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COMPARATIVE STRUCTURAL AND ECONOMIC ANALYSIS OF TROUT FARMS IN ANTALYA PROVINCE, TURKEY

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ABSTRACT

The research studied totally 19 farms; 78.9% of which were inland farms whereas 21.1% operated in the net cages. As for the legal status of the farms, 63.2% were private, 31.6% limited liability and 5.3% joint stock companies. The analysis of manpower of the farms showed that family manpower ratio was 1.32 manpower unit (MU). The highest MU was 0.84 for men and 0.12 for women for an age range of 15 to 49. It was determined that the inland trout farms had an active capital amount over ₺465 068 whereas those of the net cages was over ₺294 401. The operating costs of farms using net cages were ₺133 382 whereas those of the inland farms were ₺123 252. Feeding cost had the highest share in overall operating costs. Average profitability was 41.48% for the inland pond farms and 30.28% for the net cage farms.

Key words: Antalya, trout, facility, structural and economic analysis

ANTALYA İLİNDE ALABALIK İŞLETMELERİNİN KARŞILAŞTIRMALI YAPISAL VE EKONOMİK ANALİZİ

ÖZET

Araştırma kapsamında toplam 19 işletme incelenmiş olup, bu işletmelerin %78,9'unun karada havuzlarda, %21,1'inin ağ kafeslerde üretim yapmakta olduğu belirlenmiştir. İşletmeler hukuki yapılarına göre incelendiğinde, %63,2'sinin şahıs, %31,6'sının limited şirket ve %5,3'ünün de anonim şirket şeklinde bir hukuki yapıya sahip olduğu görülmüştür. İşletmelerdeki işgücü üzerine yapılan analizde aile işgücü oranının 1,32 EİB olduğu, en fazla erkek işgücünün 0,84'lük oran ile en fazla kadın işgücünün ise 0,12'lik oranla 15-49 yaş grubunda mevcut olduğu tespit edilmiştir. Havuzda alabalık yetiştiriciliği yapan işletmelerin aktif sermaye miktarlarının (465 068₺), kafes işletmelerinin aktif sermaye miktarlarından (294 401₺) daha yüksek olduğu belirlenmiştir. İşletme masrafları kafes işletmelerinde 133 382₺, havuz işletmelerinde 123 252₺ olarak hesaplanmıştır. İşletme masrafları içerisinde en büyük payı yem bedeli almaktadır. İşletmelerde rantabilite oranları işletmeler ortalamasında havuz işletmelerinde %41,48, kafes işletmelerinde ise %30,28 olarak tespit edilmiştir.

Anahtar kelimeler: Antalya ili, alabalık, işletme, yapısal ve ekonomik analiz

INTRODUCTION

Aquaculture is definitely one of the important resources in meeting animal protein requirements of increasing human population. Developed countries have created a new line of business in agriculture by productively using a variety of water resources and breeding fish, allowing them to provide a sufficient nutrient for domestic consumption and to generate an important income by exportation (Elbek 1981). Aquaculture has improved enormously, with the highest increase among the food producing sector. Rainbow trout is a highly important species for aquaculture not only around the world but also in Turkey. Turkish trout sector operates in the inland ponds and net cages in fresh and marine waters (Emre et al. 2011). Thanks to activities such as supplying raw materials to the industrial sector, creating employments, contributing to the rural developments and producing foodstuffs, aquaculture sector offers a significant contribution to Turkey's economy. In parallel with this, rainbow trout farms have become an important economic activity providing economic input and employment. The entrepreneurs have created systems of trout breeding, processing and marketing according to the free market rules (Doğan and Yıldız 2008). First attempts in aquaculture started in the inland waters and then extended to the seas. Although the trend at the beginning was to culture carp due to its easier breeding, today farmers prefer species with high economic values such as rainbow trout, gilthead sea bream and European sea bass (Sayılı et al. 1999). Cost analysis is the most effective tool for determining profitability and economic life cycle of species being cultured as well as of new species for aquaculture (Emre et al. 2011). According to the recent statistics announced by the Turkish Statistical Institution, majority of aquaculture production with 52.52% was from the inland waters and the remaining 47.48% from the sea in 2012. The leading aquaculture species in the inland waters is rainbow trout whereas in marine waters are sea bass and sea bream (Anonymous 2012). The goal of this study was to analyze rainbow trout farms in Antalya province in terms of technical status and financial performance.

