

INDUSTRY FORUM

Economic Findings in Production and Markets of Mediterranean Aquaculture

Aquaculture Europe 2019, Berlin, Germany

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Horizon 2020
GA No. 7217315

Outline

1. Economic performance in the industry
2. Economic optimization of production
3. Market dynamics and price analysis



Economic performance in the industry

Task 1.5



Objectives

The task focuses on analysing the **economic and financial structure** of the production process in the Mediterranean industry of seabass and seabream.

Subtasks included:

- Description of the current production processes used.
- Analyses of production costs and cost structures (fixed and variable).
- Analysis of the economic and financial structures regarding aspects such as business performance or debt.



Methodology

Descriptive analysis and ratio analysis based on financial statements

Sources of information

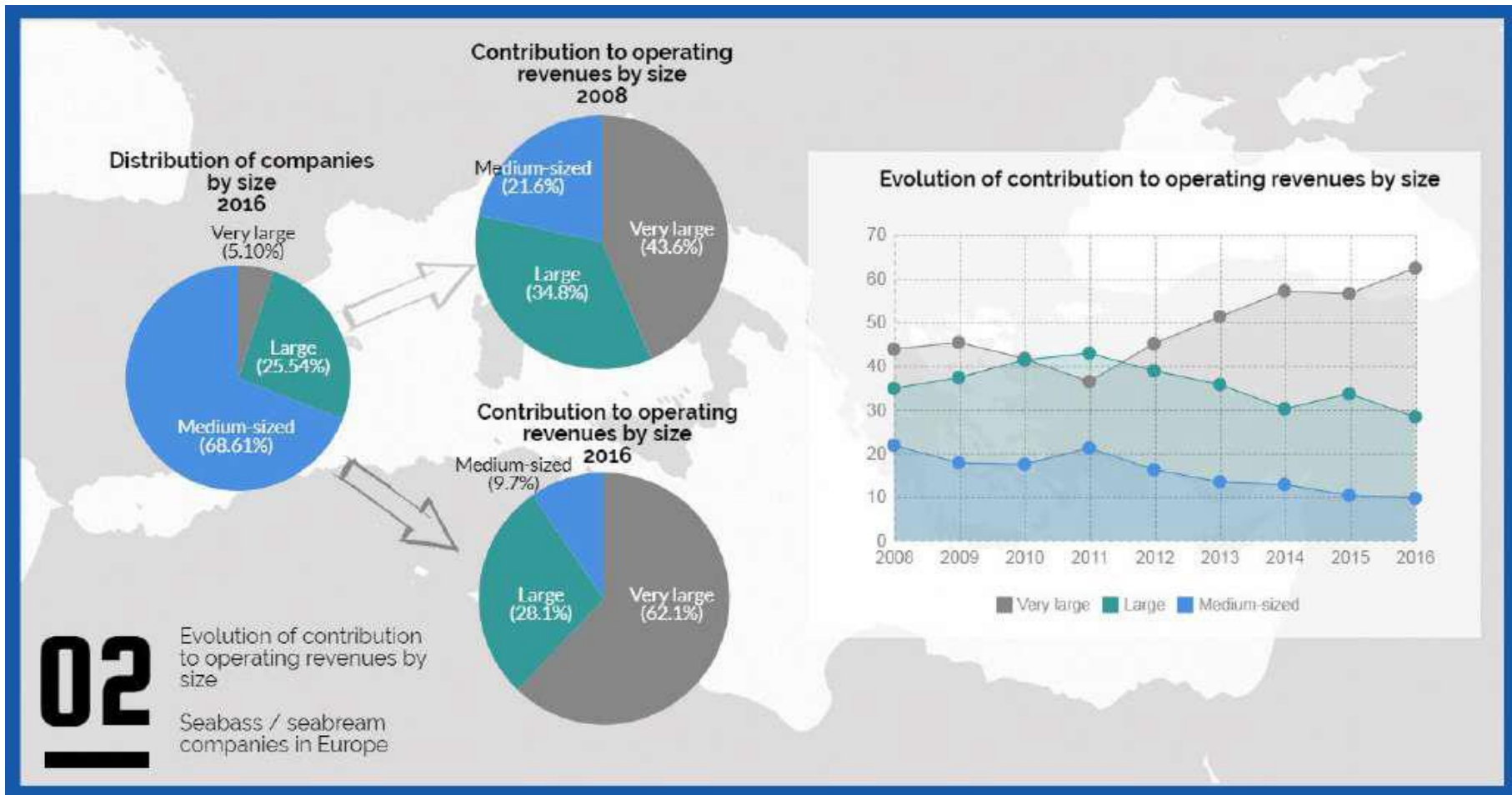


1 Industry level

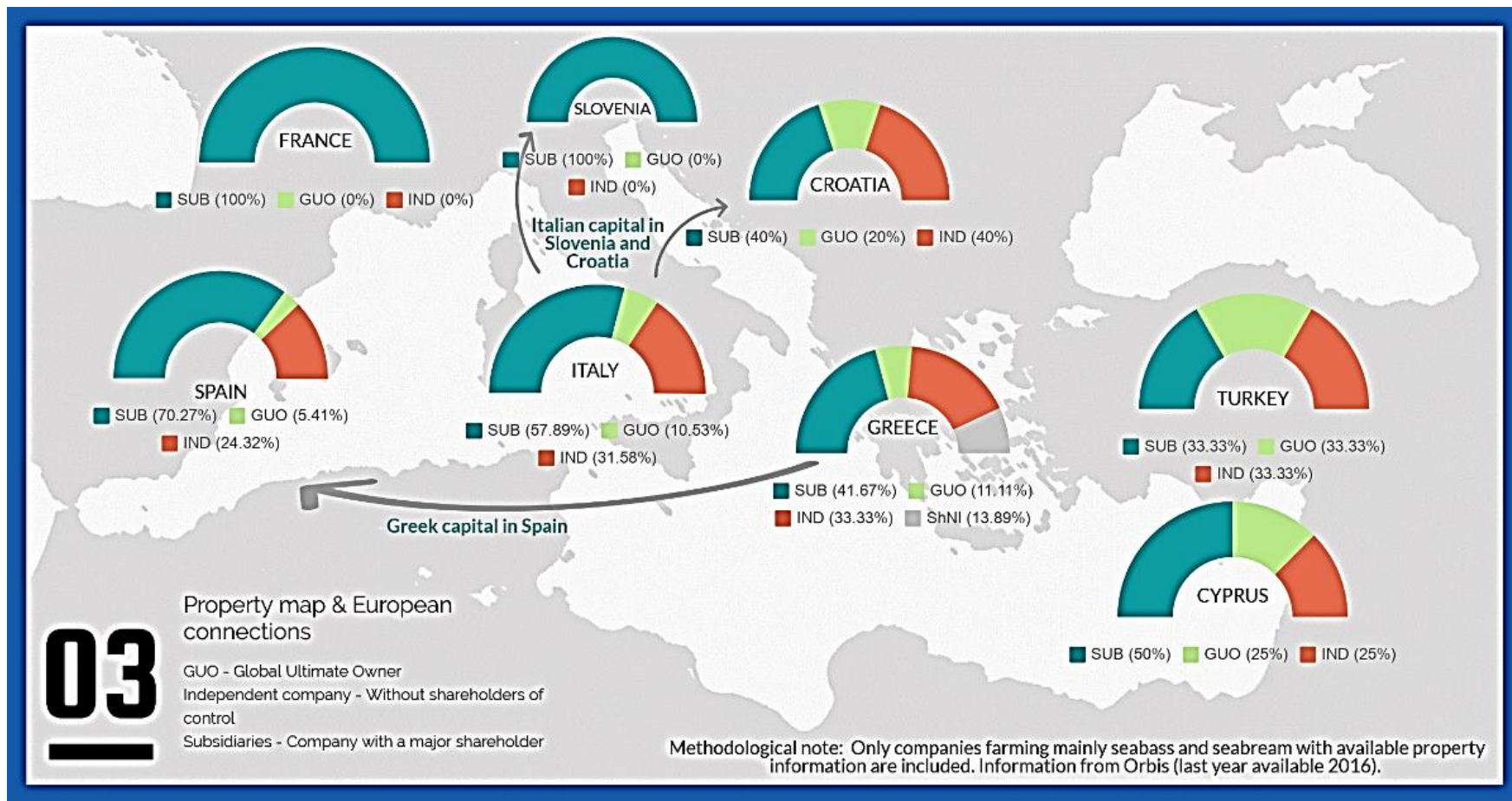
- Almost all indicators were decreasing until the cycle changed in 2010 (some firms ceased their activity). Since then, production, employment, and profitability returned to grow. The size of companies also grew.
- The change in the cycle is more related to the evolution of prices than to decreasing costs.
- However, trade data for 2017 shows increases in the export volumes and prices begin to adjust downward due to the increased supply.
- Companies operating cages are larger in capacity and dimension than other alternative production systems.



