STRUCTURAL AND ECONOMIC ANALYSIS OF TROUT BREEDING FARMS IN KASTAMONU PROVINCE[1]

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Abstract: In this research, the structural and economic analysis of the enterprises that produce trout in net cages raceway systems in Kastamonu province were carried out. The data regarding the operations are obtained through a questionnaire applied in 2015. For each of the enterprises, the average production of trout in the cages is 3.920 m^3, and the average production in the land is 1.124 m^3. The amount of fish produced per fishing net in the cages was determined to be 30 tons and 14.05 tons per unit land in the raceways. Juvenile fish production in net cages of those who buy the whole network by the production of trout. % 66.67 of enterprises engaged in production of the land by way of milking percent, %33.33 third of the young fish make by purchasing production. All of the enterprises engaged in the production of trout in cages and poools, use fish production-ready pellets and baits. The average weight of the trout in all enterprises was around 200-250 grams, and they were sold at 7-14 TL/kg,. For a large-sized enterprise, all of gross output (portion) is the sales of fish. In the enterprises growing trout in fishnet cages, the most important share of capital in the in total assets is building-pool-cage (%57.82). In the enterprises growing trout on land, the largest share of capital belongs to building-pool-cage (%40.14). The largest share in gross revenues for large size fish enterprises is selling. Feed costs, production of trout in the lattice fishnet of business enterprises and the highest share of production costs (respectively %55.81 and %53.67) has. The highest share of land in the enterprises to fry costs (respectively %46.61 and %44.82) belongs to.

Key Words: Kastamonu, trout, business, structural analysis, economic analysis

JEL Codes: A1, A10

1. INTRODUCTION

Aquaculture is an animal or plant organism that lives in inland water or in the sea, supported naturally or externally. However, when it is mentioned in our country, the first things that come to mind are fish culture, breeding and hunting at certain rates (Dogan et al., 1997; Elbek, 1992; Demir and Sonmez, 2008).

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When our country is examined in terms of aquaculture farming, it has a great potential with rivers in a total length of 175.715 km, 8.333 km of coastline, 200 lakes with the size of 906.118 hectares, reservoirs with a total area of 227.621 hectares, more than 750 pounds in the size of 15.500 hectares (Kocaman et al., 2002).

Rainbow trout is the most commonly cultivated fish species in Turkey. The habitats of the trout are cold, clear, clean, large lakes and ponds that are rich in oxygen. The cultivated trout species are divided into two groups: European and American trout. The most commonly cultivated trout species are; brouk trout, arctic char, shrub trout, lake trout, sea trout and rainbow trout (Demir et al., 2014). In Kastamonu province, there are many rivers, ponds and reservoirs where trout farming, which is an important factor in the aquaculture sector, can be carried out. It is possible to say that this region has richer water resources compared to many other regions of our country. However, given the current production capacity, it has been observed that a significant portion of the water potential has not yet been utilized.

The first trout farming in Kastamonu started in 1983 in the concrete pools within the Ministry of Forestry and the first enterprise with official project was established in 1986 with a production capacity of 20 tons portion/year and 100000 unit seeds/year. In the following years, a company, which was doing cultivation in concrete ponds and in net cages of Germeçtepe Reservoir Lake, was established with 75 tons/year capacity; and the last one in 2013 was the establishment of 29 tons/year capacity cage fish farm in Germeçtepe Reservoir Lake, constituted by Faculty of Aquaculture in Kastamonu University. In this study, it is aimed to make constitutional and economic analyzes of the trout enterprises currently operating in Kastamonu province.

2. MATERIAL AND METHOD

Material

The data, which was obtained by conducting a questionnaire at the trout farms operating in Kastamonu province, constitute the material of the research. In addition, the archives of Kastamonu Food, Agriculture and Livestock Provincial Directorate and similar studies and researches, which have previously been made, has been utilized. The data in the study belongs to the 2015 production year. Kastamonu province has 11 rainbow trout production facilities registered to the Provincial Directorate of Food, Agriculture and Livestock.