MATERIALS AND METHODS

Material

Data for this study were obtained from questionnaires handed out to the farmers in Antalya. First of all, we requested an assistance of Provincial Directorates of Food, Agriculture and Livestock, Fisheries Research Institutions and Unions of Fish Farmers in the province and its districts in order to find out the number of rainbow trout farms. In the light of official and unofficial information from the institutions, 19 active trout farms in the area were included for the study. The surveys used as a tool of gathering information for the study were based on two essential goals. The first one was the structural analysis of the farms including rearing methods, volume, marketing methods, type of enterprise, nature of manpower etc. The second one was the economic analysis of farms such as active capital structures, profitability and efficiency of manpower. Production values and costs in 2010 were considered in calculation of data obtained from the questionnaires.

Method

A survey method was used for this study. Due to demographic characteristics of farmers in the area, it was inconvenient to let them fill out the questionnaires on their own. Hence face to face interviews were conducted to gather correct data. Work performance of the employers at the farms was calculated as manpower unit (MU) using coefficients which were based on age and sex of the individuals as seen in Table 1.

Table 1. Coefficients used for converting to manpower unit (Erkuş et al. 1995)

Age Groups	Male	Female
0-6	-	-
7-14	0.50	0.50
15-49	1.00	0.75
50+	0.75	0.50

The active capital of the farms consisted of land, land improvement, building and pond, broodstock fish and operational capital including instruments and machineries, fish, materials and instruments and money. The liabilities composed of the total of debts and equity capital.

The capital structures of the farms were examined on the basis of following structures (Sayılı et al. 1999):

• Land capital covered only the area of ponds used for

fish rearing. For the land capital, trade values in the studied area were considered.

• As for land improvement capital, the assessment was based on the costs for the new lands but reconstructing costs for old ones.

• For building, fishponds and net cage capitals, the costs of locally available commercial construction materials were taken into consideration. The depreciation was considered for this evaluation.

• The instrument-machinery capitals were assessed based on purchasing costs for the new ones but trade values for the used ones.

• For fish capital, those prices declared by the farmers and selling prices on the market were taken into consideration. The depreciation of broodstock fish was also taken into consideration.

• For materials and supplies capital, trading prices were accepted.

• For money at hand and receivables as well as debts, respondents declarations were considered. The depreciation values were obtained from the official documents. Maintenance costs of the buildings, ponds and instruments-machineries were taken from the farmers. As for calculation of amortization shares of fixed capital elements of the farms, 3.5% for land development capital, 11% for building-pond and net cage capital, 16.5% for broodstock fish and finally, 11% for instruments-machineries capital were considered. In the present study, capital structures of the farms as well as their annual activity outcomes (operational and breeding costs, gross income, gross revenue, net profit, profitability, work productivity) were determined. Operational costs mean all costs made for gross income excluding active capital interest or interest provisions. Operational costs are divided into two categories; fixed costs and variable costs (Karagölge 2001). Production costs are calculated by summing interest value of active capital and the operational costs (Karataş et al. 2008)). Although several descriptions of gross income exist, most commonly used and accepted one in an agricultural operation is that it is an expression of amount and asset values of the new products and goods produced as a result of economic activities within a period of one year and increases in amount and asset values in the capital sections by production, barter and reassessment (Açıl and Demirci 1984). Net income is a value created by capital invested or an annuity of active capital. Since net income means a return of capitals used in an enterprise, when all the costs (except capital interest) made for gross income are excluded from the income, the remaining amount will be net income. Accordingly, "Net Income=Gross Income–Operational Costs" (Karagölge 2001). Net profit is the amount remaining after deduction of production costs from gross income (Çetin and Bilgüven 1991). Profitability is a value indicating the revenue (profit) earned from capital used in an establishment. The share of revenues (net income), described as capital profitability, in gross income or income earned from the enterprise is an important criteria in determining profitability of the investment. This share or ratio is known as Profitability Factor and calculated as follows; Profitability Factor=Net Income/Gross Income*100 (Karagölge 2001). Work productivity is defined as a value calculated by dividing production achieved as a result of an activity by manpower used for that production (Çetin and Bilgüven 1991). For general administrative costs, 3% of variable costs were taken into consideration. As for the circulating capital interest, a rate of 9.75% obtained after excluding of subvention from a current interest rate of 13% of the Turkish Ziraat Bank in 2010 was accepted. The survey (full inventory) and SPSS 17.0 statistics package program were used to make an analysis to set forth the structural status of hatcheries and their economic conditions.

