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Exploring socio-economic structures of freshwater trout farms in Mediterranean region of Turkey

Türkiye'de Akdeniz Bölgesi'nde tatlı suda alabalık çiftliklerinin sosyo-ekonomik yapısının araştırılması

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ABSTRACT

This study was conducted on 8 provinces (Adana, Antalya, Burdur, Hatay, Icel, Isparta, K. Maras and Osmaniye) located in Mediterranean region of Turkey. Data were collected from 198 freshwater trout farms by face to face survey technique in 2005. In the study, current status of trout farms was determined based on socio-economic indicators where solutions to the problems were suggested. In the context of this study, survey results indicate the characteristics of fish farmers demographically, socially and economically. The trout farmers are in the middle class age (66.5%), and educated at high school or below (78.3%). Trout farms are classified according to property ownership generally as private farm (76.8%). On the economic standpoint, farmers do fishery in concrete pools at land (87.9%) and the capacity of these pools vary from 2 to 16 tons (62.6%). Farmers use their own capital for their finance (78.8%). They employ generally less than 9 persons who have no professional knowledge (55.9%). As water sources, farmers prefer spring water (53.6%) and use extrude feed (60 %). Generally they have hatchery places (55.1%) and sell trout generally to agents and brokers. At last, all farmers are eager to make investment for their future. In the context of study findings, it could be suggested that water quality should be monitored and laboratory analysis should be done carefully. High quality fry production should be planned for farmers' demand oriented. Substrates for trout production should be arranged according to regions characteristics. Marketing problems and qualified labor should be solved in the future.

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ÖZ

Bu çalışma, Türkiye'nin Akdeniz Bölgesinde bulunan 8 ilde gerçekleşmiştir (Adana, Antalya, Burdur, Hatay, İçel, Isparta, K.Maraş ve Osmaniye). Çalışmada elde edilen veriler, 2005 yılında 198 alabalık çiftliğinden yüzyüze anket yoluyla elde edilmiştir. Bu çalışma, alabalık çiftliklerinin sosyo-ekonomik göstergelerinin belirlenmesi ve bazı sorunlarının çözümlerine yönelik olarak hazırlanmıştır. Çalışma kapsamında anket sonuçları balık çiftliklerinin demografik, sosyal ve ekonomik özelliklerine göre sınıflandırılmıştır. Öncelikle, alabalık çiftçileri orta yaş sınıfında (%66,5), lise ve öncesi okullarda eğitilmiş (%78,3) oldukları saptanmıştır. Alabalık çiftlikleri, mülkiyet yapısına göre ise genellikle mülk tipi işletmeler olduğu görülmektedir (%76,8). Ekonomik anlamda, çiftçiler balıkçılığı karada bulunan havuzlarda (%87,9) yürütmektedirler ve bu havuzların kapasitesi 2-16 ton (% 62,6) arasında değişmektedir. Çiftçilerin finansman kaynakları öncelikle özsermayeleridir (%78,8). İstihdam açısından bu çiftlikle genellikle 9'dan az sayıda kişi çalışmaktadır ki bu kişilerin mesleki anlamda deneyimleri bulunmaktadır (%55,9). Su kaynakları açısından çiftçiler kaynak suyunu tercih etmekte olup (%53,6) ekstrude yem (%60) kullanmaktadırlar. Genellikle kuluçkahane yerleri çiftçilere ait olup (%55,1) alabalık satışlarını aracılara yapmaktadırlar. Sonuç olarak bütün çiftçiler, kendi gelecekleri için yatırım yapma istediğindedirler. Bu çalışmanın kapsamında bulgularla, su kalitesinin izlenmesi gerekliliği ve laboratuar analizlerinin uygulanması gerekliliği ortaya çıkmıştır. Yüksek kalitede yavru balık üretimi çiftçilerin talebine göre planlamalıdır. Alabalık üretimi için yetiştirme ortamı bölgelerin özelliklerine göre ayarlanmalıdır. Pazarlama ve vasıflı eleman ihtiyacının ise yakın bir zamanda çözülmesi gerekmektedir.

1. Introduction

Turkey has great potential in terms of water resources for aquaculture. However, economic data about GDP contribution from fisheries sector (including catching, aquaculture, processing and other support services) is only about 0.4% and 2.7% of the Turkish agricultural production (FAC 2007; MARA 2007).

