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SOCIO-ECONOMIC ANALYSIS OF TROUT FACILITIES OPERATING IN BURSA PROVINCE

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Abstract:
This study was conducted to determine the socio-economic characteristics of rainbow trout enterprises operating in Bursa. According to the findings obtained in the survey conducted with 10 small-scale fish farms operating in the province in 2023, it was determined that their total theoretical capacity actively operating in 2023 was 265 tons/year and their actual capacity was 155 tons/year, and that 40% of the trout farming operators were in the 55-64 age range and all of the operators were married. When their education status is examined, it is seen that 40% of the operators are high school graduates and their fishing experience is more than 30 years (60%). It was determined that the main occupations of trout farmers in Bursa province were agriculture and animal husbandry (50%). Considering the rich water resources in Bursa, it was determined that 70% of the enterprises determined to use spring water in production, 80% of them were sole proprietorships, and 60% of them established enterprises with their own resources without using any credit as a source of financing. All of the trout enterprises in Bursa, where the working personnel are generally family members, are of the opinion that the feed costs are high and the supports should be in the feed.
Keywords: Aquaculture, Bursa, Socio-Economic evaluation, Trout production, Fish Farmers

Introduction

The coast line of 8,333 km and rivers up to 178,000 km long provide Türkiye remarkable potentials for both marine and freshwater aquaculture investments. Approximately 320 natural lakes with surface areas over 200,000 hectares, 861 dams in operation and over 1000 ponds and 26 million hectares of aquaculture production areas (DSI, 2023) demonstrate a promising future for the growing aquaculture sector.

While the world population is increasing, the need for protein and the consumption of animal foods are increasing accordingly. Considering the high protein level in fish species in comparison to terrestrial animals, the demand for seafood has increased over the last decades. With the intense pressure of catch, there has been a serious decrease in the number of fish obtained from the oceans in recent years. As a result, it has become essential to increase the production from aquaculture. Due to these reasons, along with many others, the aquaculture sector has increased very rapidly and became the fastest growing food sector according to the Food and Agriculture Organization of the United Nations (Çavdar, 2009). Besides food supply, the aquaculture sector creates employment for people, contributes to foreign currency inflows and exports to many countries. It also contributes to the cosmetics and pharmaceutical sectors, contributing to the socio -economic structure of the society.

Approximately 75% of rainbow trout aquaculture facilities, numbering 1700 in Türkiye, are small-scale trout farms with a production capacity of less than 50 tons. The share of inland aquaculture production amount in the total is 30.4%, and the most cultivated species is trout. Rainbow trout production is mostly done in concrete ponds using spring waters and streams. In addition, trout production is carried out intensively by using net cages in the sea and in dam lakes (BSGM, 2021).

Bursa province with surface area of 10,819 km is located in the southeast of the Marmara Sea, surrounded by Bilecik and Adapazarı in the east, Istanbul, Yalova, Kocaeli and the Marmara Sea in the north, Kütahya and Eskişehir in the south and Balıkesir in the west. Bursa is the 4th largest city in Türkiye, a city mild climate and 155 meters above sea level. The hottest months of Bursa are July-September, and the coldest months are February-March. Bursa, which has a coastline of 135 km, has 17 districts. While Mudanya, Gemlik, Karacabey districts are located on the coast, Büyükorhan, Gürsu, Harmancık, İnegöl, İznik, Keles, Kestel, Mustafakemalpaşa, Nilüfer, Orhaneli, Orhangazi, Osmangazi, Yenişehir and Yıldırım districts do not have coastlines. The important rivers of the province; Mustafakemalpaşa Stream, Nilüfer Stream, Göksu Stream, Kocadere, Karadere, Aksu Stream. There are Uluabat and Iznik lakes within the provincial borders (https://www.bursa.com.tr/tr/Sayfa/nufus-konum-iklim-ve-cografiya-47/).

In this study, socio-economic structures of the trout enterprises operating in Bursa were investigated with the aim of determining realities of the enterprises and operators in the light of the qualitative data obtained by the survey studies applied to the farm owners, as well as evaluating labor conditions and social security issues based on socio-economic data obtained from questionnaires.

