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# Sustainability of Production in Melon Growing Farms: The Case of Hatay Province

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## ABSTRACT

The aim of this study is to reveal the functioning and sustainability of melon producing farms in Hatay province. In the research, a face-to-face survey was conducted with 50 melon farmers in Hatay province. Additionally, the problems and disruptions encountered in melon production were identified in the study. Female labor is used extensively in melon production. In 2022, it was determined that women working in melon cultivation work for a daily wage of ₺150 (approximately $9). In 2021, 1 638 638 tons of melons were produced in an area of 668 753 ha in Türkiye. In Hatay, 32 537 tons of melons were produced from 13 230 decares of cultivation area. In addition, Kırıkhan melon received a geographical indication. Kırıkhan melon is a product that attracts attention in terms of taste and aroma. Melon prices follow a fluctuating trend during the production season. Input costs are also a serious problem in melon production. The average melon production cost was ₺10692 (approximately $590) for 1 decare. High costs threaten the sustainability of small family farms in production. As a result, farmers need to be supported and encouraged for production. Otherwise, melon production will be abandoned by small family farms. In this regard, it is important to increase training and extension activities.

**Key words:** Melon, production, market, extension, sustainability.

# Kavun Üreten İşletmelerin Üretimde Sürdürülebilirliği: Hatay İli Örneği

## ÖZ

Bu çalışmanın amacı; Hatay ilinde kavun üretimi yapan işletmelerin yapısını ve işleyişini ortaya koymak ve bölgedeki kavun üretimi ve pazar durumunu değerlendirmektir. Araştırmada, Hatay ilinde faaliyet gösteren 50 kavun üreticisi ile yüz-yüze anket çalışması yürütülmüştür. Ayrıca, kavun üretiminde karşılaşılan sorunlar ve yaşanan aksaklıklar tespit edilmiştir. Kavun üretiminde de kadın işgücü yoğun olarak kullanılmaktadır. 2022 yılı üretim sezonunda kavun yetiştiriciliğinde faaliyet gösteren kadınların günlük ₺150 (yaklaşık $9) ücret karşılığı çalıştığı belirlenmiştir. Türkiye'de 2021 yılında 668 753 ha alanda, 1 638 638 ton kavun üretimi gerçekleştirilmiştir. Hatay'da ise 13 230 da ekim alanından 32 537 ton kavun üretilmiştir. Hatay ilinde Kırıkhan kavunu coğrafi işaret almış olup tat ve aroma bakımından dikkat çekmektedir. Kavun fiyatları üretim sezonunda dalgalı bir seyir izlemektedir. Kavun üretiminde girdi maliyetleri de ciddi bir sorundur. Kavun üretim maliyeti 2022 yılında 1 da için ortalama ₺10 692 (yaklaşık $590) olarak gerçekleşmiştir. Yüksek maliyetler küçük aile işletmelerinin üretimde sürdürülebilirliğini tehdit etmektedir. Bu alanda üreticilerin desteklenmesi ve üretime teşvik edilmesi gerekmektedir. Aksi takdirde kavun üretimi küçük aile işletmeleri tarafından terk edilecektir. Bu hususta eğitim ve yayım faaliyetlerinin artırılması gerekmektedir.

**Anahtar kelimeler:** Kavun, üretim, pazarlama, yayım, sürdürülebilirlik.

## INTRODUCTION

While the melon itself can be consumed fresh, its seeds can also be consumed as a snack. Additionally, the use of its bark in the food (jam, marmalade, etc.), medicine (natural medicines) and cosmetics industry has also gained importance in recent years. However, melon is a very risky product in terms of cultivation and marketing. There is intensive use of inputs in melon production. Sudden price changes and low and fluctuating product prices are an important problem. Nevertheless; it is seen as a valuable product with high commercial value in different countries. The economic return of melon production is generally high. Therefore, its efficiency needs to be increased (Yılmaz et al., 2011; Yılmaz and Akyıldız, 2018; Aydemir et al., 2023). Saediman et al., (2020) stated that melon and watermelon production is profitable and the income-cost ratio is higher than 1. However, this rate is low for small farmers. Lack of knowledge and skills, farmers' entrepreneurial ability, warehouse and storage problems, market and market problems have an impact on costs (Saediman et al., 2019). Among the general energy inputs in melon cultivation, the highest energy consumption inputs are fertilizer energy, fuel-oil energy and human labor energy, respectively (Baran and Gökdoğan, 2014). Yılmaz et al., (2011) also reported that labor force (231.60 h $ha^{-1}$) and machine power (27.60 h $ha^{-1}$) were the most important cost items, and land rent, seed and fertilizer cost in melon production, respectively.