Method

The valid unit prices have been taken into consideration for the assessment of the soil condition of the existing land, where the surveyed companies are installed.

For the value of the land, in which the production facilities within the scope of the research were located, the purchase and sale prices of the lands in that region were taken as basis.

For existing building-pool-cage values at production facilities, today's value was determined by calculating depreciation according to rebuilding prices in old establishments, and to worth prices in new ones.

Construction unit price lists were used to calculate the reestablishment costs of production facilities. In the production facilities within the scope of the research, the existence of tools-machinery-equipment was evaluated by the current values in the new ones and by deducting depreciation from the current purchase and sale values in the old

ones. To determine the value of fish in the enterprises, the existing fish assets in the enterprises were evaluated with the sales prices for 2015.

Whether or not the production facilities within the scope of the research were indebted or not, the amounts of the debts, the receivables and the monetary value in the enterprises were determined on the basis of the declaration of the enterprise managers.

The active capital interest in the enterprises covered by the research was based on the half of the 8% interest rate applied to the agricultural loans granted by Ziraat Bank to the farmers in 2015. Fixed operating costs of enterprises, in depreciation account, were; 5% for soil leveling, 3% for building-pool-cage value, 10-25% for tool-machine value and 25% for breeding fish value rates were used (Cetin and Bilguven, 1991).

3. FINDINGS AND DISCUSSION

The Features of the Enterprises

The Physical Features of Enterprises

In Kastamonu province, 2 enterprises have been farming in net cages in the reservoir and set lakes (Germeçtepe Reservoir Lake), and 9 enterprises have been farming trout on the land using different water sources. While 81.8% of the enterprises perform intensive breeding in concrete ponds, 18.2% perform semi-intensive breeding in reservoir lakes. 63.6% of the enterprises are located in the villages of the central district, 37.4% are in other districts, 9.1% in open field, 36.4% in the valleys and 54.5% in the mountainside. In the enterprises, 54.5% of the transportation is provided on asphalt, 27.3% on asphalt and stabilized roads and 18.2% only on stabilized roads. While 54.5% of the enterprises are farming trout on their own land, 45.5% of them are farming trout by renting the land. 54.5% of the trout enterprises obtain eggs and fries from their breeding by spawning, 45.5% purchase fries from other enterprises in the region, 22% of the businesses meet a need for fries by both spawning their own fish and purchasing from stores.

Labor Force Status in Enterprises

In trout production facilities in Kastamonu province, generally, both employees and employers work full-time and all year. The labor force in the surveyed enterprises was determined as 1.7 MBU (Male Business Unit) on average. The average annual labor force was set at 420 MBD (Male Business Day) per enterprise. The average daily labor force was 1.4 MBU, the largest was 7 MBU, and the smallest was 0.75 MBU. 76.5% of the labor force resources of the enterprises were made up of male labor force and 23.5% of them were female labor force.

General Features of Enterprise Managers and Employees

The average age of the managers of trout enterprises in Kastamonu province is 45.3 years; where the youngest is 30 and the oldest is 63 years old. The average age of employees in the enterprises is 39.4 years, where the youngest is 30 and the oldest is 50 years old. 50% of enterprise managers are primary school graduates, 30% are high school graduates and 20% are university graduates. It has been determined that 50% of enterprise owners do not perform any activities other than this work, and 50% are self-employed. While 70% of enterprise owners are not working in the agricultural field, 30% are engaged in agriculture.

60% of the enterprises engaged in pool farming have hatcheries, 70% of them have the juvenile fish breeding pools, 70% of them have the feedstock, 60% of them have the

breeding pools, 50% of them have the cooking and service units. Enterprises that have been farming in net cages use a boat to transport cages. There is no place that can be used as freshness protection unit and cold storage room at the farming facilities.