Yilmaz et. al (2008) addressed that aquatic production was about 140 million tones in the world and Turkey's share was 0.4% (551,000 tons) in 2004. The aquaculture sector has developed in the last decade in Turkey. The volume of production has increased 250% and it corresponds to 128,943 tons. The increase of fish production realized because the development of growing (MARA 2007). Both fisheries and aquaculture sector has great importance. Especially small-scale farms provide a vital source of food, employment, and economic well-being for rural people throughout the world (Bene and Neiland 2003).

Main aquactic products which were grown in sea are bream (335,000 tons), seabass (41,900 tons) and trout (2,740 tons). The other aquatic products are 2,700 tons which are shrimp, mussel and etc. (MARA 2008a; MARA 2008b). The proportinal dispersion is as follows; bream (53%), seabass (41%), trout (3%), mussel 1% and others (2%). Rainbow trout (*Oncorhynchus myskiss*) is the main type of inland aquaculture production. The quantity level has reached to 58.433 tons in 2007 (MARA 2008a; MARA 2008b). Rainbow trout is generally consumed in domestic market and it is supplied to markets as fresh product.

Fish types could be grown in different substrates and methods. In Turkey there are mainly 3 sub sector of fishery. These are catching, aquaculture (farming in inland and marine) and fish processing. Farming method in inland and sea is the way of aquatic products production. Since the method began to implemented, the quantity of production has increased both inland and sea. Trout farming mostly implemented in Aegean Region with 19,792 tons, then Mediterranean Region (9,594 tons), Black Sea Region (9,414 tons), Central Anatolia Region (8,954 tons), Marmara Region (5,936 tons), Eastern Anatolia Region (3,836 tons) and Southeast Anatolia Region (907 tons) was followed respectively (MARA 2008a; MARA 2008b).

As population increases the necessity of proper foods also increases in the world. Fish and aquaculture products are important for daily diet for human. According to Ministry of Agriculture and Rural Affairs (MARA) data for 2005, annual per capita consumption is only 7.6 kg which is quite low while comparing the average of 22 kg in the EU and 13 kg in the world (Hoşsucu et al. 2001; MARA 2007). To increase aquatic products depends on many factors such as disposable income and education level, consumer preferences and the variety of products etc. Trout farming is considered as good sources for meeting consumer fish demand. Therefore, government supports aquaculture to increase production and consumption as well. Because consumers demand for animal based protein nutrition could have meet by aquatic products. Aquaculture support scheme was launched in 2006 as for € 22,400,000. Also fishermen and fish farmers benefitted from the subsidized credit scheme. State aid for fishery and aquaculture sector has planned for long time period to develop the sector.

The institutional aspect of aquaculture development is well established under the authority of the (MARA). Regulations correspond to licensing, health and environmental regulations. The primary law concerned with the regulation of aquaculture is the Fisheries Law Act No. 1380 of 1971 and the Aquaculture Regulation No. 25507 of 24 June 2004 (FAO 2009).

There are some research conducted about efficiency and cost studies on aquaculture in Black Sea Region (Bozoglu et al. 2007; Bozoglu and Ceyhan 2009a; Bozoglu and Ceyhan 2009b). Main results of these studies are results also suggested that there were positive relationships between cost efficiency and pond tenure, farm ownership, experience of the operators, education level of the operators, contact with extension services, off-farm income and credit availability. Also the education level of operators, feed use and capital use positively affected trout production, whereas the stocking density and pond size negatively affected trout production were found outcome of the studies.

Previously there is not such a field study about aquaculture in Mediterranean region. The aim of this research is to determine factors affecting socio-economic structure of trout farming in Mediterranean region in Turkey. In this study, freshwater trout farms characteristics were evaluated by doing survey with farmers in research region.

2. Materials and Methods

This research study was conducted on 8 provinces (Adana, Antalya, Burdur, Hatay, Icel, Isparta, K.Maras and Osmaniye) located in Mediterranean Region of Turkey (Figure 1). In total, there were 198 freshwater trout farms recorded by MARA in research area in 2003. All farms were included in the study: 68 from Antalya, 42 from Isparta, 33 from Burdur, 19 from K.Maraş, 18 from İçel, 13 from Adana, 3 from Hatay and 2 from Osmaniye. Sampling method is not used because all of the farms were included to scope of the study. In freshwater trout farms, only trout was produced. Data were collected from trout farms by using survey technique based on face to face interview by using questionnaire forms. It was interviewed with all trout farms in 2003.

Figure 1. Research area in Turkey.