The low level of technology use, use of their own seeds and high costs are seen as obstacles to modern melon cultivation. In Türkiye, melon cultivation is seriously affected by limited land, increasing competition for decreasing water and energy resources, and the effects of climate change. For this reason, it is extremely important to transition to sustainable agriculture and food (Akkuş et al., 2023). In this context, local genetic resources must be compiled, identified and recorded without being exposed to genetic erosion. All of these are essential for contributing to modern agriculture and for sustainable agriculture (Koca and Paksoy, 2023).

Technological developments in the agricultural sector in the world are rapidly progressing and developing day by day. With these developments, differences emerge in the cultural processes applied. Additionally, it is used in the production of newly developed varieties. However, it is seen that the speed of adoption of these practices by farmers is not in parallel with the speed of technological developments in Türkiye (Ece, 2017).

Economic sustainability is equivalent to the concept of agricultural enterprise viability, that is, its ability to survive for a long time in changing market conditions (Guth et al., 2020). Product prices, income and production costs, effectiveness, liquidity, stability and productivity indices, and people's needs to survive in farming are used as economic sustainability indicators (Wrzaszcz and Zegar, 2014; Latruffe et al., 2016; Başer et al., 2017; Özkan and Armağan, 2019).

There are fluctuations in Türkiye's melon production values over the years. While there has been a serious decrease in Türkiye's cultivation area in the last 10 years, there is no significant change in the production quantity. According to TURKSTAT 2021 data, Türkiye's melon cultivation area was 668 753 da, decreasing by 16% in the last 12 years. Türkiye's melon production amount increased by 2% between 2010-2021 and reached 1 638 638 tons in 2021. It is seen that the melon cultivation area in Hatay decreased by 21% (13 230 da) (TUIK, 2022). Additionally, Hatay's melon production quantity decreased about 12% in 2021 (Kaya and Tarakçı, 2022).

The aim of this study is to reveal the functioning and sustainability of melon producing farms. Melon is an important export product for Hatay province. It is a product that has received a geographical indication for every region in its field. Additionally, this region has not been studied before. This issue is important for both Hatay province and Türkiye's economy. There are very few studies on the economics of melon cultivation in Türkiye. For this reason, this study is an original study that can make a significant contribution to all scientific studies on melon.

## MATERIAL and METHOD

The main material of the research consists of primary data obtained from melon producing farms in Hatay province (Kırıkhan district). In Hatay, 50 melon farmers were interviewed. The data used in the study was collected through a face-to-face survey in 2022. The prepared survey forms contain information about the farmers and the farms. Melon cultivation, costs, inputs, melon marketing situation and many other questions were asked in this field. In addition to primary data, data from the Ministry of Agriculture and Forestry and previous national and international studies on the subject were also used in the research.

The places where melon farmers are concentrated in the research area were determined by "Purposeful Sampling" through interviews with the Provincial Directorate of Agriculture. In determining the main population and research area, places where melon production is intense were taken into account. Therefore, the number of melon farmers in the villages/neighbourhoods selected from the research area constituted the main population of the study. Simple random sampling method was used to determine the sample size.

The formula for the sampling method is given below (Çiçek and Erkan, 1996):

$$n = \frac{(N*s^2*t^2)}{(N-1)d^2+s^2*t^2}$$

In Equation;
n = Sample size
s = Standard deviation
t = t value in the 95% confidence interval (1.96)
N = Total number of farmers
d = Indicates acceptable error (5%)

In the study, a face-to-face survey was conducted with 50 melon farmers in Hatay province. In 2021, 1 638 638 tons of melons were produced in an area of 668 753 ha in Türkiye. In Hatay, 32 537 tons of melons were produced from 13 230 decares of cultivation area. According to the data of the Ministry of Agriculture and Forestry, melon production in Hatay province was carried out by 189 farmers in 2021 (TOB, 2021).

Kırıkhan melon, which has a geographical indication, has an important place in the region. This geographical indication was registered on 13.09.2021 to be protected as of 23.11.2020 under the Industrial Property Law (TÜRKPATENT, 2021). Thus, the recognition of Kırıkhan melon was increased. In the study, the sustainability of the activities of the farms was examined by determining the current condition of buildings, land, tools and equipment. Additionally, problems encountered, evaluation and marketing of products were investigated in the study.

Average costs of inputs used were determined according to farmers' responses. Moreover, the importance level of the problems encountered in melon farming and change in melon production in the last 20 years was determined using a 5-point Likert scale. The reliability of the scales was tested with Cronbach's Alpha value. The fact that the alpha (α) coefficient is $0.60 \leq \alpha < 0.80$ indicates that the scale is quite reliable (Kalaycı, 2016). Tekin (2000); Tavşancıl (2014) it was reported that reliability is an indicator of the stability of the measurement tool. Also, Kruskal-Wallis H test was conducted to measure the differences between the presence of water problems in melon production and the changing issues regarding melon production in the last 20 years. Kalaycı (2016) it was said that with this analysis, comparisons are made for three or more groups. Additionally, the activities carried out by women were investigated.