Material and Method

Within the scope of the study, the list of trout enterprises registered in Bursa province (Figure1) as of January 01, 2023 is prepared and the thesis universe for the study to be carried out has been determined. In this universe, which will be evaluated within the scope of the thesis, there are 10 actively operating trout farming facilities registered with the Provincial Directorate of Agriculture and Forestry throughout the province of Bursa. In order to evaluate 10 trout farming facilities that are actively operating in Bursa in 2023, questionnaires have been prepared with closed-ended and open-ended questions and answered by meeting one-on-one with the fish farmers.

Figure 1. Bursa province on Türkiye map (www.wikipedia.org).

The data required to evaluate the socio-economic aspects of these facilities determined in the study were obtained primarily from the records of the fisheries and aquaculture cooperatives operating in the region, the Provincial Directorate of Agriculture and Forestry, through face-to-face interviews with the owners or officials of the aquaculture facilities.

The survey study, the full counting method was used to obtain healthy and reliable data for the questions related to the enterprises. In addition, scientific studies conducted in different regions were also used. MS Excel program was used to evaluate and analyze all the data obtained from the survey questions made with the fish farmers.

Results

There are 10 rainbow trout facilities operating in Bursa province in 2023, with capacities of 2 tons/year and 60 tons/year (Table 1).

Marital Status, Age Distribution, Dependents, Educational Status and Main Professions of the Fish Farmers

The age distribution of the trout farm owners in Bursa ranged between 22 and 90. Operators in the 55-64 age range constitute the most crowded age group with a rate of 40%. These were followed by the 35-44 and 45-54 age groups with 20%, and the 65 years and older and 18-24 age groups with 10%. There were no trout farm owners in the 25-34 age group (Figure 2).

Table 1. Trout holdings operating within the borders of Bursa province in 2023

Business Location	**Farm Name**	**Farm Status**	**Culture Type**	**Actual Capacity (ton/year)**	**Year of Establishment**
Keles	Sarıkız Trout Production Facility	Active	Pond	6	1985
Yıldırım	Aral Seafood Production Facility	Active	Pond	25	1994
Mustafakemalpaşa	Kepez deresi Trout Production Facility	Active	Pond	10	1993
İznik	Serhat Trout Production Facility	Active	Pond	20	1994
Keles	Taypen Trout Production and Breeding Facility	Active	Pond	12	1993
Kestel	Deliçay Trout Facilities	Active	Pond	5	1997
Osmangazi	Kaya Trout Production Facility	Active	Pond	2	2002
Osmangazi	Aras Deresi Trout Production and Breeding Facility	Active	Pond	5	1988
Kestel	Erbaylar Babasultan Trout Production Facility	Active	Cage	60	2017
İnegöl	Atalay Maden Trout Production Facility	Active	Pond	10	2007

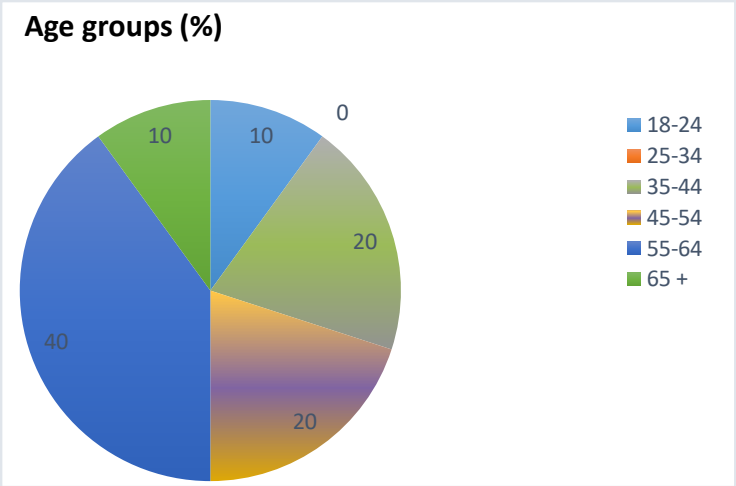

Figure 2. Age distribution of trout farm owners.

When the marital status of the 10 farm owners participating in the survey were examined, it was seen that all 10 farm owners are married.