1 Industry level

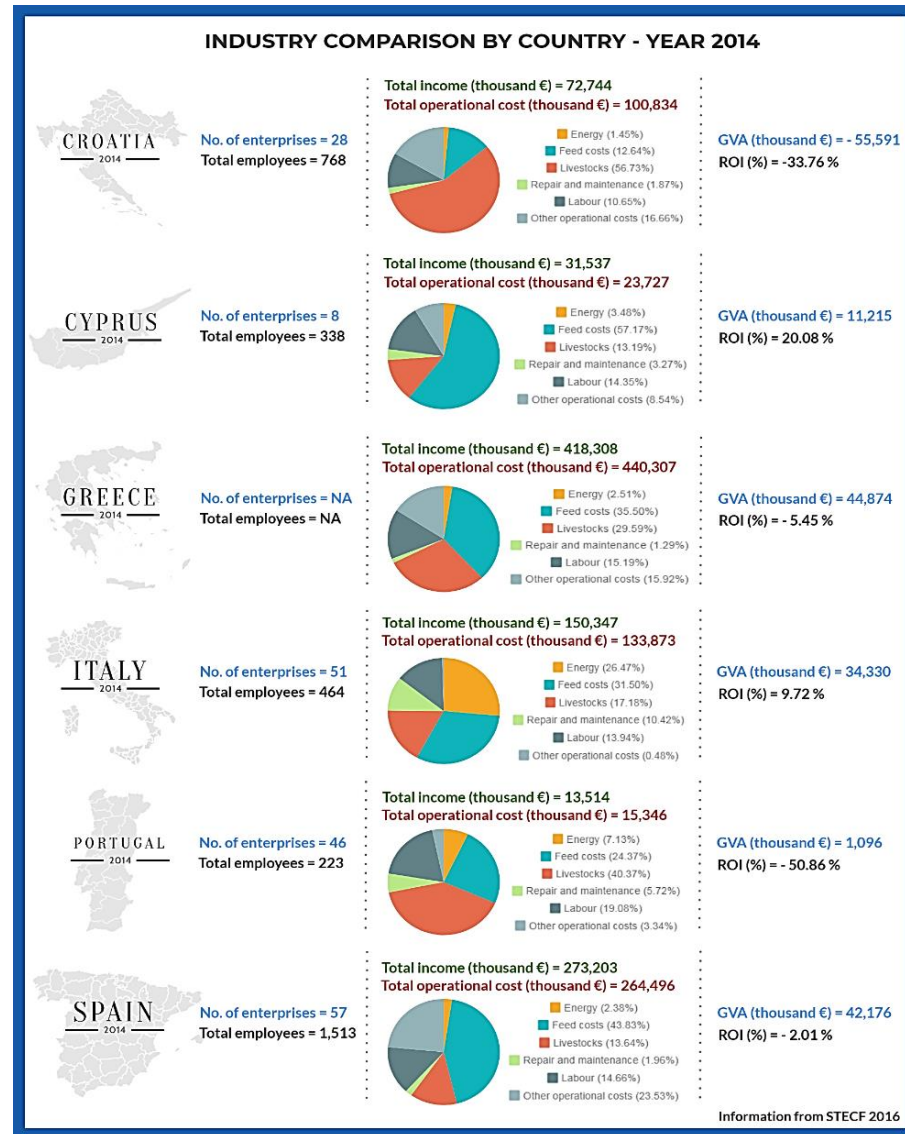


1 Industry level



1

Industry level



2 Company level

- The average size of seabass/seabream companies in the sample (137 companies) has increased since 2015 in terms of total assets (17.30%), number of employees (23.41%) and sales turnover (15.77%). Financial and economic profitability (ROE and ROA) has also improved. Positive trend in labour productivity.
- By countries, Turkish and Greek companies bigger in terms of total assets, number of employees and sales turnover and Croatian companies are fast growing
- Export activity available only for Croatia, France, Greece and Turkey, shows a decrease in French companies and a significant development in Croatia.