As a result, the socio-economic structure of the farms producing melon and the farmers activities in melon cultivation were evaluated in the study. Thus, it is thought that this study will contribute to policy makers and the regional economy.

## RESULTS and DISCUSSIONS

The data was obtained by face-to-face interviews with melon producing farms in Hatay province. In Hatay, brokerage enterprises play an important role in both the production and marketing stages.

### *General information about the farms and farmers*

The ages of the farmers participating in the study range between 28 and 69 years. Farmers are generally among the active population, and the average age is 45.66. In addition, it was determined that more than 90% of the individuals growing melon in Hatay province had a good education level (high school and university). The family size of farmers varies between 2 and 7 people. Additionally, it consists of families with an average of 5 people. Most of these farmers are experienced in agricultural production. The average farming experience of farmers is 24.36 years. Also, the farmers have over 10 years of experience in melon cultivation. Furthermore, approximately 90% of farmers stated that they keep farm records. The study also found that farmers have a high rate of technology use such as computers and telephones. . In addition, almost all farmers have social security. Approximately 2/3 of melon farmers in Hatay province stated that they used credit. Additionally, 56% of melon growers also operate non-agricultural farms. In the study, it has been determined that melon growers also grow carrots. Akkuş et al., (2023) calculated the average age of melon farmers as 56.4 years. Yılmaz et al., (2011) found that the average farmer age was 47.59. Additionally, it was reported that they are generally farmers in the middle age group and the average family population is 4 people. Moreover, it has been reported that the agricultural experience of the farmers varies between 2 and 70 years, while the melon production experience varies between 2 and 45 years. In their study, Akkuş et al. (2023) calculated the average agricultural experience of farmers as 37.2 years and the average melon production experience as 27.6 years. It was also determined that 22.5% of melon farmers worked in another activity other than agriculture. It was dedicated that all melon producers within

the scope of the research had social security. Ece, (2017) melon farmers in the area, have significant knowledge and experience.

Melon and carrot production is under the monopoly of brokers in Hatay. The annual average non-agricultural activity income of melon farmers was calculated as ₺265 000 (approximately $14 000). The annual income of melon farmers varies between ₺200 000 and ₺6 000 000. The average annual income of farmers was calculated as ₺1 016 704.55 (approximately $56 000) (Figure 1).

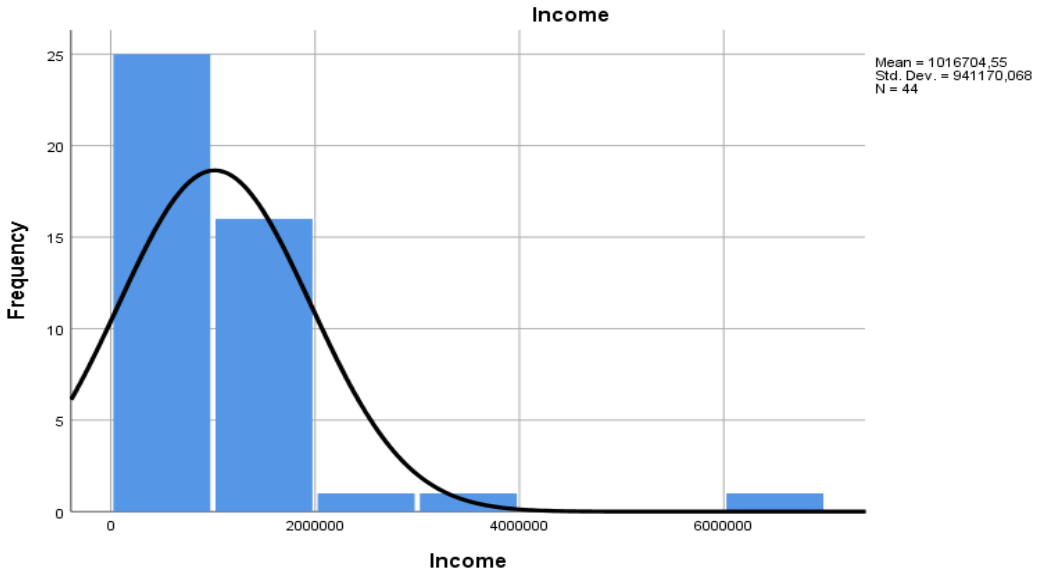


Figure 1. Annual income distribution of farmers

Farmers also grow different products along with melons. It was determined that they also grew products such as carrots, cotton, corn, wheat, nectarines and peppers. Additionally, it was determined that 46% of farmers grow winter vegetables. Approximately 70% of individuals who grow melons reported that they grow carrots as a winter vegetable. Farmers contribute to the production pattern of Hatay province by growing spinach and lettuce, as well as carrots. In the study, only 14.9% of the farmers stated that they had soil analysis done (Table 1).

