yield was calculated as 1.092 kg/da. In a previous study conducted in the same region in 2018, the ratio of the area where garlic is grown within the farmland was reported as 18.19% and experience of producers in garlic production was reported as 22.11 years (Gül et al., 2018). Garlic production cost in Taşköprü district of Kastamonu province was calculated and information regarding this calculation is given in Table 1.

Table 1: Production costs of growing enterprises surveyed (USD da[1]) and proportional distribution (%)

COST ELEMENTS	Value	%	%
Primary Tillage	11.89	1.01	1.30
Secondary Tillage	8.39	0.71	0.92
Tertiary Tillage	13.46	1.14	1.47
Seed + sowing	592.11	50.19	64.67
Fertilizer + Fertilization	49.91	4.23	5.45
Water + Irrigation	124.29	10.53	13.58
Pesticide + Disinfestation	40.92	3.47	4.47
Harvest	15.36	1.30	1.68
Drying	4.73	0.40	0.52
Transport	19.30	1.64	2.11
Circulating Capital Interest (0.04)	35.22	2.99	3.85
VARIABLE COSTS TOTAL (A)	915.58	77.60	100.00
General Administration Expenses (A/2*%3)	13.73	1.16	5.20
Insurance	250.49	21.23	94.80
FIXED COSTS TOTAL (B)	264.22	22.40	100.00
TOTAL OF PRODUCTION COSTS (A + B)	1 179.80	100.00	

Total production cost per decare area was calculated as 1179.80 USD. The ratio of variable costs in total costs was identified as 77.60%. Within total production costs, seed and

sowing had the highest share (50.18%) and water and irrigation costs were also quite high (10.53%).

In a previous study carried out in Taşköprü district of Kastamonu province in 2018, garlic production cost was reported as 26 397, 37 ₺/ha (700 $/da) (Gül et al., 2018). In another study conducted in Taşköprü district of Kastamonu province in 2019, garlic production costs per decare was reported as 4159.0 ₺ (796.74 $/da). Samavatean et al. (2011) conducted a study in Iran and reported garlic production cost per hectare as $6969.11 (696.91 $/da). The production costs reported in studies conducted in Kastamonu-Taşköprü and Iran were close to each other (Akan et al., 2019; Gül et al., 2018; Samavatean et al., 2011). There is a difference of approximately $100 between the lowest and highest cost of three studies (Akan et al., 2019; Samavatean et al., 2011). Garlic production costs reported in Samavatean et al. (2011) (Iran: 696.91 $/da) and Gül et al. (2018) (Taşköprü: 700 $/da) were quite close to each other. However, present value (1179.80 $/da) was $ 412.68 higher than the value determined in 2019 for the same region and $509.42 higher than in 2018. Such a case was attributed to recent general level of prices and increasing input prices. The cost value reached in this research as of 2022, when compared with previous research, revealed the reflection of accelerated price increases, especially since the beginning of 2022, on the cost of garlic production.

The highest cost items in the total cost were identified as input (seed, chemical fertilizer, pesticide, water and energy) costs (35.1%) in the study conducted in Taşköprü in 2019 (Akan et al., 2019), as seed and sowing costs (29.64%) in the study conducted in the same region in 2018 and planting cost (29.64%) Gül et al., 2018) and as labor force (45%) in the study conducted in Iran (Samavatean et al., 2011). Akan et al. (2019) reported the ratio of seed and sowings costs as 29.09% and ratio of all inputs as 35.1%. In this study conducted in 2022, almost half of total production cost was constituted by seed + sowing costs (50.18%) and such a case was attributed to price increases. Data on profitability of garlic production are provided in Table 2.