3. Results and Discussion

3.1. Settlement area and road conditions

Most of the trout farms are located at villages (65%). Then, town (16.7%), community (12.1%) and province respectively (6.1%) (Figure 2).

Closeness to water resources is important that determination of establishment of farms. It has been known that water inland potential is higher in villages than other places.

A majority of trout farms (88%) has 0-20 km distance to the nearest settlement places. The others are located at 21-50 km (9.6%) and far than 51 km. distance (1.5%) (Figure 3).

Closeness to settlement places is an advantage for both fish marketing and transporting and other logistical facilities.

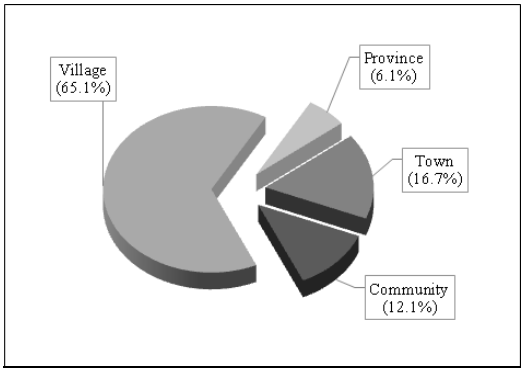

Figure 2. Farms by settlement place type.

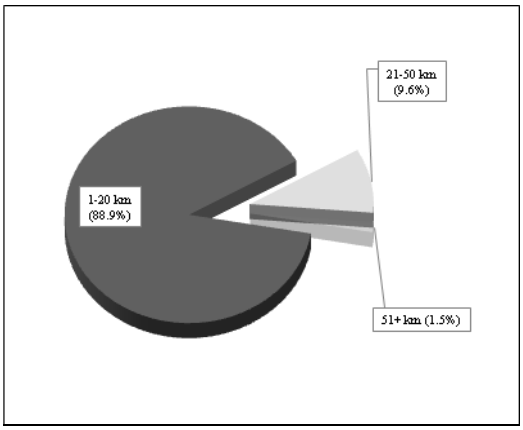

Figure 3. Farms by distance from settlement place.

Beside closeness to road advantage, road type which is used for transportation is also important for trout farms. Because, distorted and inconvenient roads leads to time wastes, crop losses during transportation and also increase maintenance costs for vehicles. According to research findings, the road types to reach farms are 68.2% asphalt, 22% gravel and 10.1% unimproved road (Figure 4).

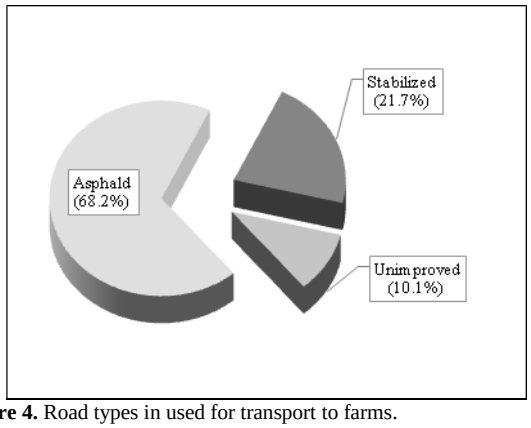

Figure 4. Road types in used for transport to farms.

It is expected that the most convenient road type is asphalt for all farms for transporting. Due to closeness to water resources, some farms prefer founding farms near at inconvenient places in terms of road types.

3.2. Foundation and production capacity

A majority of trout farms were mostly established in the period of 1990-1995 (32.8%) and 1996-1999 (37.9%) in Mediterranean Region in Turkey (Figure 5).

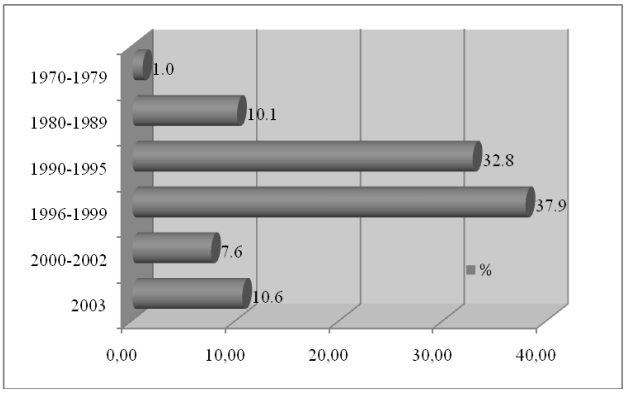

Figure 5. The percentage of trout farms in total by foundation year (Total number:198=100%, Total capacity: 3.102 tons year=100%) (ton=mt=metric ton).