In our study, 40% of the farm owners are high school graduates, and this group constitutes the largest proportion of the participants' education level. This group is followed by college and primary school graduates with a rate of 30% (Figure 3).

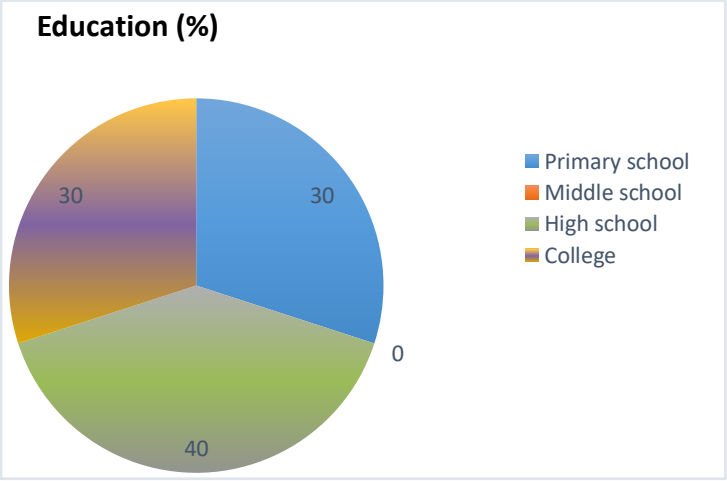

Figure 3. Educational status of trout farm owners.

The largest share of business owners is agriculture and animal husbandry with 50%. This is followed by 30% of the business owners whose main occupation is fishing, and 10% of the business owners whose main profession is tradesmen and teachers (Figure 4).

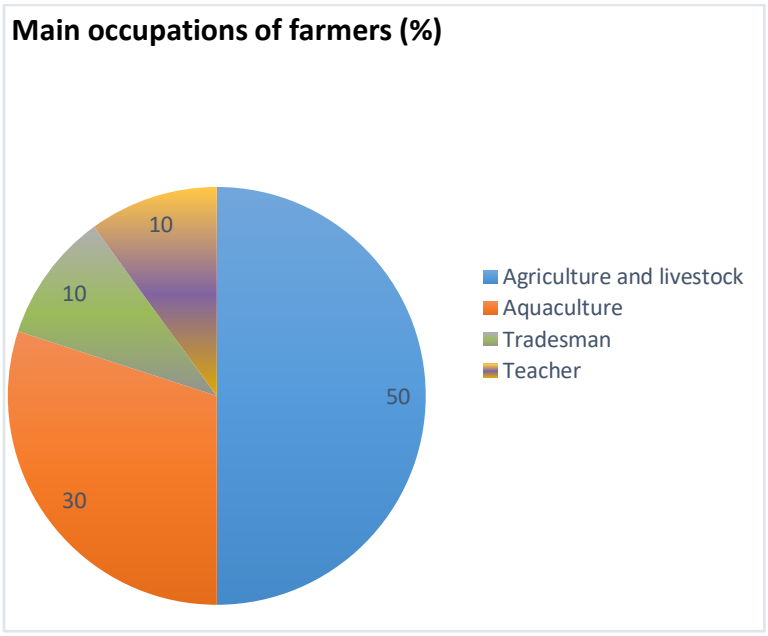

Figure 4. Main occupations of trout farm owners.

When the data on the number of dependents of the operators participating in the survey are evaluated, it is seen that most of the participants are obliged to take care of 4 people with a rate of 50%, 40% are obliged to care for 5 people and 10% are obliged to look after 3 people (Figure 5).