3 Farm level

Production

- Labour and energy costs gain importance to the detriment of the feed cost and other production costs.
- A larger scale of production shows a higher labour productivity.



3 Farm level

Marketing and processing

- About 70% of sales are fish between 300g and 800g (400g – 600g the most marketed size) and around 10% of sales correspond to fish over 1 kg.
- Processing in the sample is low (5 out of 13 firms), mainly eviscerated, although some companies filet the fish. The main packaging system involves boxes (polispan and polystyrene).
- The main preservation system is the chilling of the fish in ice.
- National production is mainly targeted to satisfy domestic demand (Spain or Italy) and exports to overseas markets.
- Main marketing problem is transportation time (putting in risk product's shelf-life and freshness).



Recommendations

- Industry competitiveness has room for improvements: need to improve production efficiency through **technical, operational, and managerial innovations.**
- Diversification of products and markets could help to reduce the risk associated with fluctuations in supply and prices: **communication of the highest quality or innovation in processing and packaging.**



Economic optimization of production

Task 6.1



Objective

The objective of this task is to develop new optimization methodologies in order to address the complex decision-making process in seabream and seabass farming.

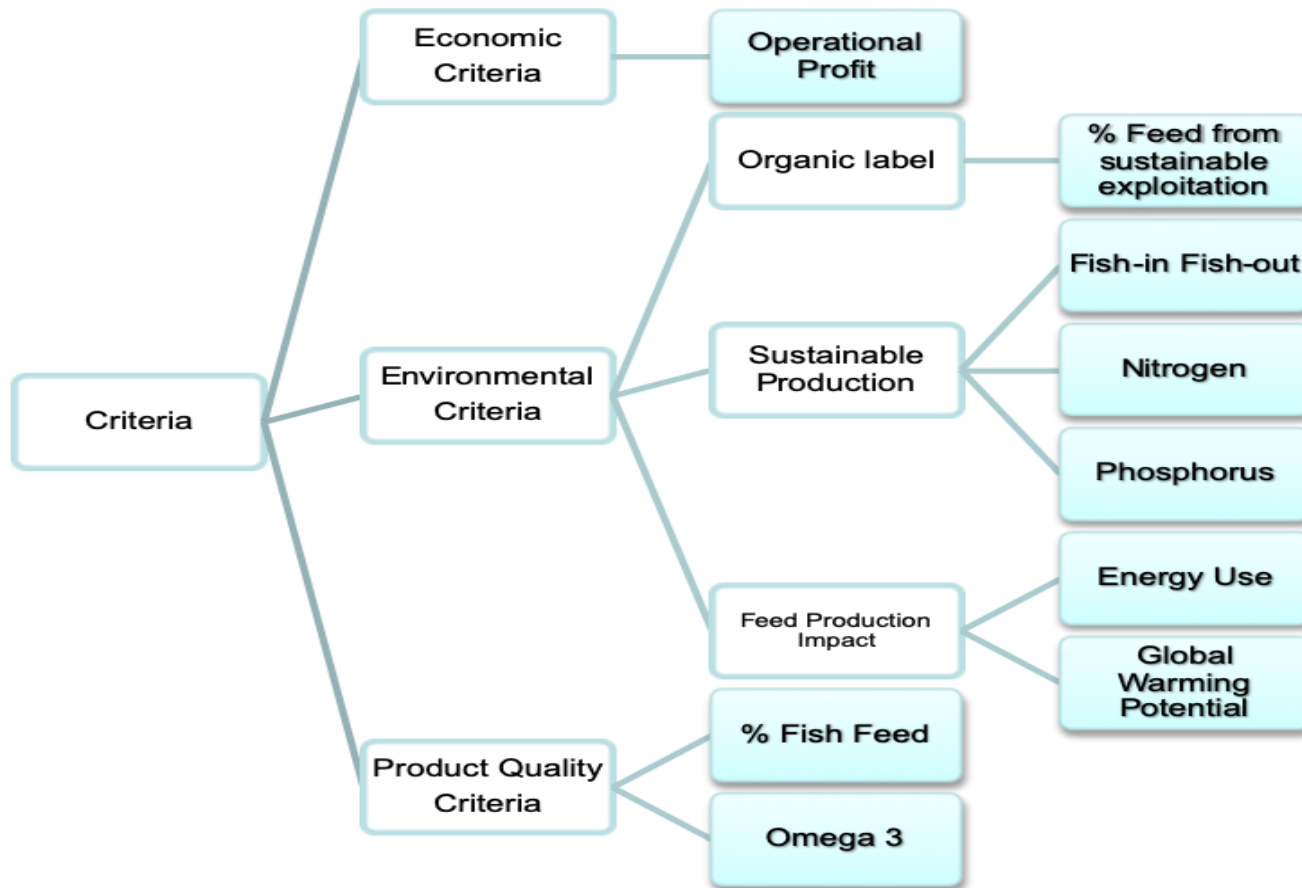
Methodology

Multiple-Criteria Decision-Making (MCDM) methodologies allow us to estimate the relative importance of the different criteria (AHP), ranking the feeding alternatives by their closeness to the ideal solution (TOPSIS).



First Step: Decision criteria

Selection of key criteria in decision-making processes in aquaculture (individual election).



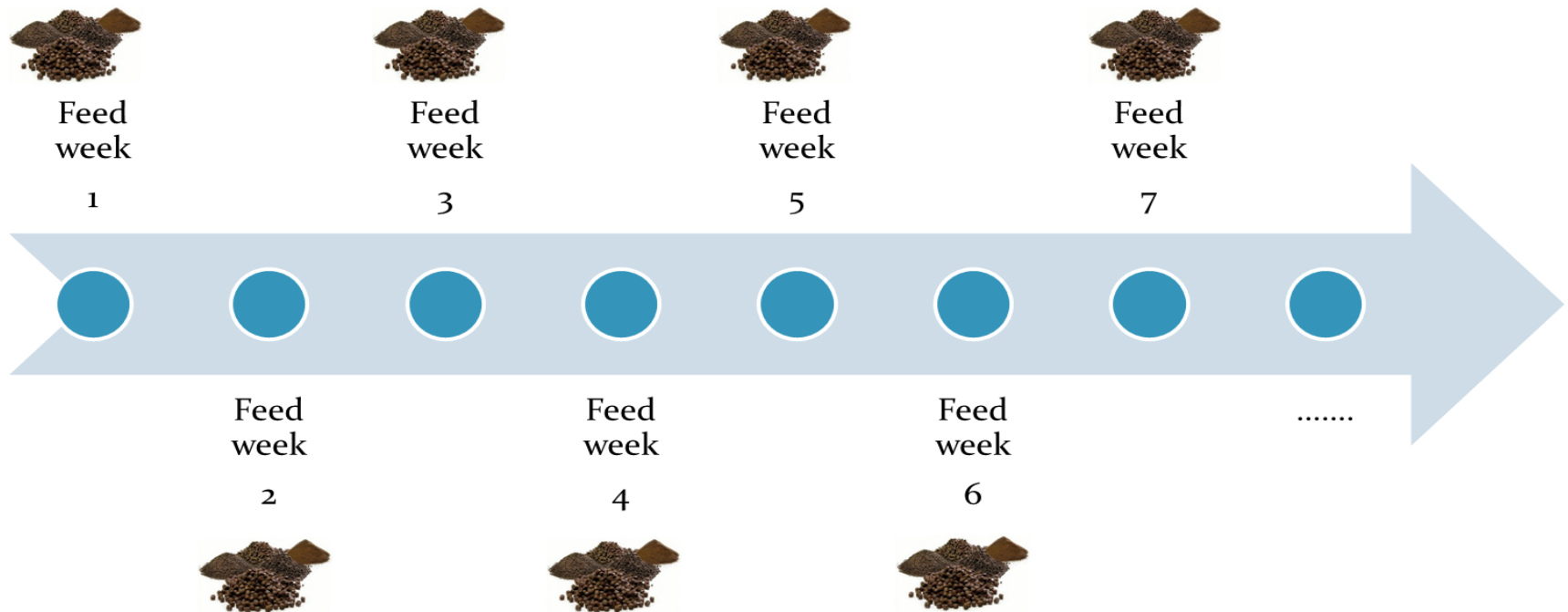
*Luna, M., Llorente, I. & Cobo, A. (2019). Integration of environmental sustainability and product quality criteria in the decision-making process for feeding strategies in Seabream aquaculture companies. *Journal of Cleaner Production* 217:691-701.