Major part of total situated capacity was also established at the same period. In this period, support and incentive policies on fishery investment were affective on this development. Today, different support tools like premium support, low rate of investment and management credits have utilized for fishery still. As a matter of fact, today farm capacity and production quantity increased 2.5 times more than research period in 2003. According to the latest data, total trout production quantity is 57,659 ton year in both inland and sea. The numbers of total inland trout farms are 1,288 and their capacity is 56,026 ton/year. Almost all of the production (97.1%) has done in inland area (MARA 2007).

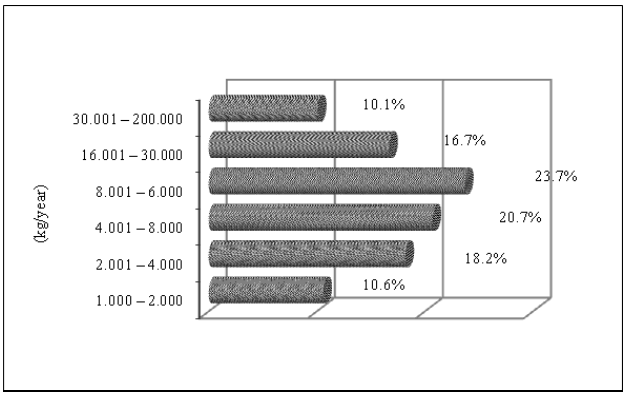

Figure 6. The distribution of farms by situated capacity (%)(Total farm number:198=100%).

Situated capacity of farms changes between 1 and 200 tons during the research period. Generally most of the farms (198 farms) have less than 30 ton/year capacity (89.9%). This fact explains that most of the farms have small scale production capacity in this region. The ratio of these farms among total situated capacity (3,102 ton/year) is 49.9%. However, farms which has more than 30 ton year capacity ratio is 26% among the total number of farms and 50.1% of total capacity (Figure 6)

During research period, inland trout farm number and their total capacity dispersion geographically in Mediterranean

Region are as follows; Antalya has high ratio in terms of farm number (34.3%) and their capacities (29%). Isparta, Burdur and Maraş follow Antalya respectively (Table 1).

These four provinces have superiority with their number of farms and their capacities (80%). Also all farms are producing actively in these provinces (Table 1).

Table 1. The capacities and numbers of farms by districts in research region.

Provinces	Farm number	(%)	Capacity (ton/year)	(%)
Antalya	68	34.3	899.1	29.0
Isparta	42	21.2	547.6	17.7
Burdur	33	16.7	666.0	21.5
K.Maras	19	9.6	424.0	13.7
İcel	18	9.1	208.0	6.7
Adana	13	6.6	299.5	9.7
Hatay	3	1.5	40.0	1.3
Osmaniye	2	1.0	17.9	0.4
Total	198	100.0	3 102.1	100.0

3.3. Financial resources for investment

Generally own resources are preferred during the establishment of farms. Farms which has insufficient financial own resources receive credit for investments from public and private banks or benefit from other public owned (ministry, municipality and other) investment incentive tools. However, general tendency for farms are using own capital for investments. Thus, 78% of total farms in research area use own financial resources and the rest of 22% of total farms own financial resources are used beside credit, investment incentives and other financial resources (Table 2).

Table 2. Trout farms according to financial resources.

	Farm number	(%)	Capacity (ton/year)	(%)
Own resources	156	78.8	1 941.6	62.6
Own resources and credit	32	16.2	997.5	32.2
Own resources and incentive	6	3.0	101.0	3.3
Others	4	2.0	62.0	1.9
Total	198	100.0	3 102.1	100.0

3.4. Growing systems used

Inland trout growing is applied in ponds or channel system in land. On the other hand, cage system is applied in dam, lake or river. Among these systems water channel and ponds are the most preferred. The shape of pond or channels can be square, rectangle or circle according to preferences (Yilmaz et al. 2008; FAC 2007).

Growing conditions in ponds and channel system are mostly preferred among farms (87.9%) in research area. Especially farms in K.Maras and Osmaniye provinces are suitable conditions and facilities for ponds or channel systems. Cage system in river, dam and lake is rarely preferred (12.1%) in Mediterranean Region (Table 3).

Types of pond and cage preferred: A majority of farmers prefer to concrete pond type for growing activity (Figure 7).