RESULTS

Structural Characteristics

Of 19 rainbow trout farms in Antalya, 78.9% (15 farms) were functioning in land based ponds whereas 21.1% (4 farms) net cages. In terms of types of main water intake systems of the land based farms, 66.7% were concrete flume, 20.0% soil flume and 13.3% PVC pipes. Besides, it was determined that majority of the farms (60.0%) supplied water separately to each ponds. Of the farms, 42.1% were situated in open fields, 21.1% along riverside (Manavgat Brook) and 15.8% in foothill zones. In terms of access roads to the farms, 52.6% were asphalt whereas 47.4% were stabilized. As for the legal status of the farms; 63.2% were private, 31.6% limited and 5.3% joint stock companies. Majority of the farms (56.3%) operated in their own properties, 37.5% in leased-lands and remaining 6.3% in own properties plus the leased-

lands. An evaluation of production type of the farms revealed that 57.9% (11 farms) only grew fish from juvenile to harvest size (i.e. they buy juvenile from the hatcheries), while the remaining 42.1% had a combination of a hatchery and ongrowing system. When it comes to marketing strategy, the farms were divided into five categories; 57.9% both retail and wholesale trade, 10.5% both retail and restaurants, 10.5% only retail and 10.5% only wholesale and 10.5% restaurant. Most of the farms (89.5%) were small-scale (0 to 49 tons/year) and remaining were 10.5% medium scale (50 to 499 tons/year). Above half the farms (63.2%) intended to increase their production capacities in time if the conditions are suitable. Membership percentage of a union was high (78.9%) with a consideration becoming a member appropriate their interests. Minority of the farmers (26.3%) used a working capital loan or investment loan while the remaining majority (73.7%) started up with their own capital. A query about cleaning frequency of the ponds and cages used by the farmers revealed that 42.1% cleaned periodically (weekly or biweekly), 36.8% monthly, 15.8% once every two to three months and 5.3% only once a year.

Manpower

The manpower analysis of the farms displayed that family manpower ratio was 1.32 MU with an age group of 15 to 49 for both sexes. The highest rate of male manpower was 0.84 MU while 0.12 MU for women. The hired labor ratio was 1.37 MU (Table 2).

Table 2. Family and hired labor by age groups at the farms analyzed (MMU)

		Family	Hired Labor
Age 7-14	Male	-	-
	Female	-	-
Age 15-49	Male	0.84	1.21
	Female	0.12	-
Age 50+	Male	0.28	0.16
	Female	0.08	-
Total	Male	1.12	1.37
	Female	0.20	-
	General Total	**1.32**	**1.37**

Capital Structure

Active Capital

The active capital of the farms was the farm and operational capitals. As seen in Table 3, the average total of active capital of the land based farms was ₺465 068 and ₺294 401 for net cages. Of the active capital in the land based farms, building and pond had the highest share whereas fish capital had the highest share in the net cages. The later was the second place in the land based farms. The ratio of fish capital in the active capital was 39.27% for the land-based farms and 60.00% for the net cage farms. The average active capital per "kg" was ₺15.87 in the land based farms and ₺9.90 in the net cage farms. The active capital per unit fish was ₺4.39 for the land based and ₺2.14 for the net cage farms.