Water Usage Features of Enterprises

30% of the pool enterprises only use the river water, 30% use the river water as well as the spring water, and 20% only use the ground water as the source. All enterprises generally have a decrease in water level in the summer months. It was determined that the water temperature in reservoirs was 0-18 °C (surface) throughout the year, pH value was 7.2-7.8, and oxygen amount was 8.9 mg/L. In ground and river waters, it was determined that the temperature was 0-23°C, pH was 7.5-7.9 and the amount of oxygen was 6-10 mg/L.

Pools Properties in Enterprises

In farms operating in net cages, there is an average capacity of 3,920 m^3 per enterprise, of which 81.4% are breeding and 18.6% are juvenile fish care cages. On average there are 25 cages per enterprise. In the cage farming enterprises, the stock density is 9.5 kg/m^3. There is an average of 1524.2 m^3 pool volume per enterprise in the pool farming enterprises. 41.53% of this volume constituted as cultivation pools, and 19.9% are juvenile fish care pools, 7.24% are sales pools, 5.24% are breeding pools, 0.7% are incubation pools and 25.34% are soil pools. Pool cleaning periods of the enterprises; 50% does 1-2 times a year, 20% does every 6 months, 20% does every month, 10% does not do any maintenance and cleaning. 40% of the enterprises only uses lime, 20% uses lime and bleach, 10% uses NaOH and bleach as disinfectant.

Farming Features of Enterprises

70% of enterprises feed breeding fish to obtain eggs. The minimum number of breeding is 150 and the highest number of breeding is 600. The average number of breeding per enterprise is 197.9. As a general practice in breeding, fishes between 2-5 years old are reserved for breeding, and bred fishes over 5 years old are given to fish market. Generally the loss ratio in the enterprises is 14.8%. 50% of the enterprises produce fries in their own farm, 40% only buy juvenile fish from the fish markets and 10% of enterprises, despite their breeding fish production and farming, they purchase extra amount of juvenile fish, because the amount of juvenile fish that was obtained could not meet the production amount.

Marketing Features of Enterprises

24% of the total fish production of the enterprises is sold at retail, 24.3% is sold at restaurants and 51.7% is sold as wholesale. Sales price is 11.1 TL per kg in restaurants, retail average price is 9.7 TL, and wholesale average price is 9 TL. Sales weight of fish is 200-250 grams. While the enterprises were expressing the problems faced in the marketing phase of their products, 20% said that they got less demand, 20% said they had difficulty in delivering the products to the consumers, 20% stated that they had a marketing problem due to the fact that the product processing and evaluation facility did not take place during marketing stage.

Economic Analysis of Investigated Enterprises

Capital structure of the investigated enterprises

While active capital in pool enterprises consists of land, land reclamation, building-pool, breeding fish, tool-machine, fish, material-ammunition and money capital; it

consists of land, building, pool-cage, tool-machine, fish, material-ammunition and money in net cages enterprises. Passive capital is in the form of both debts and equity capital in both forms of production.