Table 3. Trout farms according to systems used.

	Farm number	(%)	Capacity (ton/year)	(%)
Ponds in land	174	87.9	2 127.6	68.6
Cages in river	7	3.5	260.0	8.4
Cages in dam-lake	17	8.6	714.5	23.0
Total	198	100.0	3 102.1	100.0

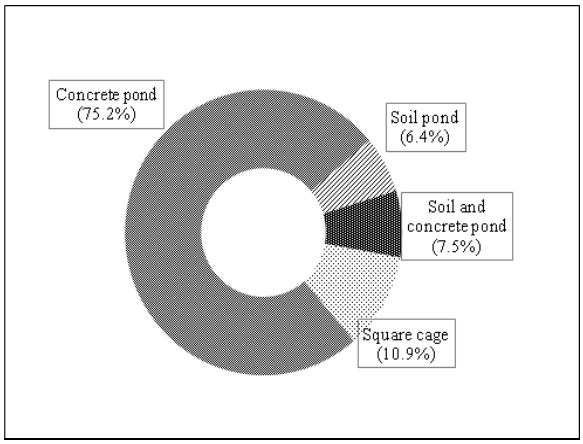

Figure 7. Pond and cage types preferred for trout farms (Total farm number:198=100%).

3.5. Farm management and land ownership

Trout farms are managed mostly by private ownership (76.8%) and private farms (19.7%) in research area. Their capacity shares in total farms in this area are 57.9% and 39.8% respectively. Public and cooperative owned farms are so rare and their share only 1% of total farms (Table 4).

Table 4. Trout farms by management types.

	Farm number	(%)	Capacity (ton/year)	(%)
Private property	152	76.8	1 794.6	57.9
Private firm	39	19.7	1 234.5	39.8
Cooperative	2	1.0	34.0	1.1
Public	2	1.0	30.0	1.0
Other	3	1.5	9.0	0.2
Total	198	100.0	3 102.1	100.0

Approximately half of the number of trout farms which prefer ponds system in land has their own land (49.5%). The other groups of farms lease land from public sector (34.8%). Leasing land from private sector proportion is 15% of total farms (Table 5).

Table 5. Ownership of trout farm land.

	Farm number	(%)	Capacity (ton/year)	(%)
Owned	98	49.5	1 137.9	36.7
Newly purchased	1	0.5	7.5	0.3
Rent from private	14	7.1	237.2	7.6
Rent from public	69	34.8	1 551.3	50.0
Other	16	8.1	168.2	5.4
Total	198	100.0	3 102.1	100.0

Leasing option is so common for establish aquaculture farms in Mediterranean Region like other regions. Leasing duration changes according to farms but it takes generally 5-10 years. Some of the farms lease spring water beside land from public sector. Producers who prefer cage systems in river or lake pay the leasing cost to public authorities because of benefiting river and land. The demand of producers about renting is the ownership of the farm land should be governed under MARA control. Also producers wish that the renting costs should keeping at low level and the duration should be at least 15-30 years.

3.6. Employment, gender, age and education

Total employee number is approximately 50-100 thousand in Turkey for aquaculture sector. Generally, 90% of total employment dedicated to catching (sea and inland) and 10% of them engaged in aquaculture processing and growing fields of aquaculture. It is estimated that 6 thousand people are employed in growing field of aquaculture. Almost the entire fishery boats are operated by owners. About 66.65% of the farmers work in fishery boats for their profit and the rest of them work as laborer in the boats (FAC 2007; MARA 2007).

All grower farms sustain their production with utilizing family labor and hired labor permanently or temporarily. Generally small scale farms employee family labor and middle or big scale of farms hire permanently or temporarily beside family labor. According to research findings, most of the trout farms are "small scale firm" and their employee is based on family labor. These trout farms can be called as family farms. Generally trout farms employee (82.3%) 1-2 person among total farm number and their capacity is 63.1% in total capacity of farms (Table 6). Total employee person in trout farms is 522 and average personal number is 2.64 per farms.

The number of men employee is high in fishery boats. Contrarily, 10% of total employee is women at growing departments of farms and 70% in management departments (FAC 2007). Total employment dispersion in terms of gender in research area is as follows: almost the entire employee is men but the 6.6% of farmer is women.

According to research findings, age of farmers differ between 19-79. Farmers are mostly middle aged. The share of farmers between 30-59 years old is higher in total number. Average trout farmer age is 46.34 (Figure 8).