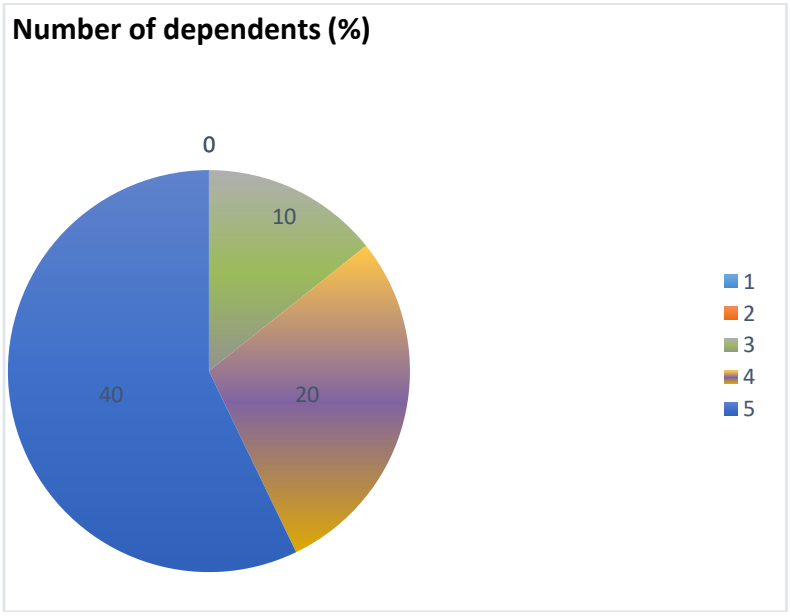

Figure 5. Number of populations that farm owners are obligated to depend on.

Fish Breeding Experience of the Operators and the Birth of the Idea of Trout Farm Management

When the aquaculture experience of the surveyed operators is evaluated, it is seen that the majority (60%) have more than 30 years of experience, while those with 20-30 years (20%) and 10-20 years (20%) of experience remain at a lower rate (Figure 6).

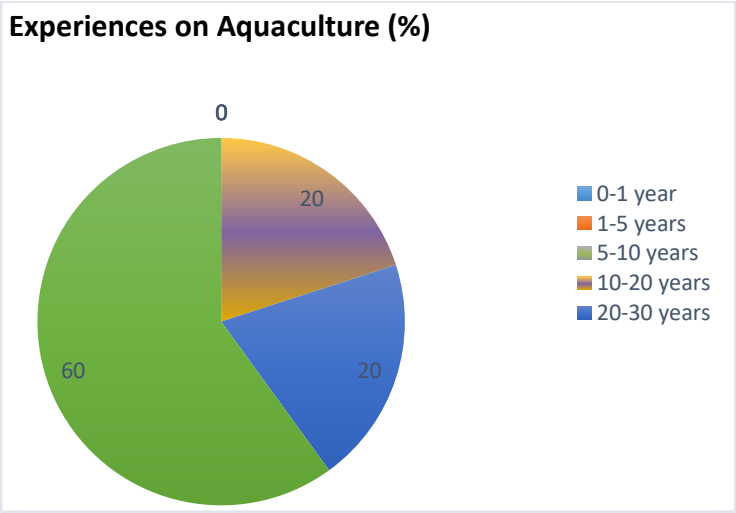

Figure 6. Experience of trout farm owners on aquaculture

When we asked the trout plant owners surveyed how the idea of building a trout plant began, they all selected multiple options. These options are; The idea of high economic return, the lack of investment opportunities in the region, liking fish farming and having received education are options. Of these options, the most marked is liking fish farming, followed by limited job opportunities in the region as the highest marked option. Among the options, having received the education and the idea that the return is high are the least marked options (Figure 7).

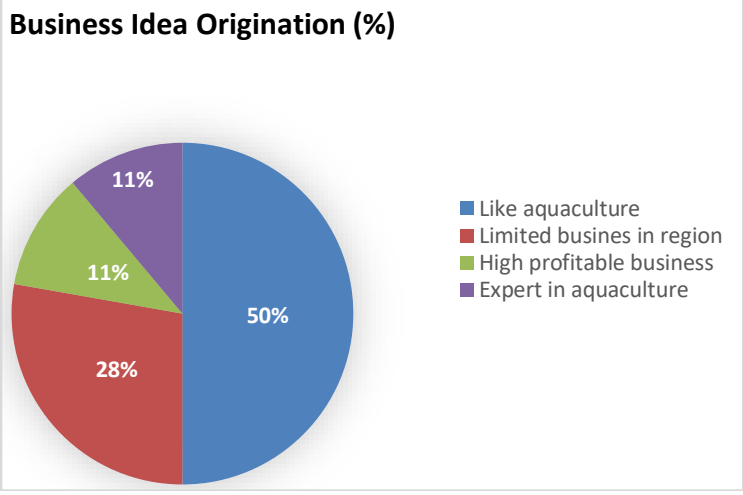

Figure 7. Inspiration for trout farm idea at first.