The average active capital values of the enterprises engaged in cage fishing were calculated as 302.655 TL. The most important share in active capital was building-pool-cage capital with an average 175.000 TL (57.8%). Following this, fish capital was 50.000 TL (16.5%), money capital was 28.500 TL (9.4%), material-ammunition capital was 25.000 TL (8.3%) and tool-machinery capital was 24.150 TL (8.0%) (Table 1). The average active capital value of trout farming enterprises in the pools was 354.160 TL. The most important share in the active capital of the pool fishery enterprises is the building-pool capital with the average of 142.171 TL (40.1%). Following this, land capital was 78.902 TL (22.3%), fish capital was 46.813 TL (13.2%), money capital was 28.429 TL (8.0%), material-ammunition capital was 20.750 TL (5.9%), tool-machine capital was 18.686 TL (5.3%), land reclamation capital was 15.125 TL (4.3%) and breeding fish stock was 9.115.8 TL (2.6%) (Table 1). The study by Yavuz et al. (1995) showed 35.40% share of building and pool capital, and the study by Korkmaz (2000) showed 77.26% share of building and pool capital. As can be understood, construction costs have the largest share in the establishment of trout production facilities. On the other hand, passive capital comes from debts with a level of 40.000 TL (13.2%) and the remaining 262.655 TL (86.8%) is in the form of equity capital. There is no land capital as the production in caged fishery enterprises takes place in reservoir lakes. In pool fisheries, about 26.786 TL (7.6%) of passive capital comes from debts and the remaining 327.374 TL (92.4%) is in the form of equity capital. In similar studies related to the research topic, the distribution of equity and debt within the passive capital were calculated, and they were calculated as; 100% (Yavuz et al., 1995), 99.22% and 0.78% (Soylu, 1995), 96.33% and 3.67% (Karatas et al., 2008), 96.1% and 3.9% (Aydin, 2000), 96.1% and 3.9% (Kocaman et al., 2002), 95.89% and 4.11% (Adiguzel and Akay, 2005), 92.2% and 7.8% (Elbek, 1981), 87.3% and 12.7% (Sayili et al., 1999) 85% and 15% (Rad and Köksal, 2001),respectively.

Table 1: Capital structures of trout enterprises in Kastamonu province

CAPITAL ELEMENTS	Cage Fishery Enterprises		Pool Fishery Enterprises	
	Value (TL)	Share (%)	Value (TL)	Share (%)
A. ACTIVE CAPITAL				
I. FARM CAPITAL				
1. Land Capital	--	--	78.902	22.3
2. Land reclamation Capital	--	--	15.125	4.3
3. Building-Pool-Cage Capital	175.000	57.8	142.171	40.1
II. ENTERPRISE CAPITAL				
1. Fixed Operating Capital				
a) Breeding Fish Capital	--	--	9.115.8	2.6
b) Tool-Machine Capital	24.155	8.0	18.686	5.3

2. Circulating Enterprise Capital				
a) Fish Capital	50.000	16.5	46.813	13.2
b) Material-Ammunition Capital	25.000	8.3	20.750	5.9
c) Money Capital	28.500	9.4	28.429	8.0
TOTAL ACTIVE CAPITAL	302 655	100.00	354 160	100.0
B. PASSIVE CAPITAL				
1. Debts	40.000	13.2	26.786	7.6
2. Equity Capital	262.655	86.8	327.374	92.4
TOTAL PASSIVE CAPITAL	302.655	100.0	354 160	100.0

Annual operating results of the investigated enterprises

1-Operating and production costs in the investigated enterprises

In the caged fishery enterprises. the total of operating costs was 255.298 TL and the total of production costs was 270.450 TL (Table 2). The largest share of operating costs was the feed cost with 142.500 TL (55.8%). Within the production costs, the highest share (52.7%) was still feed cost. The operating costs (100 m3) per unit area were determined as 8.100.42 TL and the production costs (100 m3) per unit area was determined as 8.951.09 TL. In the pool fisheries, the average cost per operation was 158.548 TL. Feed costs, like in cage fisheries, had the most important share with 73.900 TL (43.3%) in pool fisheries (Table 2). In the enterprises engaged in pool fisheries, the average production cost per operation was 170.478 TL. Within the production costs, feed costs had the biggest share with 73.900 TL (43.3%). In the enterprises engaged in pool fisheries, the operating costs (100 m^3) per unit area were determined as 14.105.69 TL/enterprise, and the production costs per unit area (100 m3) were 14.669.92/enterprise.