Table 6. Trout farms with employment status.

Employee	Farm number	(%)	Capacity (ton/year)	(%)
1 - 2	163	82.3	1 957.1	63.1
3 - 4	20	10.1	421.0	13.6
5 - 6	9	4.5	339.0	10.9
7 - 8	4	2.0	160.0	5.2
≥ 9	2	1.0	225.0	7.3
Total	198	100.0	3 102.1	100.0

According to a project result which was conducted in Black Sea Region, age interval is 25-70 and average age is 46.5 (Çeliker et al. 2006).

In the Mediterranean region, farmers are educated generally elementary school (39.9%). But the proportion of high school education level is also high (38.4%) (Figure 9).

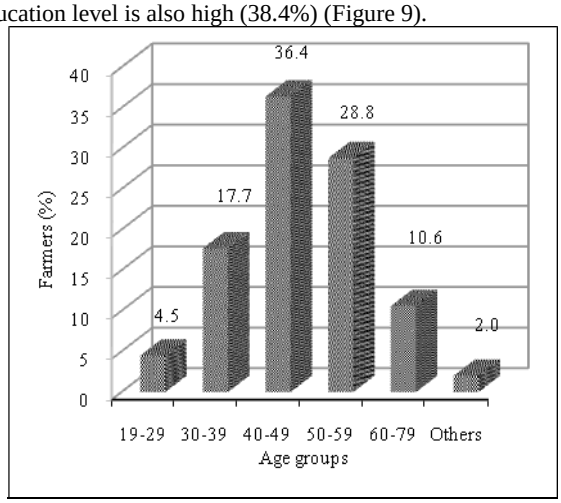

Figure 8. The share of farmers according to age groups (Total farmer number:198=100%).

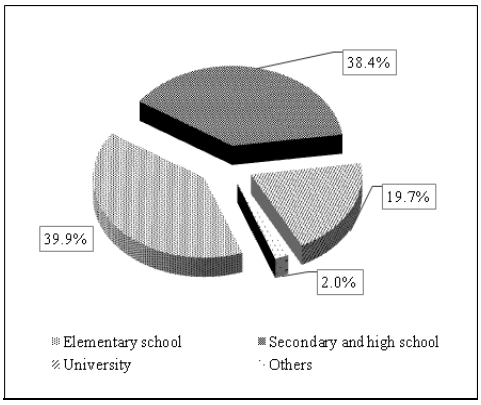

Figure 9. Education level of trout farmers (Total farmer number: 198=100%).

3.7. Previous occupation of farmers

The farmers were engaged in agriculture before trout growing (39.8%). The ratio of farmers who were in trade business, retired from other jobs, engineer or worker in other sector previously are; 15.8%, 10.5%, 7% and 3.5% (Figure 10). Farmers who worked at other business before aquaculture sector are 23.4%.

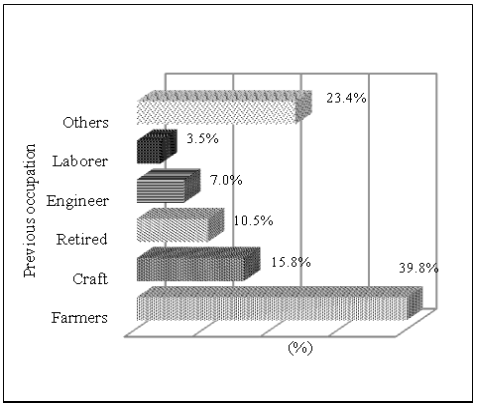

Figure 10. Previous occupation of farmers (Total trout farmer number: 198=100%).

3.8. Feed consumption

There is 12 *factories* which produce fish feed. Domestic mixed fish feed demand is approximately 200 ton year and the most of this quantity (2/3) supplied by domestic farms. However, there is dependency to other countries on raw material for production like fish oil and fish powder besides some technical equipment needs and diversified additional materials (FAC 2007). Farms preferences about feed usage were investigated in this study due to its importance. The 59.7% of farms use extrude feed and 40.3% of them don't use it (Figure 11).