Table 1. General information about the farms

| Variable | Definition | N | % | Variable | Definition | N | % |
|---|---|---|---|---|---|---|---|
| Soil analysis | Yes | 7 | 14.9 | Production method | Seedling | 44 | 88 |
| | No | 40 | 85.1 | | Both seeds and seedlings | 6 | 12 |
| Grafted seedling | Yes | 31 | 62 | Planting method | Flat | 16 | 32 |
| | No | 19 | 38 | | Embankment | 34 | 68 |
| Cultivation type | In the open field | - | - | Water problem | Yes | 16 | 32 |
| | greenhouse | 31 | 62 | | No | 31 | 62 |
| | Both of them | 19 | 38 | | Sometimes | 3 | 6 |
| Between rows (cm) | 140 | 31 | 62 | On row (cm) | 70 | 22 | 44 |
| | 145 | 3 | 6 | | 75 | 6 | 12 |
| | 150 | 16 | 32 | | 80 | 22 | 44 |
| Tunnel type | Mini | 19 | 38 | Cover | Plastic | 50 | 100 |
| | Low | 31 | 62 | | Single layer | 50 | 100 |
| Irrigation* | Regular | 50 | 100 | Policies | Very inadequate | 32 | 64 |
| | Drip | 50 | 100 | | Inadequate | 15 | 30 |
| | Frequency (two days) | 50 | 100 | | Undecided | 3 | 6 |

Additionally, 88% of the farmers stated that they produced with seedlings, and 12% used both seedlings and seeds. Moreover, 62% of farmers reported using grafted seedlings. Farmers who grow melon mostly operate in the form of greenhouse agriculture. Generally, the planting method is determined as 140 cm (62%) between

rows and 70-80 cm above the row. Furthermore, production continues using mini and low tunnels with a single layer of plastic cover material. In addition, 32% of melon growers in the region reported that they had water problems. For this reason, farmers irrigate regularly every two days using the drip irrigation method. Policies implemented in melon cultivation, which is a branch of activity with high production costs, are generally inadequate by the farmers (Table 1).

Duman et al., (2020) it was stated that support is needed during the production phase and to increase market opportunities. Additionally, it has been revealed that greenhouse melon production has increased by 75% in the last 10 years. Moreover, it was also mentioned that pineapple (low plastic tunnel and open field), Ankara, Kırkağaç, Canary, Gallia, Kantalop (greenhouse, low plastic tunnel and open field) and Charentias (greenhouse and low plastic) melon types can be grown. Also, it was said that half of the farmers prefer hybrid and open-pollinated varieties and that hybrid varieties dominate.

Farmers complain about increasing costs and low product prices. For this reason, 80% of melon farmers in Hatay province reported that they will not grow melons next year (2023 production season). Additionally, capital distribution of melon growers in Hatay province is given in Table 2. In this section, attention was drawn to the option most preferred by farmers. According to this, 44% of farmers have building asset capital between 1-5 million. Additionally, 78% of them have land improvement capital of less than ₺100 thousand. Moreover, 70% have less than 10 thousand animal capital. Furthermore, it was determined that 32% of them had capital between ₺500 thousand and 1 million, and 38% of them had a mechanization capital of over ₺1 million. Additionally, it was revealed that 54% of the farmers had a warehouse capital of less than ₺50 thousand. In addition, 82% of the farmers generally have paye money of less than ₺50 thousand. Also, it was determined that 30% of the farmers had a debt between ₺100-500 thousand, and 40% had a debt of more than ₺500 thousand (Table 2).

Table 2. The farm's view to grow melons next year and capital status

| Variable | Definition | N | % | Variable | Definition | N | % |
|---|---|---|---|---|---|---|---|
| Views of growing melons next year | Yes | 10 | 20 | Animal capital (₺) | 10 thousand > | 7 | 70 |
| | No | 40 | 80 | | 10-50 thousand | 3 | 30 |
| Building ownership (₺) | 500 thousand > | 6 | 12 | Mechanization (₺) | 100 thousand > | 3 | 6 |
| | 500 thousand -1 milyon | 16 | 32 | | 100-500 thousand | 12 | 24 |
| | 1-5 million | 22 | 44 | | 500 bin-1 million | 16 | 32 |
| | 5 million < | 6 | 12 | | 1 million < | 19 | 38 |
| Land improvement (₺) | 100 thousand > | 39 | 78 | Material-ammunition warehouse (₺) | 50 thousand > | 27 | 54 |
| | 100-500 thousand | 8 | 16 | | 100-500 thousand | 6 | 12 |
| | 1 million < | 3 | 6 | | 500 thousand < | 17 | 34 |
| Paye (₺) | None | - | - | Debt (₺) | 50 thousand > | 12 | 24 |
| | 50 thousand > | 41 | 82 | | 50-100 thousand | 3 | 6 |
| | 100-500 thousand | 3 | 6 | | 100-500 thousand | 15 | 30 |
| | 500 thousand < | 6 | 12 | | 500 thousand < | 20 | 40 |

***Change of melon production in the last 20 years***

There are differences in farmers' thoughts about the change in melon production in the last 20 years. The importance level of total cost, tools and equipment capital, number of machine usage, number of fights against diseases and pests, fertilization dose, dosage used for diseases and pests was found to be high. The importance level of seeds per decare, planting frequency and yield was found to be lower. The low level of importance reveals that the change in the last 20 years has not been much (Table 3).