Table 2: *Operation and production costs of trout production in Kastamonu province*

COST ELEMENTS	Production Enterprises in Net Cages (TL)	Production Enterprises in Land (TL)
Juvenile Fish Costs	19.500	18.094
Feed Costs	142.500	73.900
Labor Costs	37.500	25.214
Chemical and Disinfectant Substance Costs	1.000	563

Heating-Lighting Costs	-	3.488
Repair and Maintenance Costs of Buildings and Facilities	10.000	2.750
Tool-Machine Repair Maintenance Costs	2.500	1.500
Drug-Vitamin Costs	2.500	1.375
Decrease in Inventory Value (Fish Loss)	7.500	5.063
Market Sales Costs	18.500	5.938
VARIABLE COSTS TOTAL (1)	242.000	137.744
Circulating Capital Interest (%5.58)	2.008.66	5.346.06
Management Costs (%3)	7.658.94	3.137.79
Building and Facility Depreciation	5.250	4.265
Tool-Machine Depreciation	6.038.75	4.672
Breeding Fish Depreciation	-	2.278.968
FIXED COSTS TOTAL (2)	13.297.41	16.561.87
TOTAL OF ENTERPRISE COSTS (3=1+2)	255.298	158.548
General Administration Costs (%3)	7.658.85	4.657
Active Capital Interest (%4) (4)	10.211	6.341.92
TOTAL PRODUCTION COSTS (5=3+4)	265.509	164.890
Variable Costs/100 m^3	5.792	12.254.80
Fixed Costs /100 m^3	369.25	1.473.47
Enterprise Costs / 100 m^3	6.161.15	14.105.69
Production Costs / 100 m^3	6.436.58	14.669.92

2- Gross products in the investigated enterprises

In caged fisheries, the production of juvenile fish was not performed and only the sales revenue was obtained from the fishes of the weight of 200-260 gr, Thus. caged fishery enterprises get all of their gross product values from their fish sales. While the enterprises that make pool fishery earn 0.3% of their income from the sale of juvenile fish, the gross product value of the fish sales of 200-260 gr is 99.7%. For the enterprises engaged in cage fishing, the value of the gross product amount (100 m^3) per unit area was calculated as 3.987 TL and the ratio of the gross profit to the active capital (gross profit value corresponding to each lira in the active capital) was calculated as 0.95. In the pool fisheries, the value of gross product amount was 17.410 TL and the ratio of gross income to active capital is 0.44 (Table 3).

Table 3: *Gross product value of trout enterprises in Kastamonu province*

Gross Product Elements	Cage Fishing Enterprises		Pool Fishing Enterprises	
	Value (TL)	%	Value (TL)	%
Juvenile Fish Sales	---	0.0	1.250	0.3
Large Size Fish Sales (Portion)	315.000	100.0	191.500	99.7
TOTAL GROSS PRODUCT	315.000	100.0	192.750	100.00
Gross Product/100 m^3	3.987		17.410	
Gross Product/Active Capital	0.01		0.49	

3- Net revenue and net profit in the investigated enterprises

In the enterprises that research was done, net revenue was found by subtracting operating costs from the gross product value and net profit was found by subtracting production costs from gross product values (Sayılı et al.. 1999).

For the enterprises engaged in cage fishing within the scope of the research, the net revenue of the product was found to be 74.402.5 TL/enterprise and the net profit value was found to be 59.549.7 TL/enterprise. For the enterprises engaged in pool fishery, the net revenue of the product was calculated as 39.013.80 TL/enterprise and the net profit value was calculated as 22.640.30 TL/enterprise (Table 4).

Table 4: *Net revenue and net profit values of trout enterprises in Kastamonu province*

	Cage Fishing Enterprises (TL/enterprise)	Pool Fishing Enterprises (TL/enterprise)
Gross Product (1)	315.000	192.750
Enterprise Costs (2)	255.298	158.548
Production Costs (3)	265.509	164.890
Net Revenue (4 = 1 - 2)	59.702	34.202
Net Profit (5 = 1 - 3)	49.491	27.860
Net Revenue / 100 m^3	1.511	3.034
Net Profit / 100 m^3	1.253	2.472

4- Profitability in the investigated enterprises

Profitability is defined as the ratio of the profits that an enterprise has gained over a certain period of time on the capital (active capital) used to obtain this profit. Profitability is an important measure used to indicate the year-end operating results of enterprises engaged in economic activity and used in the comparison of the enterprises (Sayili et al.. 1999).