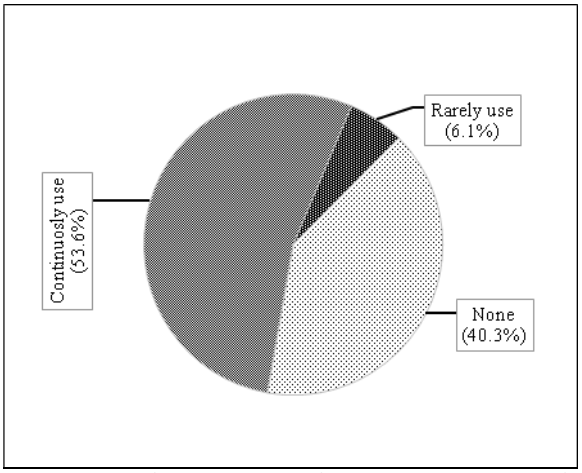

Figure 11. Trout farms by extrude feed consumption (Total farm number: 198=100%).

In using of other feeds by farms, pellet feed comes in first order with 89% in total farm number. Fresh and granulated feed are rarely used in farms and the ratio is just 3% of total farms (Figure 12).

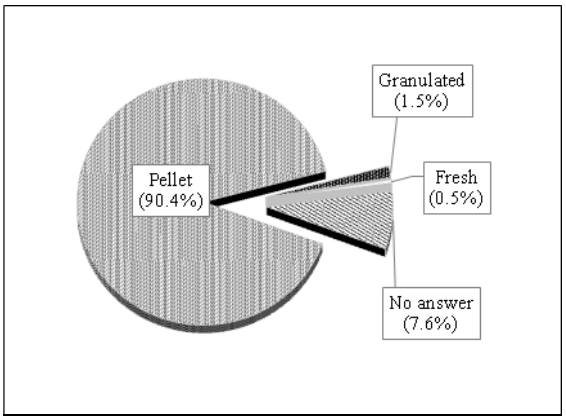

Figure 12. Trout farms by other feed consumption (Total farm number: 198=100%).

3.9. Water resources

Generally trout farms in inland use river, dam-lake, spring water or small river choices as those sources. Farms obtain water from mentioned resources or utilize those sources as growing substrate. Farms choose the water resources alternatives regarding as most convenient and suitable for growing conditions in located area. As a matter of fact, farms in research area prefer water resources according to mentioned reasons. The number (53.6%) of farms prefers to use spring water. Then the other options followed respectively (Figure 13). In general, farms in research area consider that water quantity for trout growing is sufficient (Figure 14).

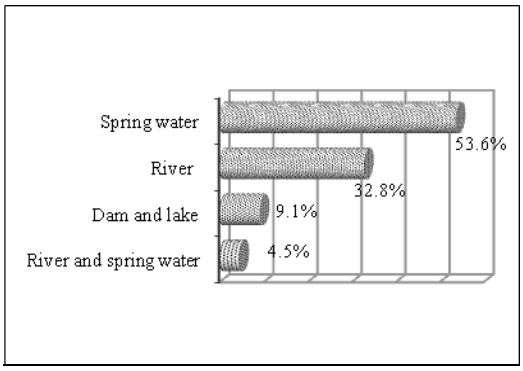

Figure 13. Farms according to water resources used (Total farm number: 198=100%).

3.10. Hatchery availability

Hatcheries are available at farms which have big scale production capacity. First of all, big scale farms would like to meet juveniles (fry, fingerling etc.) from owned resources because of costs and other reasons. However, small scale farms buy juveniles from other big farms which have hatchery.

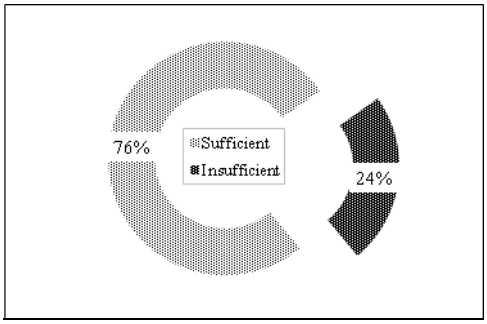

Figure 14. Farmers' comments on water quantity (Total farmer number: 198=100%).

According to findings, 55% of farms have hatchery and juveniles growing substrates. These farms have the 57.3% of total production capacity in the research region (Table 7).

Table 7. Farms by hatchery availability.

	Farm number	(%)	Capacity (ton/year)	(%)
Present	109	55.1	1 777.1	57.3
Absent	89	44.9	1 325	42.7
Total	198	100.0	3 102.1	100.0

The output rate is higher in eggs; egg quality and maintenance requirements are necessary for suitable hatchery quantity and quality of water is to be effective. The most used water resources are spring water (78.9%) and river (16.3%) and rest of (1.8%) followed respectively.