Second Step: New feeding strategies

Is it possible to increase the company results combining the existing feeds in the market along the feeding process with better results?

We use **genetic algorithms**, a methodology based on the process of natural selection, to generate near-optimal feeding alternatives.

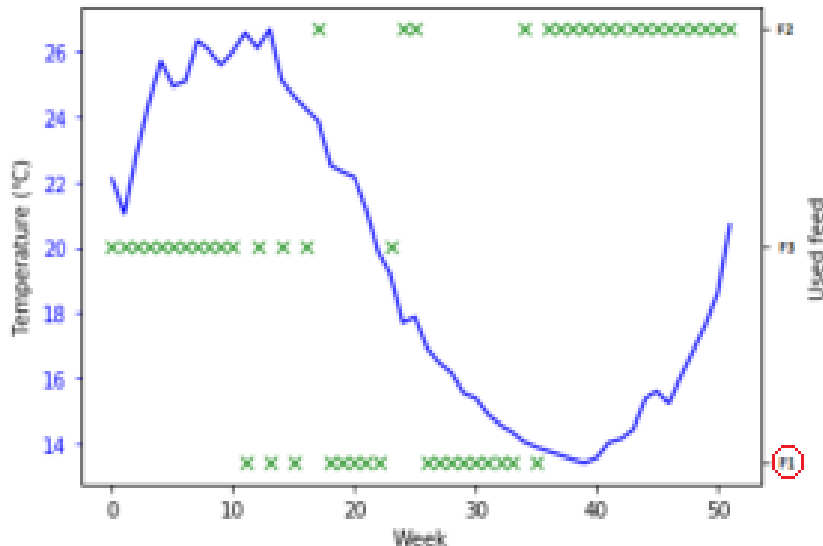


*Luna, M., Llorente, I. & Cobo, A. (2019). Determination of feeding strategies in aquaculture farms using a multiple-criteria approach and genetic algorithms. Annals of Operations Research. DOI: 10.1007/s10479-019-03227-w



Results

Criteria	Scenario 2
Economic Criteria	81.8%
Profit	81.8%
Environmental Criteria	9.1%
% Organic Feed	0.3%
Fish-in Fish-out Ratio	3.2%
Total Nitrogen	1.0%
Total Phosphorus	1.0%
Energy Use	1.8%
Global Warming Potential	1.8%
Quality Criteria	9.1%
% Fish origin feed	0.9%
Omega 3	8.2%