Land Structure and Water Resources of the Facilities

When the types of land where the trout plants participating in the survey are examined, 50% are located between the valleys, 30% in the hillside and 20% in flat land (Figure 8).

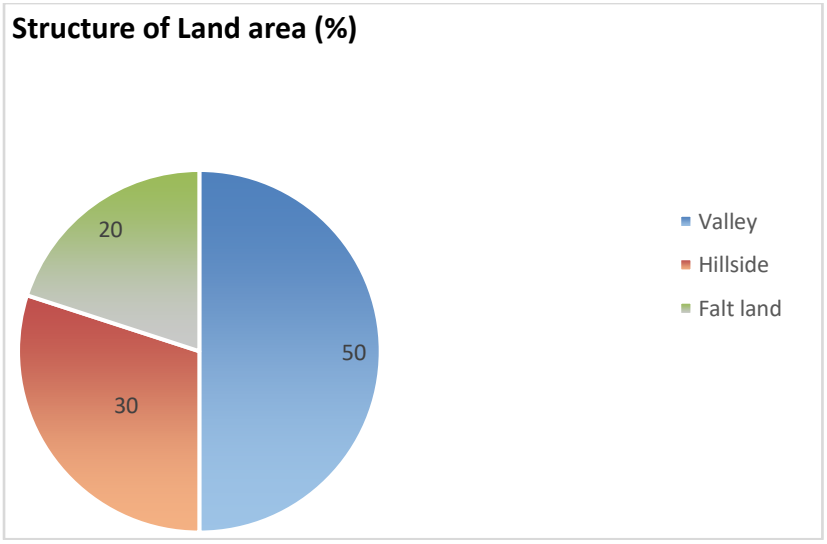

Figure 8. Percent structure of land area.

Rainbow trout facilities in Bursa use mostly spring water (70%), as well as stream (20%) and river water (10%). There is also a facility built on the dam lake (Figure 9).

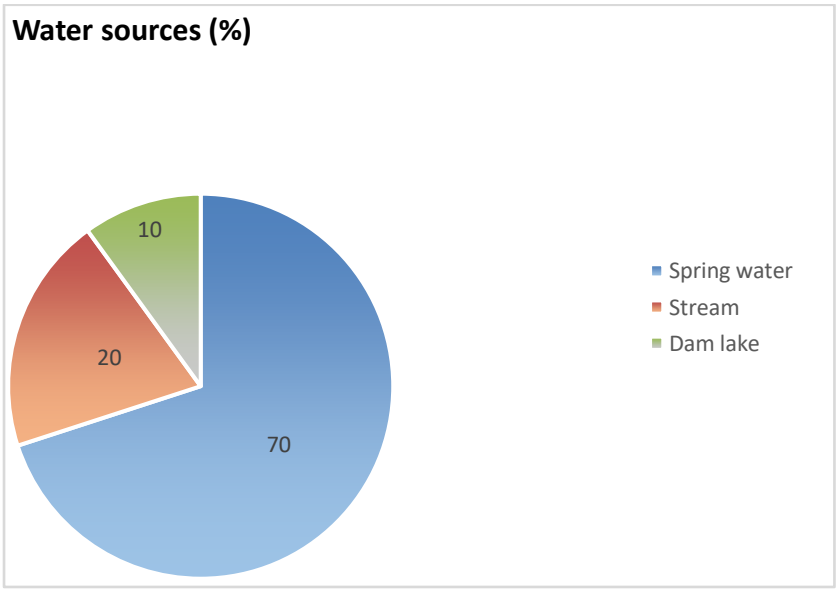

Figure 9. Percent distribution of water sources

Financial Structures of Facilities

80% of the enterprises included in the study are sole proprietorships and 20% are operating within the company. There are no enterprises operating as cooperative, public and simple partnership enterprises.

It is understood that 60% of the businesses surveyed do not use any credit as a source of financing for the facility, while 40% use both equity and credit.