Kruskal-Wallis H test was conducted to measure the differences between the presence of water problems in melon production and the changing issues regarding melon production in the last 20 years. By the test, It has been determined that there is a statistically significant difference between the presence of water problem and the dosage amount used for diseases and pests ($X^2$=17.461; p<0.01), number of fertilization ($X^2$=13.628; p<0.01), fertilization döşe ($X^2$=18.407; p<0.01), number of hoeing ($X^2$=17.962; p<0.01), hoeing hours ($X^2$=7.206; p<0.05), yield ($X^2$=6.011; p<0.05), product quality ($X^2$=8.300; p<0.05), total cost ($X^2$=6.646; p<0.036) and labor use ($X^2$=8.419; p<0.05). But, it was stated that there was no significant difference between the seeds planted per decare ($X^2$=1.233; p>0.05), planting frequency ($X^2$=1.233; p>0.05), number of fights against diseases and pests ($X^2$=2.365; p>0.05), number of machine usage ($X^2$=1.123; p>0.05), machine usage hours ($X^2$=2.353; p>0.05) and capital of tools and equipment ($X^2$=0.649; p>0.05). In other words, it is understood that water shortage causes new problems in different matters.

Table 3. Change of melon production in the last 20 years

| Change | Mean | SD | Median | N | Cronbach's Alpha |
|---|---|---|---|---|---|
| Total cost | 4.94 | 0.240 | 3.00 | | |
| Tool equipment capital | 4.84 | 0.370 | 3.00 | | |
| Number of machine uses | 4.70 | 0.580 | 5.00 | | |
| Number of fights against diseases and pests | 4.68 | 0.471 | 5.00 | | |
| Fertilization dose | 4.62 | 0.490 | 5.00 | | |
| Machine usage (hours) | 4.58 | 0.702 | 5.00 | | |
| Number of fertilization | 4.54 | 0.734 | 5.00 | | |
| Dosage amount used for diseases and pests | 4.48 | 0.471 | 5.00 | 50 | 0.693 |
| Labor use | 4.34 | 1.154 | 3.50 | | |
| Number of hoeing | 3.94 | 0.978 | 3.00 | | |
| Hoeing hours | 3.70 | 1.165 | 2.00 | | |
| Product quality | 3.10 | 1.298 | 3.00 | | |
| Seeds planted per decare | 2.88 | 0.328 | 5.00 | | |
| Planting frequency | 2.88 | 0.328 | 5.00 | | |
| Yield | 2.28 | 1.213 | 5.00 | | |

Scale: 1=very decreased, 2=decreased, 3=same, 4=increased, 5=very increased

***Melon price formation and marketing***

In the study, it was determined that the harvested products were marketed in 4 classes. According to this classification, the average values of production quantity and price are given in Table 4. In Hatay, first-class products are sold at an average price of 4.50 ₺/kg. It was determined that fourth class products were offered for 1.50 ₺/kg in the market (Table 4).

Table 4. Average values of post-harvest classification

| Classification | N | Production quantity (kg) | Price (₺/kg) |
|---|---|---|---|
| 1. class | 50 | 3673 | 4.50 |
| 2. class | 50 | 869 | 2.97 |
| 3. class | 44 | 355 | 1.79 |
| 4. class | 4 | 250 | 1.50 |

In Hatay province, 92% of farmers reported that they determine the harvest time according to product maturity. Additionally, 8% of farmers stated that climatic conditions are also effective. It has been reported that almost all of the farmers classify melons after harvest, and most of them do this classification in the farm (Table 5).

Table 5. Production harvest and classification

| Variable | Definition | N | % |
|---|---|---|---|
| Harvest time | Maturity | 46 | 92 |
| | Climatic conditions | 4 | 8 |
| Classification | Yes | 47 | 94 |
| | No | 3 | 6 |
| Classification place | In the field | 6 | 12 |
| | In the farm | 44 | 88 |
| If there is classification* | Color | 7 | 14 |
| | Hardness/softness | 26 | 52 |
| | Size | 50 | 100 |
| Reason for classification | Buyer demand | 39 | 78 |
| | Exporting firm demand | 11 | 22 |
| Product loss (%) | Yes | 50 | 100 |
| | 1-3 | 7 | 14 |
| | 4-7 | 25 | 50 |
| | 8-10 | 18 | 36 |

* More than one option is specified.