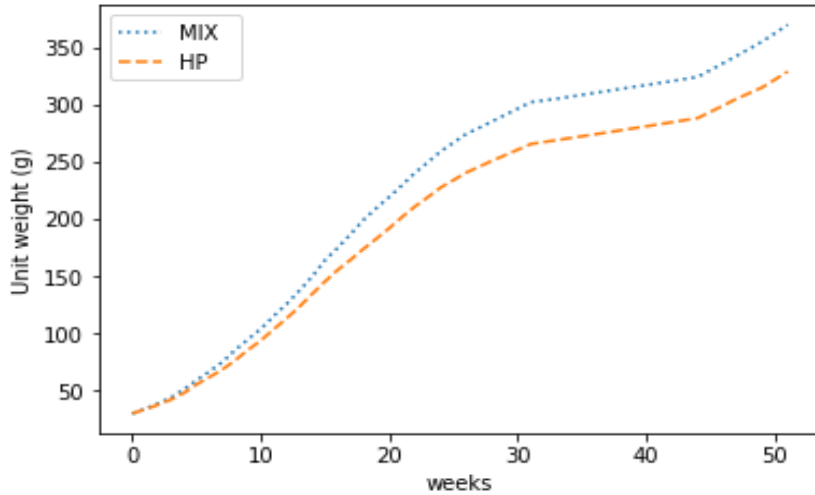


	Scenario 2	F1	Mixed	Var.
Fishes		12,141	12,144	0.02%
Unit weight reached		329.28	370.19	12.42%
Total weight (Kg)		3,997.82	4,496	12.45%
Cost (\$)		9,341.17	11,028.29	18.06%
Cost per kg		2.06	2.16	4.99%
Revenue (\$)		19,262.20	21,660.39	12.45%
Revenue per kg		4.82	4.82	-
FCR (%)		210%	192%	-8.50%
Economic Criteria				
Profit (\$)		9,921.03	10,632.10	7.17%
Environmental Criteria				
Organic Feed (%)		0%	25%	(+25%)
Fish-in Fish-out Ratio		52%	75%	42.94%
Total N (g)		650,069.23	722,507.69	20.90%
Total P (g)		136,724.24	149,525.28	11.14%
Energy Use (MJ equiv.)		163,154,800	151,911,800	1.98%
Global Warming (kg CO ₂ equiv.)		13,966,000	12,036,020	8.55%
Quality Criteria				
% Fish origin feed		25%	39%	56.22%
Omega 3 (%)		1.02%	1.27%	24.99%