Liabilities

The liabilities of the farms consisted of the total debts and equity capitals. The amount average farm debt was ₺6 705 for the land based and ₺38 492 for the net cage farms. The average equity capital was ₺458 363 for the land based and ₺255 909 for the net cage farms. The shares of the debts and equity capital within the liabilities for the land based and net cage farms were 1.44% and 13.07%, and 98.56% and 86.93% respectively. The debt and equity capital data of the farms investigated are illustrated in Table 3.

Annual Activity

Operational and Breeding Costs

The average of operational costs was ₺123 252 for the land based and ₺133 382 for the net cage farms. The average of total breeding costs was ₺133 268 for the land based and ₺144 950 for the net cage farms. The feeding cost had the highest share in rearing costs with a percentage of 55.43% in inland farms and 47.83% for the net cages. The operational and rearing costs of the farms are illustrated in Table 4.

Table 3. Capital structure of trout hatcheries analyzed in Antalya province

	Pond Averages		**Net Cage Averages**	
A. Active Capital	₺	%	₺	%
Hatchery Capital				
Land Capital	9 968	2.14	0	0.00
Land Improvement Capital	17 052	3.67	370	0.13
Building and Pond Capital	189 466	40.74	4 108	1.40
Net Cage Capital	0	0.00	39 400	13.38
Broodstock Fish Capital	5 920	1.27	10 000	3.40
Total	222 406	47.82	53 877	18.30
Operational Capital				
Instruments-Machineries Capital	6 507	1.40	21 438	7.28
Fish Capital	182 637	39.27	176 641	60.00
Material-supplies Capital	17 078	3.67	15 950	5.42
Money Capital	36 440	7.84	26 496	9.00
Total	242 662	52.18	240 524	81.70
Total Active Capital	**465 068**		**294 401**	
B. Liabilities	₺	%	₺	%
Debts	6 705	1.44	38 492	13.07
Equity Capital	458 363	98.56	255 909	86.93
Total Liabilities	**465 068**		**294 401**	

Table 4. Rearing costs of farms analyzed in Antalya

	Pond Averages		**Net Cage Averages**	
Cost Item	₺	%	₺	%
Feeding costs	68 313	55.43	63 800	47.83
Workmanship costs	16 034	13.01	25 848	19.38
Eggs and Seed Fish Costs	7 913	6.42	9 000	6.75
Heating and Lighting Costs	2 905	2.36	2 625	1.97
Chemicals and Disinfectant Costs	3 033	2.46	7 250	5.44
Maintenance-Repair Costs	1 000	0.81	2 000	1.50
Transportation Costs	1 717	1.39	6 313	4.73
Taxes	1 812	1.47	1 813	1.36
Total Costs	102 728	83.35	118 648	88.95
Circulating Capital Interest (9.75%)	10 016	7.51	11 568	7.98
Total of Variable Costs	**112 743**	**84.60**	**130 216**	**89.84**
General Administration Costs (3%)	3 382	2.74	3 906	2.93
Rental Costs of Farm Land and Water	7 265	5.89	5 050	3.79
Land Improvement Amortization	597	0.48	13	0.01
Building, Pond and Net Cage Amortization	7 579	2.74	1 740	2.93
Instruments-Machinaries Amortization	716	0.58	2 358	1.77
Broodstock fish amortization	986	0.80	1 666	1.25
Total Fixed Costs	**20 524**	**15.40**	**14 734**	**10.16**
Total Operational Costs	**123 252**	**92.48**	**133 382**	**92.02**
Total Breeding Costs	**133 268**	**100**	**144 950**	**100**

