Aquaculture Production in Greece, 1980-1988

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ABSTRACT

Aquaculture production (excluding lagoons) in Greece increased from 2,000 t in 1980 to 3,900 t in 1988 with a mean production of 2,340 t representing 1-2 % of the mean annual fishery production in Greek waters. The mean 1986-1988 production was allocated as follows: 1983 t trout, 233 t carp, 132 t sea bream/sea bass, 570 t mussels, and 51 t other species (of which 7 t eels). The mean 1984-1986 production represented 0.4% of the mean (1984-1986) Mediterranean aquaculture production. A quadratic trend model explained 85% of the variability of aquaculture production in 1980-1988 and forecasts for 1992 amount to 7,900 t.

INTRODUCTION

Although aquaculture experience in Greece goes back to the 1950's, it is only since 1980 that aquaculture developed systematically; from 1981 to 1988 more than 12 million USD have been spent for the development plant of marine aquaculture (ANONYMOUS 1990) whereas more than 100 million USD were planned to be invested for aquaculture during 1987-1991 (KALLIFIDAS 1990). Here aquaculture production in Greece (excluding lagoons) is reviewed for 1980-1988. Yet, since forecasting of aquaculture production will be beneficial for the development of aquaculture infrastucture, forecasts are developed using decomposition (trend analysis) time-series techniques.

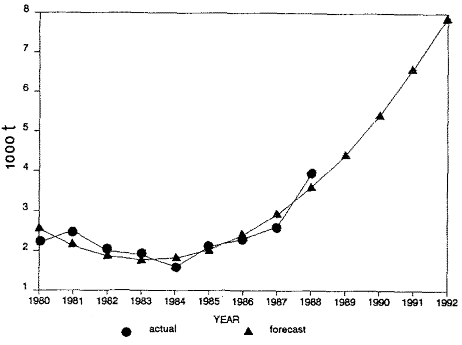

Fig. 1. Aquaculture production (excluding lagoons) in Greece, 1980-1988, and forecasts produced by the quadratic trend model (1980-1988: in-sample forecasts; 1989-1992: out-of-sample forecasts).

MATERIAL AND METHODS

Annual aquaculture production in Greece (excluding lagoons) for 1980-1988 and production per species (1986-1988) are taken from the Ministry of Agriculture, KALLIFIDAS (1990) and ARGYROU (1990). Trend analysis was used to model aquaculture production for 1980-1988 and, consequently, in-sample (1980-1988) and out-of-sample (1989-1992) forecasts were produced. The following measures of forecasting accuracy were computed: (1) Absolute Percentage Error, APE, (2) Mean Absolute Percentage Error MAPE, and (3) Mean Error (according to MAKRIDAKIS et al. 1983) and the coefficient of determination (according to SAILA et al. 1979).

RESULTS AND DISCUSSION

Aquaculture production (excluding lagoons) in Greece increased from 2,000 t in 1980 to 3,900 t in 1988 (Fig. 1) with a mean production of 2,340 t representing 1-2 % of the mean annual fishery production in Greek waters (STERGIOU 1990a). The mean 1986-1988 production was allocated as follows (Fig. 2): 1983 t trout, 233 t carp, 132 t sea bream/sea bass, 570 t mussels, and 51 t other species (of which 7 t eels). The mean (1984-1986) production amounted 2,000 t representing 0.4% of the mean (1984-1986) Mediterranean aquaculture production (= 496,000 t; GIRIN 1989). The mean (1984-1986) trout production ranked fourth in the Mediterranean salmonid production representing about 2 % of the mean (1984-1986) (= 66,000 t; France, Italy and Spain made up more than 90% of salmonid production during that period, GIRIN 1989).

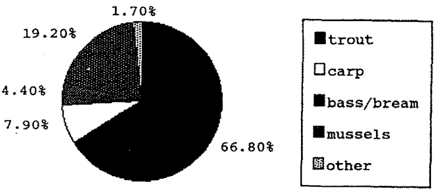

Fig. 2. Mean (1986-1988) aquaculture production per species (excluding lagoons) in Greece

Production per farm during 1986-1988 increased significantly for mussels (from 15 t/farm to 46 t/farm) and carp (from 5 t/farm to 14 t/plant) whereas it did not exhibit any significant increase for the remaining species (ARGYROU 1990).

Forecasting as applied to biological systems is mainly oriented towards modeling on the basis of: (a) explanatory, regression techniques (simple, multiple, categorical) which take into account other input variables, and (b) stochastic, time series techniques that treat the system as a black box (AutoRegressive Integrated Moving Average models, transfer function models, spectral analysis) (see STERGIOU 1989, 1990b). These techniques cannot be applied to our data because (a) the factors that mainly affect aquaculture production in Greece (e.g. such as technical and scientific expertise, management skills) cannot be parameterized, and (b) production time-series is short. Hence, a simple, decomposition method (trend analysis) was used to model and predict aquaculture production. Decomposition methods try to identify components of the basic underlying pattern and forecasting is based on extrapolation each of these component patterns separately and recombining them into a final forecast. The following quadratic trend curve was fitted to the 1980-1988 data: $X_t = 3.12 - 0.65\,T + 0.08\,T^2$, where X_t = production (in 1000 t) and T = time. ME and MAPE were estimated to be 0.0 and 9.5% respectively. APE ranged from 3.3 to 15.9%. The model explained 85% of the variability of aquaculture production in 1980-1988 and forecasts for 1992 amount 7,900 t (Fig. 1).

Forecasting plays a central role in managerial decisions: it preceeds planning which, in turn, preceeds decision making (MAKRIDAKIS et al. 1983). Forecasting of annual Greek aquaculture production within an APE ranging from 3.3 to 15.9% (MAPE = 9.5%) is an important goal. Aquaculture production in Greece is influenced by many factors and is confronted by all sorts of uncertainty (management skills, availability of fingerlings, availability of food, technical and scientific expertise). Yet accurate forecasts will be beneficial for the development of aquaculture infrastructure (fry and feed production both of which at present are mainly imported increasing the cost of products and render them not competitive for exportation), predict future prices, and planning exports and absorption by the local market.

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