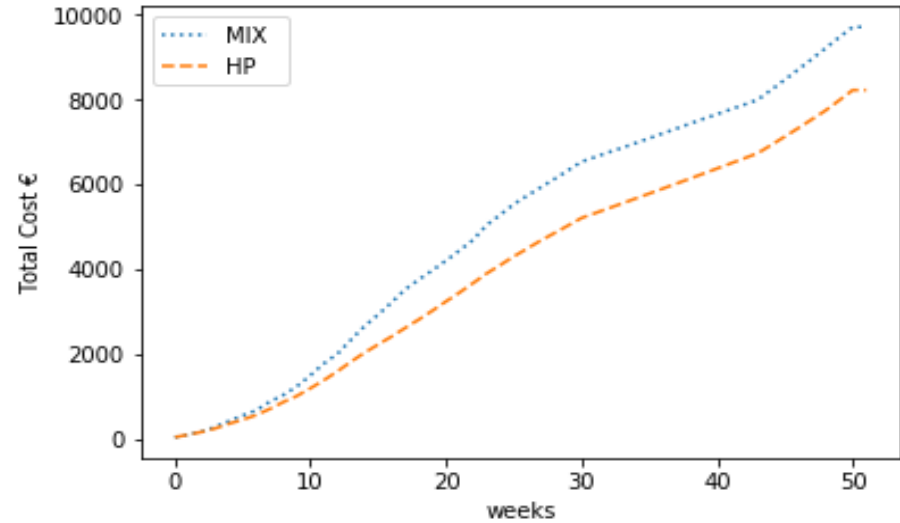


Results

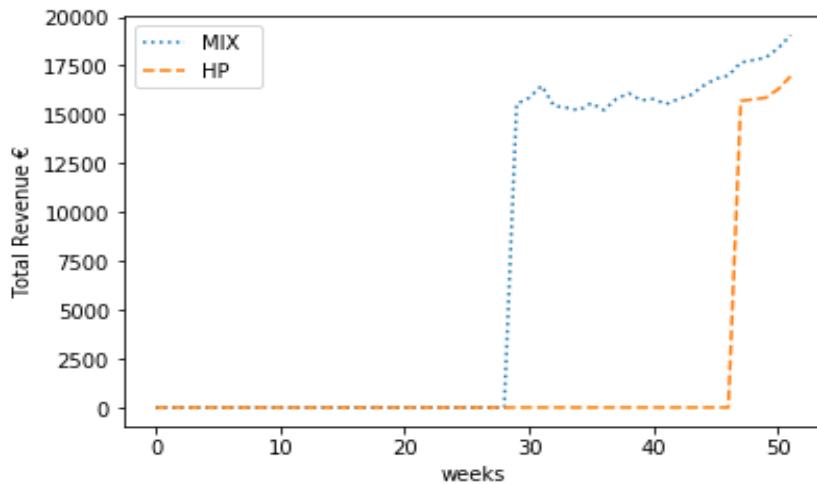
Best growth rate



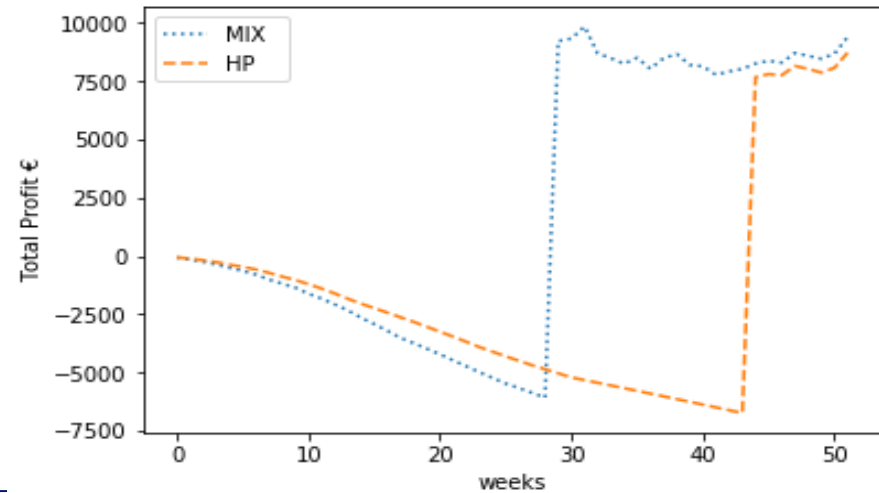
Higher costs



Higher revenues



Higher profit and lower risk



Market dynamics and price analysis

Task 6.2



Objectives

- Task 6.2 is concerned on the analysis of market equilibrium, whether supply and demand dynamics converge in steady prices and quantities and how the equilibrium price is transferred downstream and upstream along the value chain.
- The analysis is performed at different levels which involve long and short term, international and national markets and disaggregated by value chain levels and grocery categories in the countries when this information is available.

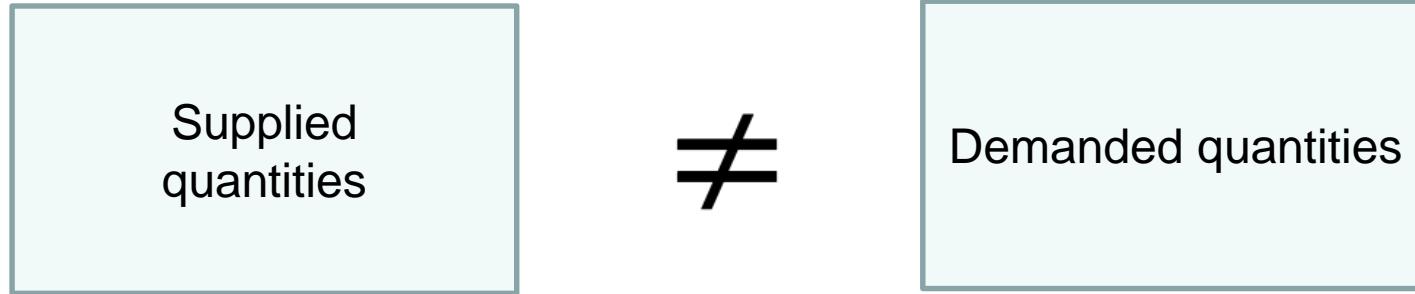


Long Term Equilibrium

- In general terms, demand for both species can be considered price and income elastic. Seabass and seabream appear as superior goods in all cases, with increasing consumption as consumers' disposable income grows.
- Substitution across the two species was found to be significant in almost all cases.
- Supply of both species was found to be inelastic in almost all the producing countries.
- Feed cost is the most relevant factor affecting the price of production, and also the main inefficiency of producers.



Long Term Equilibrium



Inelastic supply \neq Elastic demand

Price Volatility



International Trade and Competition

- Substitution across species and countries of origin is confirmed. Seabream substitutes seabass and Turkey substitutes Greece.
- Importers' demand is elastic for both species. Quantities are fixed according to price and substitution effects.
- So, quantities of seabream imported from Greece are dependent on Greek and Turkish seabream price (elastic demand). Besides, Greek price is dependent on Turkish price.
- Exporters' supply is also elastic. However, price and substitution effects differ across species and destination countries.



Price Transmission in the Value Chain

- Price transmission is imperfect.
- Wholesale price adapts to imports and is transferred upstream to local farmers.
- Changes in producers' price do not reach the end market.
- Farmers may be unable to transfer their costs to the market incurring in decreasing margins and risk of unprofitability.



Main Bottlenecks

- Supply hardly adapts to changes in demand resulting in price volatility. Producers may be forced to sell under low or even unprofitable price.
- Prices are driven by keen competition across countries and species. Seabass and seabream substitute each other. International prices are driven by changes in Turkish exports.
- National producers in destination countries face limitations in their margins due to effects of international competition and asymmetric upstream price transmission.



Questions?