All farmers base their classification on melon size. Also, 52% argued that hardness and softness, and 14% argued that color factors were also effective along with size. In addition, 78% of the farmers stated that the classification was a buyer's demand, and 22% stated that it was an exporting firm's demand. Additionally, all farmers reported that they experienced product losses (Table 5).

In the study, 64% of farmers stated that the product price varies depending on the quantity. Others said that it was created by agreement with firms and that the firms determined the product prices themselves. In this process, 58% of farmers stated that they cooperated with brokers. Other farmers stated that they did not have any intermediaries and that they sold to the most suitable broker according to the conditions. More than half of the farmers reported that the product price was low or very low, also. Additionally, 82% of farmers market their products at the collection center. Most farmers prefer the "Producer-PCB-Retailer-Consumer" marketing channel. Moreover, farmers prefer sales without intermediaries due to their proximity to the market and ease of transportation (Table 6).

Table 6. Melon price formation and marketing situation

| Variable | Definition | N | % |
|---|---|---|---|
| Price formation | We set prices by agreeing with firm | 12 | 24 |
| | Firm determine the price themselves | 6 | 12 |
| | Product price varies depending on quantity | 32 | 64 |
| Broker collaboration | Yes | 29 | 58 |
| | No, depending on the conditions | 21 | 42 |
| Product price | Very low | 19 | 38 |
| | Low | 9 | 18 |
| | Not bad | 16 | 32 |
| | Normal | 6 | 12 |
| Market place | Vegetable-fruit market | 9 | 18 |
| | Collection center | 41 | 82 |
| Marketing channel** | Farmer-Consumer | 12 | 24 |
| | Farmer - PCB-Retailer-Consumer | 28 | 56 |
| | Farmer - PCB-CCB- Retailer -Consumer | 3 | 6 |
| | Farmer - Direct Exporter | 7 | 14 |
| Selling without intermediaries | Proximity to the market and ease of transportation | 38 | 76 |
| | The price is high | 12 | 24 |
| Intermediaries | Other farmers in the region | 3 | 6 |
| | collector farmers | 22 | 44 |
| | Truck owners from other provinces | 3 | 6 |
| | Brokers in the local | 19 | 38 |
| | Exporting firms | 3 | 6 |
| Abroad sales | Yes | 3 | 6 |
| | No | 47 | 94 |
| Firm payment | Partly deferred, partly cash | 23 | 46 |
| | Varies depending on conditions | 27 | 54 |
| Sales month * | June | 32 | 64 |
| | July | 50 | 100 |
| | August | 38 | 76 |
| | September | 17 | 34 |
| Market preference reason | Ease of marketing | 41 | 82 |
| | He is a broker | 9 | 18 |
| Best marketing | Farmer-Consumer | 25 | 54.3 |
| | Direct export | 3 | 6.5 |
| | Near market | 9 | 19.6 |
| | Farmer-Broker-Consumer | 9 | 19.6 |

* More than one option is specified; **PCB: Production Center Broker, CCB: Consumption Center Broker

In Hatay province, most of the melon farmers in the region do not sell abroad. Also, firm payments for melon sales generally vary depending on the conditions. Melon sales are made in the harvest months of June, July, August and September. By the farmers, the best form of marketing is direct sales from the producer to the consumer (%54.3). If a cooperative was established in the region for marketing and meeting common needs, farmers would want to become members (54%). It was determined that those who answered no to this question had insecurity. In addition, there are no farmers who engage in contractual production or sales to factories in terms of melon production among farmers in the region (Table 6).

Akkuş et al., (2023) stated that melon has gained a place in the local market where it is mostly consumed fresh. It has been said that selling it under the label "It is a geographically indicated product" will support its transformation into a product that is more recognized and demanded by the consumer. It was also reported that with the encouragement of the local government, Cesme melon can be produced in the form of Turkish delight, molasses and jam to add value.

***Production cost of melon***

Farmers think that the costs of the inputs are quite high. In Hatay, melon production cost for 1 decare varies between ₺9 500 and ₺12 000. The average production cost was determined as ₺10 692 (approximately $590). Daily wage for male and female workers is ₺150. Additionally, the average soil tillage and sowing/planting costs were determined as ₺1 350. Moreover, the average value of one decare of irrigated land was calculated as ₺1 182, and the value of dry land was calculated as ₺887. It is seen that the value of dry land is lower than irrigated land. In addition, there is an average cover cost of ₺818 per da$^{-1}$ in melon production. Moreover, there is a water fee of ₺564 da$^{-1}$ and irrigation equipment rent. There are pesticides (₺1 416 da$^{-1}$), fertilizers (₺1 448 da$^{-1}$), seed/seedling (₺1 175 da$^{-1}$) and commission fees in melon production. Additionally, it was calculated that an average of 794 root seedlings were planted in 1 decare area. The varieties used were determined as Eylul, Galia and Ananas (Table 7).