Number and Educational Status of Personnel employed at the Farms
It is seen that 3 of the trout facilities employ engineers, 5 of them skilled workers, 1 of them unskilled workers, 1 of them temporary workers and 9 of them family members.
When we evaluate the educational status of the personnel working in the enterprises, there are 11 primary school, 2 secondary school, 16 high school and 7 university graduates.

Market Structure of the Businesses
All of the trout farming facilities market their products as retail (fresh) and by offering them for consumption in their restaurants/restaurants. Three facilities offer the products they grow for consumption in their retail and restaurants as well as market them through wholesalers. The fish produced in the enterprises are offered for sale with an average weight of 250-350 g / piece. Since the facilities do not have a processing unit, there is no such thing as processing and marketing the fish grown. At the same time, none of the enterprises market the fish as frozen, to fish processing facilities and abroad.

In general, the fact that the capacities of the enterprises are quite low compared to the surrounding provinces also causes the products grown to be marketed in the domestic market. While all of the trout facilities state that they do not experience market problems, they state that they cannot sell the products at the price they want above the production inputs, except for one enterprise, that the price they have sold now does not even cover the costs, and that it is insufficient. The high production costs, especially the high price increases in feed, which is indexed to foreign currency and constitute one of the biggest costs of the facilities, reduce the profit margin of the enterprises, and the enterprises are forced to sell the products they grow to figures that do not satisfy them.

Conclusion and Discussion
Within the provincial borders of Bursa, there are 11 trout enterprises registered to the Provincial Directorate of Agriculture and Forestry in 2023. When the negotiations for the survey began, one of the enterprises did not participate in the survey by declaring that it had stopped its production activities due to economic reasons and that the enterprise would be officially closes. For this reason, a survey was conducted with 10 enterprises to analyze the socio -economic structures of these enterprises.

The first of the enterprises participating in the survey was established in 1985. Three years after this facility started producing, another facility was established and an increase in the number of facilities started in the 90s. 50% of the enterprises were established between valleys, 30% on the mountain slopes and 20% on open land, and the water resources used by the enterprises are 70% spring water, 20% stream, river water and 10% in lakes.

When the other provinces where trout production is carried out in Türkiye are examined, it is reported that the first trout production and breeding facility established in Tunceli was established in 1976 under the Directorate of National Parks, transferred to the private sector through a tender in 1998, and 69.57% of the water resources used in the trout facilities in the province are on the dam lakes (Güçer, 2014). In the study conducted in Tokat Province, it is stated that 47.37% of the enterprises are established between the foothills, 31.58% of the open land and 21.05% of the valleys, while in terms of the water resources used, 47.37% of them benefit from spring water, 21.06% from the dam lake, 10.53% from the artesian well, 5.26%

from the pond, 5.26% from the irrigation channel, pond and artesian well, 5.26% from the spring water and stream, and 5.26% from the stream and artesian well (Adıgüzel and Akay, 2005). In terms of water resources in trout farms in the Mediterranean region, enterprises stated that they preferred spring water with 53.6% (Emre et al., 2011).

Demir (2017) found that the first trout operation in Malatya province was established in 1986, 50% of the trout facilities were built on flat land, 40% between valleys and 10% at the foot of the mountains, and when examined the water source, it was determined that 65% of them were engaged in trout farming using spring water and 35% using stream / river water. In another study (Ertümen and Yılmaz, 2015), which examined the trout facilities of Bayburt province, it was determined that the enterprises were established between 1995 and 2010, producing using 62.5% pond water, 25% stream water and 12.5% spring water. Buruç (2018) stated that the first enterprise established in Bitlis province was established in 1989, 40% of the enterprises located on the foothills and flat land and 20% between the valleys, 80% of them used spring water and 20% of them used lake water in terms of water resources. Tolon et al., (2016) stated that 75% of the enterprises in Fethiye district were established on the foothills, 25% on the plain, 75% on spring water and river, and 25% on river.

It was determined that 80% of the enterprises included in the study were sole proprietorships, 20% of the trout plants operating within the company did not use any credit as a source of financing, and 40% used both equity and credit as a source of financing. There are no trout plants operating as cooperative, public and simple partnership enterprises.