Table 2: Profitability status in -garlic cultivation

		Value
1	Variable costs total	915.58
2	Fixed costs total	264.22
3	Total of production costs (1 + 2)	1 179.80
4	Sale price (USD/kg)	1.09
5	Yield (kg/da)	1092
6	Gross production value (USD/decare) (4*5)	1190.28
7	Unit cost (USD/kg)	1.11
8	Net profit per decare (USD/decare) (6-3)	10.48

Average yield of participant producers was determined as 1092 kg/da and the average sale price was determined as 1.09 USD/kg. In previous studies, yield value was reported as 1050 kg/da under irrigated conditions and 400 kg/da under dry conditions (Akan et al., 2019). Gül et al. (2018) reported average yield as 8208.44 kg/da (820.84 kg/da), Samavatean et al. (2011) as 16768.8 kg/ha (1676.88 kg/da). Tayel et al. (2010) performed 27 different treatments and reported the lowest yield as 2 tons/fed (476.19 kg/da) and the highest as 6 tons/fed (1428.57 kg/da). Present value was greater than the values reported in previous studies conducted in the same region (Akan et al., 2019; Gül et al., 2018) and greater than the lowest value of the study conducted in Egypt (Tayel et al., 2010), but lower than the study conducted in Iran (Samavatean et al., 2011) and the highest value of the study conducted in Egypt (Tayel et al., 2010).

Present calculations revealed garlic production cost as 1.11 USD/kg and net profit as 10.48 USD/da.

In previous studies, costs per kilogram were reported as 4.2 ₺ ($0.804) (Akan et al., 2018); 3.22 ₺ (1.42 $) (Gül et al., 2018) and 0.415 $ (Samavatean et al., 2011).

Present profitability value was quite different from the values reported in previous studies. In present study, a profitability of 10.48 $ per decare was seen, in other words, a loss of approximately 20 $/da. In previous studies conducted in the same region, about 147.53 $/da (Gül et al., 2018) and 1427 $/da (Akan et al., 2019) profitability was reported. Previous values indicated that for garlic production, it was usual to have a profitability of between $150 - $300 per decare (1600 ₺/da (306.51 $/da) under dry conditions (Akan et al., 2019); 7700.94 ₺/ha ($147.53/da) (Gül et al., 2018); $2520.35/ha ($252.04/da) (Samavatean et al., 2011) and a negative profitability or $1427 could be considered as marginal values. It was thought that severe and unbalanced changes in input prices and product sales prices caused very low profitability in the present study conducted in 2022. Average sale price in 2019 with the highest profitability (1.72 $/kg) (Akan et al., 2019) was greater than the present value in 2022 (1.09 $/kg). In 2019, sales price increased up to 2.30 $/kg (Akan et al., 2019). On the other hand, while the total production cost was 1179.80 $/da in this study with 2022 prices, it was determined as 796.74 $/da in the study conducted in the same region in 2019 (Akan et al., 2019). While the ratio of seed + sowing costs in the total cost was 30% in 2019, such a ratio reached to 51% in 2022.

5. Conclusion

Garlic is not only a prominent product in food and gastronomy industry, but also has an economically significant place in agricultural sector, producers and the region. It has been the subject of the country's agenda with price rises in various years and such a case reveals that agricultural market conditions for this product were operating harshly. Intensive and multi-faceted studies on this product may be effective in making high uncertainty and price fluctuations in the garlic market somewhat apparent.

In this sense, questionnaire data obtained from 84 garlic growers in Taşköprü district of Kastamonu province were used to determine garlic production cost, gross production value, variable costs and gross margin. Present findings revealed that garlic brought a profitability to the producers in 2022 (10.48 USD/da). Average yield per decare for the research area was 1092 kg. Total production cost was calculated as 1179.80 USD/da. The ratio of variable costs to total costs was identified as 77.60%. Seed + sowing costs had highest share (50.18%, almost half) in total production costs. Crop insurance cost had the second place (21.23%) in total production costs.

It was thought that the critical price changes caused by the COVID 19 pandemic and political instability in the world and in Turkey in 2022 had a negative impact on the profitability level of this product. Considering the net profit results for garlic in previous studies, severe fluctuations in this product were clearly seen. It was also seen that this product, which provided significant profits for some years, resulted in a loss of $10.48 per decare in 2022. Such a case clearly reveals the reflection of recent price movements on garlic production.

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