Tablo 7. Production cost of melon (2022 production period)

| Inputs | Mean | Min | Max |
|---|---|---|---|
| Male worker daily wage (₺ day$^{-1)}$ | 150 | - | - |
| Female worker daily wage (₺ day$^{-1}$) | 150 | - | - |
| Soil cultivation and sowing/planting (₺ da$^{-1}$) | 1350 | 1200 | 1500 |
| Irrigated land value (da) | 1182 | 1500 | 2000 |
| Dry land value (da) | 887 | 700 | 1000 |
| Cover cost (da) | 818 | 700 | 900 |
| Water fee and irrigation equipment rent (₺ da$^{-1}$) | 564 | 400 | 800 |
| Pesticide fee(₺ da$^{-1}$) | 1416 | 1000 | 1600 |
| Fertilizer fee (₺ da$^{-1}$) | 1448 | 1000 | 1800 |
| Seed/seedling fee (₺ da$^{-1}$) | 1175 | 1000 | 1250 |
| Seedling (root da$^{-1}$) | 794 | 750 | 850 |
| Commission rate (%) | 12.79 | 12 | 13 |
| Total cost (₺) | 10692 | 9500 | 12000 |
| Type of seed used | | Eylul, Galia, Ananas | |

Note: $1= ₺18.20 (Aug-22); $1= ₺26.52 (Aug-23)

Akkuş et al., (2023) stated that the risk factors that farmers consider most important for melon production are misuse of land and high input prices. Additionally, by the farmers, the second most important risk factor is high input prices and therefore high production costs. However, there are three risk strategies that farmers consider the least important. These are the use of shared machinery, the use of certified seeds, and the application of mulching and environmentally friendly production techniques, respectively. The majority of farmers reported that they thought melon production was not economically sustainable. However, when the research results are evaluated, it has been revealed that it can be economically sustainable.

Farmers said that the melon grown in Hatay province is good in taste and aroma. In addition, the fact that it has been registered makes melon production strong. Additionally, very high input costs (pesticide, fertilizer, labor force, etc.) and market and marketing (including transportation) are the weaknesses of melon production. If melon prices are good, it is shown as an opportunity for producers to make high profits. However, high input

costs are a serious threat to the continuity of production. Also, market and marketing problems and labor supply are among other threats in Hatay province. If there is no market, product prices will be low and the farmer will not be able to sell his products. Yılmaz et al., (2011) the significant cost items were human and machine power, land rent, seed and fertilizer costs. labor and machine power used were 231.60 and 27.60 h $ha^{-1}$ in the melon production period, respectively. Average production costs were 2320.60 $ $ha^{-1}$. Economic analysis showed that net return per kilogram of melon was sufficient to cover costs of production in the research area. Even though positive gross profit and net profit are obtained in melon growing, it is necessary that yield increase should be ensured, profitability should be increased by decreasing costs and modern melon growing should be improved. In the study conducted by Baran and Gökdoğan (2014), the highest energy consumption inputs among the general energy inputs in both watermelon and melon cultivation were determined to be fertilizer energy, fuel-oil energy and human labor energy, respectively.

***The role of women in melon production***

Women work intensively, especially in vegetable agriculture. Female labor is also used extensively in melon production. Women play an important role in melon cultivation at every stage from production to consumption in Hatay province. Women are the main actors in the seedling planting period and the covering. Additionally, it was determined that women carried out the transportation and classification of the harvested products during harvest. Also, women take on both work and home responsibilities.

Women engaged in melon cultivation receive a daily wage of ₺150 (approximately $9) in 2022. Women's participation in the workforce has increased in recent years. However, women's labor is not fully rewarded. Moreover, women are deprived of all kinds of social security rights as unpaid family workers. The use of female labor in agricultural production is quite high, even if it is not registered. Additionally, women play primary and secondary roles in almost all of their daily lives (economic and social). It is necessary to examine and solve the problems of women involved in melon growing and other agricultural activities. Additionally, women's working and living conditions should be improved. Eliminating the lack of information, increasing labor wages and protecting women's rights are among the priority issues. Within the scope of agricultural extension, women should be informed with adult education.

Anonymous (2021) reported that women, who are seen as responsible for the nutrition of the family and society in agricultural production, are the most important elements of agricultural activity from planting to harvest. Kaya and Acıbuca (2023) reported that women experience work-related health problems (especially back and waist pain). It was also said that it is a serious problem that women do not have the same property rights as men in work life. Additionally, it has been understood that most of the women working in agriculture have primary education or lower levels, their income level is low and they remain in the background in working life. Candan and Özalp Günal (2013) it was mentioned that women seasonal agricultural workers have never-ending shifts. Ercan et al., (2010) it was stated that inadequate and difficult working conditions for women, low wages, and long working hours hinder women's employment.