Gross Income and Net Incomes

The average of gross income was ₺210 608 for the inland pond farms and ₺191 303 for the net cage farms. The gross income-active capital ratio was calculated as ₺0.45 for the land based and ₺0.65 for the net cage farms. The former had an advantage in terms of gross income per unit fish since the amount was ₺1.99 in comparison with ₺1.39 for the later. The advantage in favor of the land based farms was further validated in terms of gross income per "kg" with ₺7.19 *vs*. ₺6.43. The average net incomes of the land based and net cage farms were ₺87 356 and ₺57 921, respectively. The average ratio of net income to the active capital was 0.19 for the land based farms whereas 0.20 for the net cage farms. The net incomes per fish quantity for the land based and net cage farms were ₺0.83 and ₺0.42, respectively. The land based farms were more advantageous in terms of net income per unit "kg" amount than the net cages with values ₺2.98 and ₺1.95, respectively. Gross and net income values of the farms are shown in Table 5.

Table 5. Gross income and net income values of rainbow trout farms in Antalya

	Pond Averages	Net Cage Averages
	₺	₺
Gross Income (1)	210 608	191 303
Gross Income / Active Capital	0.45	0.65
Operational Costs (2)	123 252	133 382
Gross Revenues (1-2)	87 356	57 921
Gross Revenues / Active Capital	0.19	0.20

Net Profit

The average net farm profit was ₺77 340 for the land based and ₺46 353 for the net cage farms. The values of net profit per "kg" in the same order were ₺2.64 and ₺1.56 whereas net profit values per unit fish quantity were ₺0.73 and ₺0.34. Net profit values of the farms are displayed in Table 6.

Table 6. Net profit values of the farms investigated

Antalya Province	Pond Averages	Net Cage Averages
	₺	₺
Gross Income (1)	210 608	191 303
Breeding Costs (2)	133 268	144 950
Net Profit (1-2)	**77 340**	**46 353**

Profitability

The average farm profitabilities were 41.48% and 30.28% for the land based and net cage farms, respectively, meaning that the net cage farms were more advantageous over the inland pond farms. The profitability rates of the farms analyzed are given in Table 7.

Table 7. Profitability ratios of the farms in Antalya

	Pond Averages	Net Cage Averages
	₺	₺
Net Income (1)	87 356	57 921
Gross Income (2)	210 608	191 303
Profitability (%) (1/2)	**41.48**	**30.28**

Work Productivity

Total production amounts of the land based and net cage farms in Antalya province and manpower required for those productions are presented in Table 8. A higher rate of production per workday was estimated for the land based farms with 32.33 kg/day than the net cages with 20.38 kg/day.

Table 8. Manpower productivity of the farms in Antalya

Productivity Elements	Pond	Net Cage
Annual Production Quantity (Kg/Year) (1)	29 300	29 750
Work period (Day) (2)	906	1 460
Manpower productivity (Kg/Day) (1/2)	**32.33**	**20.38**

CONCLUSION

Production activities continue throughout the year, resulting in a year around need of manpower Female manpower ratio in the present study was remarkably lower than male manpower since the culture works require a great deal of physical strength. Moreover, it was observed that when the family manpower was insufficient, foreign labor power was resorted to meet the requirement. The legal status evaluations showed that majority of the farms were "private companies". This is a direct result of the farms having established as small scale family entrepreneurs. The same applies to the farms' properties. Another conclusion drawn from the study is that majority of trout farms operated

in inland ponds and grew their fish directly from juvenile procured from an another hatchery to harvest size. In addition, a high proportion of the farms in both pond and cages made periodic cleanings between weekly or monthly intervals. A positive approach among the respondents was observed towards fish culture unions and majority of the farmers was a member of a union. The reason of this attitude appeared to be an idea that such organizations would facilitate product publicity and marketing as well as using government incentives. Findings of the current study showed that the active capital amounts of the net cage farms in Antalya were higher than those of the land based. The variable costs of the farms investigated seemed to surpass the fixed costs probably due to the former constituting the main costs of the farms. Due to larger production quantities, the land based farms had higher gross income compared with the net cage farms. Net income and net profit amounts displayed a similar trend. In terms of the profitability ratios, the land based farms were more advantageous over the net cages. The work productivity values of the hatcheries suggested that the inland pond culture had a higher rate of production per workday.

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