Profitability values calculated in the enterprises covered by the research were calculated as 0.16% for caged fishery enterprises and 0.07% for land trout producing enterprises (Table 5).

Table 5: *Profitability ratios of trout enterprises in Kastamonu province*

	Cage Fishing Enterprises (TL/enterprise)	Pool Fishing Enterprises (TL/enterprise)
Net Profit (1)	49.491	27.860
Active Capital (2)	302.655	354.160
Profitability (3 = 1 / 2)	0.16	0.07

4. CONCLUSION

Within the scope of this study, structural and economic analyzes of trout farms were carried out in land and net cages in Kastamonu province. As a result of this research carried out with 10 trout enterprises registered to Kastamonu Provincial Food. Agriculture and Livestock Directorate, which are operational in Kastamonu province and in active condition:

- It has been determined that the enterprises are experiencing structural problems. Since the enterprises are small family type enterprises. the transition to the professional production model has not been achieved,
- Enterprises are limited in the amount and quality of production due to the fact that pools and buildings are about to fill their service life and economic life,
- The biggest problem in front of producers is undoubtedly the problem of feed. which is the biggest obstacle in front of fish farming. In all of the enterprises covered in the study, there were problems in supplying feed and problems of high prices,
- In the case of enterprises, the traditional production style, lack of agricultural publications. lack of sufficient technical staff. lack of knowledge, experience and skill and the difficulties in the provision of juvenile fish emerge as other elements to limit production. Inland water farms are usually medium-sized family enterprises and do not develope within themselves,
- Most of the enterprises in Kastamonu use retail and restaurant-oriented marketing strategy and there is no local market. Moreover, the problem of organizing the producers. the fact that the organizations are not sufficient and non-functional limits the producers' activities.

Kastamonu is a great potential for aquaculture, especially in cages where there are numerous reservoirs and ponds for fish farming. Although the aquaculture activities started in Kastamonu in 1983 and have increased in the 1990s. they are not sufficient, based on its potential. Kastamonu Provincial Directorate of Food. Agriculture and Livestock, and Kastamonu University Faculty of Aquaculture should organize publishing activities in the existing establishments in the region and inform them about the ways of improving their production and all financial assistance should be provided to better utilize the existing potentials of the existing small family enterprises.

All of the existing enterprises in Kastamonu province are experiencing great difficulties regarding feed prices and feed supply. The enterprises should be informed about the use of live and wet feed. which are both more nutritious and cheaper, rather than the higher-priced pellet feed. which is the biggest complaint. The enterprises should work together to initiate to establish a small-scale feed unit and produce their own feed. Having a close distance to raw materials of feed appears as an advantage.

One of the biggest problems of regional enterprises is the diseases faced in the aquaculture. Owing to the limited number of personnel specialized in the diseases of aquaculture and their harms, and the authorization of veterinarians, who are not fully knowledged about the issue, there are difficulties in interfering with various diseases that occur in the enterprises and no appropriate treatment has been applied. As a solution. Aquaculture Engineers and Fisheries Technology Engineers, who have knowledge about diseases and their damages, are required to be authorized.

Producers in the region cannot open up to big markets in the sense that the capacities of the enterprises in the region are small. To increase production. work should be done to develop market networks of small-scale enterprises and broader market opportunities should be provided by the government.

Due to the lack of processing facilities at the competent level in the region and the fact that producers do not have enough knowledge about the processing of aquaculture. the fish must be freshly consumed. Therefore, extra fish in the operation makes the producers unsettled. Aquaculture processing and evaluation facilities should be established with government support. producers should be provided with training on this subject.

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