***Problems encountered in melon farming***

The most important problems faced by farmers in melon production are low product prices, high input prices and price instability. Additionally, excessive rise in costs, market and marketing, the existence of intermediaries, labor problems, transportation, and the fight against diseases and pests are also among the important problems. The importance level of the problems encountered in melon farming is examined in Table 8. Lack of cooperation and organization among farmers (4.70±0.463), high input prices (4.40±0.495), inability to find sufficient markets and buyers (4.40±0.700) and low product prices (4.16±0.618) are the most important level. Problems in cultivation, fertilizer and fertilization, suitable credit, use of machinery, equipment supply, quality seeds, fertilizer and pesticide supply are among the other problems faced by farmers and their importance level was found to be low (Table 8).

Akkuş et al., (2023) reported that agricultural policies for plant production should be encouraging, sustainable and reducing the cost of production. Ece (2017) emphasized the need to create unity in marketing. Akkuş et al., (2023) it was reported that continuing to produce local varieties in Türkiye contributes to sustainability, and is extremely important in delivering healthy food to future generations.

Table 8. The importance level of the problems encountered in melon farming

| Topics and Problem Areas | Mean+SD | Median |
|---|---|---|
| Lack of cooperation and organization | 4.70±0.463 | 2.00 |
| High input prices | 4.40±0.495 | 4.00 |
| Inability to find sufficient markets and buyers | 4.40±0.700 | 1.00 |
| Product prices are low | 4.16±0.618 | 3.00 |
| Fighting diseases and pests | 3.48±1.328 | 1.00 |
| Control of input sellers | 2.92±1.085 | 1.00 |
| Water supply and irrigation | 2.80±1.565 | 1.00 |
| Regarding cultivation | 1.96±1.068 | 1.00 |
| Fertilizer and fertilization | 1.78±1.016 | 4.00 |
| Suitable credit | 1.56±1.163 | 3.00 |
| Use of machinery | 1.36±0.598 | 4.00 |
| Equipment supply | 1.36±0.851 | 5.00 |
| Supply of quality seeds, fertilizers and pesticides | 1.24±0.555 | 5.00 |

Scale: 1= No problem, 2= little important, 3= undecided, 4= important, 5= very problem

## CONCLUSION and RECOMMENDATIONS

Melon is an important product that contributes to the fresh fruit and vegetable sector in terms of production and foreign trade both in Türkiye and Hatay. Recently, there has been a water shortage in the region. It is also an activity that protects water resources for which the drip irrigation method is preferred. It is very important for the sustainability of agricultural activities. For this reason, farmers in Hatay province should be informed so that they do not abandon melon production. Additionally, training and extension activities should be increased. Moreover, farmers' access and use of technology should be encouraged.

Farmers cannot keep up with the increase in input costs. Also, harvested products have market and marketing problems. Furthermore, the lack of cold storage in the region prevents the storage of the product. For this reason, cold storages need to be increased in Hatay province. Additionally, marketing organizations should be developed. Appropriate input can be provided through cooperative formation. Thanks to cooperative formation, it is possible to achieve ease of marketing and high income. However, cooperation and organization among farmers in Hatay province were found to be insufficient. Moreover, It has been determined that farmers do not trust each other. In Hatay, melon farming is actually thought to be profitable. However, increasing input and transportation costs are a serious problem. Because costs and efficiency do not increase at the same rate. On the contrary, it has been shown that productivity growth has not changed much in the last 20 years. For this reason, new techniques and modern applications are needed to increase efficiency.

Melon is a vegetable that is generally consumed fresh in Hatay. Seasonal price fluctuations are one of the most important factors limiting melon production in Türkiye. This situation causes the farmer to make high profits in some years, and sometimes to serious losses. Carrying out this activity in a controlled manner is possible with prior research. It is possible to realize melon production in a healthier way with the cooperation of farmers, extensiones and policy makers. Additionally, enterprises to be established in the region will increase the added value of the products. Thus, it is thought that the marketing problem can be solved to some extent.

Kırıkhan melon is a product with a geographical indication. Also, it is thought that its recognition will increase even more with its branding. Moreover, it is possible to create new employment areas with the establishment of an enterprise. By processing the products, the income level of those living in rural areas increases. Furthermore, it allows the processing of second/third class products. It is also thought that agriculture-based industry will make significant contributions to the regional and the Turkish economy. In this way, sustainable income transfer is achieved. New employment areas are provided for female workers working in agriculture. An increase in the welfare level of women working in agriculture is expected in Hatay province. Also, working conditions also improve. It is thought that increasing income in the process of social change will support sustainable development. Additionally, it is expected to contribute to society in many areas in the region (production, consumption, nutrition, migration, employment, income, etc).

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