3.11. Fixed capital

Fixed capital existence subject to farms scale. For example, 92.9% of total farms have feed stock room and 88.4% of them

have farm building. Some farms have also other fix capital such as restaurant, selling office, motel, vehicle, boat and etc. (Figure 15).

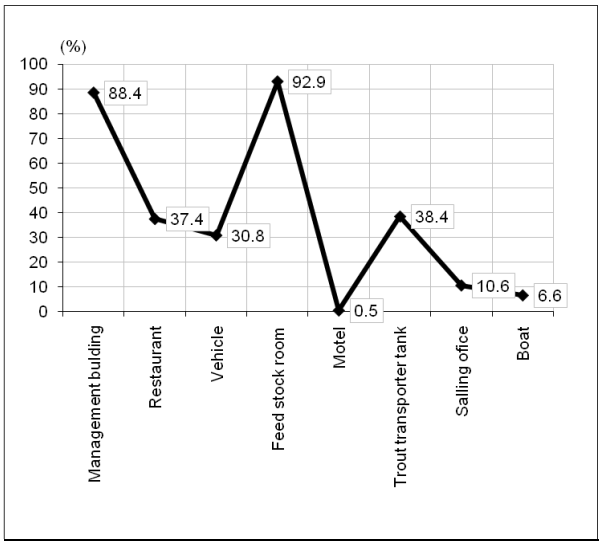

Figure 15. Farms by fixed capital (Total ratio for each fixed capital: 100%).

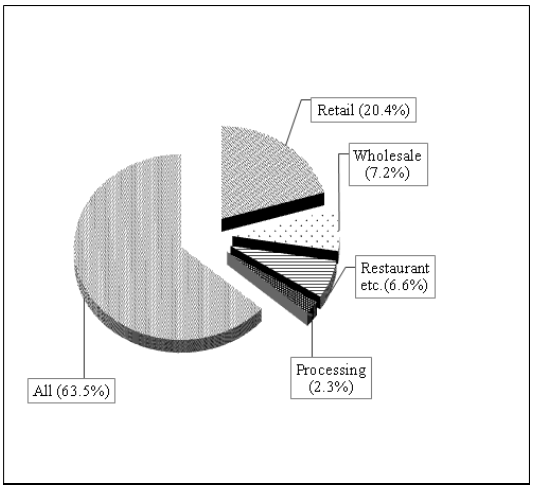

Figure 16. Trout marketing channel in research areas.

3.12. Marketing channel

Farmers sell trout generally to agents and brokers. But there is no correct data about that. According to research finding, only wholesale marketing type of the trout farms are not common (7.2%), only selling to processing founds (2.3%) and restaurant etc. (6.6%) are also not common. Despite that, majority of entrepreneurs' (63.6 %) use all mentioned type of marketing channels and the rest of them use (20.4%) only retail marketing channel (Figure 16).

4. Conclusions

In the context of this research, survey results indicate the some characteristics of fish farmers demographically, socially and economically.

- Firstly; fish farms are in the middle class of age (66.5%), educated at high school or below (78.3%).
- Secondly; fish farms are classified according to property ownership generally as

  private farm (76.8%).

Third one is on the economic standpoint, briefly we can say those:

- A majority of farms do fishery in concrete pools at land (87.9%),
- They use their own sources for their finance (72.2%),
- They employ generally less than 9 person who has no professional knowledge

  (55.9%),
- Production capacity of farms vary between 2 and 16 tons (62.6%),
- They prefer spring water (53.6%) and
- They have positive tendency for an investment in the future.

The consumption of fish is quite low in Turkey. It is essential to increase the amount of consumption quantity for human daily protein needs. Trout farming is one of productive way that accessing high quality and cheap fish from market. Therefore government support trout farming in marine and inland. It should be also require doing projects for changing consumer habits for fish consumption instead of red meat. Trout is consumed generally in domestic market as fresh. To increase the value added for trout sales it should be supply to market as processed forms. About fish farming, general constraints of the sector are determined as inputs, lack of credit facilities, inadequate extension services, pollution, high cost of equipment and ecological problems like over flooding (Ofuoku et al. 2006). The other problem arises from prices of fish feeds. Fish feed prices are high due to import prices and fish prices are quite low. Due to trout farms are operated by small scale farmers, the input prices cause the sustainability of production in terms of high costs. Fish feed and other input market should be regulated by regulations and new agricultural policy tools should generated.

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