In Türkiye, most of trout facilities are sole proprietorship. Sole proprietorship rates in trout facilities vary from province to province. The rates of sole proprietorships Doğan and Yıldız (2008) state 74.5% in the Marmara region, Demir (2017) 80% in Malatya province, Ertümen ve Yılmaz (2015) 100% in Bayburt province, while Aksu (2017) and Güçer (2014) state 78.26-82% in Tunceli Province. In this study, it is similar to the rate (80%) of sole proprietorship in Bursa.

It was determined that the water resources used were established on dam lakes with 69.57%, spring waters with 21.74% and creek-river waters with 8.69%, and that all of them market their products as fresh to a large extent. Emre et al., (2011) determined that 76.8% of the enterprises are sole proprietorships, and 78.8% of them are equity capital as a source of financing. Demir (2017) determined that 80% of the enterprises in Malatya are individuals, 15% are companies and 5% are cooperatives. As a result of the study conducted in the Marmara Region, it was found that 74.5% of the enterprises were sole proprietorships (Doğan and Yıldız, 2008). While Ertümen and Yılmaz (2015) determined that all trout farms in Bayburt are sole proprietorships, Buruç (2018) determined that 80% of businesses operating in Bitlis are privately owned and 20% are public enterprises.

While the average theoretical capacity of the trout facilities participating in the survey within the borders of Bursa province is 26.5 tons/year, the average actual capacity they realize is 15.5 tons/year and not all enterprises plan to increase their capacities. In other researches, they found that the total theoretical capacity of the trout plants in Tunceli province is 8,879 tons/year and their actual capacity is 3,778.99 tons/year (Güçer, 2014) and their theoretical capacity in Malatya province is 777 tons/year in total, and their actual realized capacity is 440 tons/year (Demir, 2017). While it is stated that the capacity utilization of the facilities in Tunceli and Malatya provinces is lower in Bursa province as in this study, it is reported that the total

theoretical capacity of the enterprises operating in Bitlis is 190 tons/year and their actual capacity is 215 tons/year (Buruç, 2018).

It has been observed that 50% of the farm owners, all of whom are married, are responsible for 4 people, 40% for 5 people and 10% for 3 people. The ages of the participants vary between 22 and 90, and the operators in the 55-64 age range constitute the most crowded age group with a ratio of 40%. These are followed by the 35-44 and 45-54 age groups with 20%, the 65 and over and 18-24 age groups with 10%. There is no operator in the 25-34 age group.

Güçlü (2014) stated that 34.78% of the fish farmers s in Tunceli, where most of them are married, are obliged to take care of 4 people, and the most crowded age group is the 46-50 age group, with 30.44%. Adıgüzel and Akay (2005), in their study in Tokat Province, stated that the oldest operator is 57 years old, and the youngest operator is 28 years old. Emre et al.(2011) determined that 66.5% of the trout facility operators in the Mediterranean region are in the middle age class. Demir (2017) determined that the producers of trout farming in Malatya were between the ages of 40-66 and 55% were between the ages of 40-49 and all were married. Buruç (2018), as a result of the survey they conducted with 5 businesses operating in the province of Bitlis; While 60% of the operators between the ages of 43 and 51, and 40% of the operators between the ages of 52-62, it has been determined that almost all of the operators are responsible for 6-7 people and only one operator is responsible for 5 people. In Fethiye district, it was determined that the oldest operator was 64 years old and the youngest one was 30 years old (Tolon et al., 2016). Birici et al.,(2015), of the operators engaged in trout farming in Elazig, 89.2% of the operators are married, 10.8% are single, the age range is between 18-65 years, the highest is 37.8% and 26 They determined that it was in the -35 age group and 37.8% in the 36-45 age group.

The largest share among farm owners is agriculture and animal husbandry, with a ratio of 50%. This is 30% of the farm owners whose main occupation is aquaculture, 10% of which is the main occupation of tradesmen and teachers, 40% of them are high school graduates and this group constitutes the largest proportion of the participants in education level. This group is followed by college and primary school graduates with a rate of 30%.

When the farm owners participating in the survey were questioned “how the idea of operating a trout farm was born”, all of the participants chose more than one option. The most marked among these options is to enjoy fish farming, followed by the limited job opportunities in the region as the highest marked option. Having received education and the thought that it has a high return are the least marked options. As a result of our interviews with trout farm owners, aquaculture experiences; It has been determined to be more than 30 years with a high rate of 60%, followed by those with 20-30 years of experience and 10-20 years of experience with rates of 20%. Güçlü (2014) determined with a rate of 58.82% that trout farm owners established this business due to the high return on the idea of establishing a business, Ertümen and Yılmaz (2015) stated that the average years of experience of operators in Bayburt province were 11 years in net cages and 15 years in enterprises located on land. They determined that the year. In the study carried out with the operators in the province of Elazig, 26.99% of them started this business for commercial purposes. Seeing this situation from other facilities, field experience, personal curiosity, and obtaining credit are followed by situations (Aydoğdu and Özdemir, 2019). Birici et al. (2015) found that 21.6% of the operators operating in the province of Elazığ have been engaged in aquaculture for 1 year, while those with 15 years or more experience have a rate of 15.6%.

While all of the enterprises state that they do not experience market problems, they state that they cannot sell the products at the price they want above the production inputs, except for one enterprise, that the price they have sold now does not even cover the costs, and that it is insufficient. The high production costs, especially the high price increases in feed, which is indexed to foreign currency and constitute one of the biggest costs of the facilities, reduce the profit margin of the enterprises, and the enterprises are forced to sell the products they grow to figures that do not satisfy them. Doğan and Yıldız (2008) determined that the fish produced in the region is sold freshly at retail and in the restaurants in the facility with a rate of 72.6% in terms of marketing, and Güçlü (2014) determined that all of the enterprises in Tunceli market their products as fresh wholesale. Aksu (2017), as a result of another study conducted in Tunceli, found that 31.81% of the fish grown in the enterprises were wholesale, 29.55% retail, 22.72% in the restaurant and 15.90% in the restaurant. stated that it was marketed to factories.

Adıgüzel and Akay (2005), about the market structure of the businesses in Tokat, stated that all of them sell within the facility, with this situation 21.05% to other businesses, 15.79% to public institutions, 10.53% to markets and 10% to markets. They determined that 10.53 of them were marketed to restaurants. Demir (2017) stated that half of the trout farming operators in Malatya are tradesmen and they consume the fish they grow in the restaurants/restaurants belonging to the enterprise, and the products grown are marketed to retailers, wholesalers and neighboring provinces. When Doğan and Yıldız (2008) examined the marketing methods of the trout produced in the Marmara Region, they found that 72.6% were sold in retail and in the restaurants/restaurants in the facility.

Ertümen and Yılmaz (2015) stated that the marketing structure in the province of Bayburt is that all of the net cage enterprises are wholesale, 33.3% of the land enterprises are retail, 33.3% are wholesale, and 33.3% are both retail and wholesale. Buruç (2018) stated that businesses market their fish as retail or wholesale, while businesses that have restaurants/restaurants in their facilities market them by offering them for consumption. When the marketing situation of the enterprises is analyzed in the study carried out in the province of Elazig, the majority of them, such as 62.25%, sell their products as wholesale.

During the interview with the farm owners, their common concern was concentrated on high feed costs. Since feed costs comprise the highest share of the total production costs in fish farming, their expectations were mainly focused on government support for feed costs, in order to reduce production costs. They stated that the profitability ratios decrease due to the increase in feed costs every year, and therefore the farmers face difficulties in the further expansion of the business, and they may plan to increase their capacity in the future if they see any further hopes to overcome the difficulties encountered from high production costs, that is mainly caused due to feed expenses.

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Not applicable

Informed consent
Not available

Data availability statement
The authors declare that data can be provided by corresponding author upon reasonable request.

Conflicts of interest
There is no conflict of interests for publishing this study.

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Contribution of authors
Pınar SAÇ: Conceptualization, Data curation, Formal analysis, Writing original draft
Sebahattin ERGÜN: Project administration, Resources, Supervision, Validation, Visualization, Review, Editing.
All authors have read and agreed to the published version of the manuscript.

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