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Managing the Risks of the Greek Crisis in Aquaculture: A SWOT Analysis of the Mediterranean Mussel Farming

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Abstract

A SWOT analysis of the mussel aquaculture based on the current vision for national targets of the Greek economy (2012-2020) give to the industry a future direction. The flexible and independent structure of the mussel farming (local natural seed collection, no additional food expenses, flexible labour, mostly locally constructed equipment) as well as the export orientation of the final product gives a competitive advantage in comparison to other aquaculture or primary production Greek industries. Despite that, the sector needs restructuring, mainly to achieve the benefits of the economies of scale. Organizing local production and marketing activities into larger schemes would decrease production costs and add some value to the final product.

Keywords: Risk analysis, SWOT, mussel farming, Greek crisis management

1. Introduction

The marine aquaculture sector in Greece has been successfully established and developed over the last 30 years as a high-risk innovation trial to grow industrial scale Mediterranean species such as bivalve shellfish like mussels (*Mytilus galloprovincialis*), and marine fish species like seabream (*Spaurus aurata*) and seabass (*Dicentrarchus labrax*) (Theodorou 2002; Theodorou et al. 2011a; 2015a).

However successful the Greek mariculture industry has been so far in research and development issues, little or no effort has been attributed to risk assessment and risk management. In order to fill this knowledge gap and establish an industrial risk management policy, an exploratory risk analysis set out to investigate the risk source priorities of the sector and their effective management options (Theodorou et al., 2010; 2018).

This deliverable was used as a tool for SWOT analysis to evaluate the industry position in the current Greek crisis period as well as to demonstrate future adaptations that would enable the meeting of the national priorities targets and overcome the so-called Greek Crisis.

2. Materials and Methods

2.1 Risk Management Background

The definition of the risk management policies associated with the Greek mussel industry described in Theodorou et al. (2010) as the results of the industry survey that was carried out during late 2008 before the Greek crisis culminated (2010). The production and marketing trends of Mediterranean mussel farming in Greece were also taken in account to establish the context of this effort (Theodorou et al. 2011; 2015a).

Since there is limited data from inside sources during the crisis period, we tried to compare the previous sources with facts and figures referred to in the vision for the Greek economy as the “new national growth model and strategy developmental model” presented by McKinsey & Co (2012) in response to the Greek government’s demand for setting up the current and future developmental priorities to surpass the crisis.

2.2 Country Profile

The macro-economic status of the agricultural sectors (crops, livestock and fishing) including aquaculture in Greece is summarized by McKisney & Co (2012) and is divided into: i) the pre-crisis period (up to 2010), and ii) the current vision, which is what the sector aims to achieve in the future in order to overcome the recession (in 2020).

2.3 Pre-Crisis Agri-Economics

The Greek agriculture sector, including the crops, the animal livestock and the fisheries, represents 13% of the country’s employment, a total of 550,000 jobs. It is characterised by low productivity, as demonstrated by the pre-crisis Gross Value Added (GVA) being below 44% of 15 EU member states but paradoxically labour costs have almost doubled during the period 2000-2008. Competitiveness has decreased despite other EU countries showing an increase, such as Germany (+3%), Italy (+23%) and France (+38%).

In addition, the farm sizes are rather very small, about 1/5 of EU farm sizes. Marine aquaculture is dominated by finfish species and adds 400 million euros GVA; an important figure for the Greek economy but relatively small according to the global approach of McKisney & Co (2012). Annual growth is up 3% at that period (up to 2020); 90% of seabass and 80% of seabream have been exported in bulk as a portion-size fresh product with low value processing, such as gutted. Mussels, as a follower farmed seafood commodity, haven’t be taken into the account in this study but the industry, with a maximum turnover 10 million euros approx., contributes to the national economy (Theodorou et al., 2011a, 2014). The farmed fish sector is also vulnerable to mismanagement, with a price fluctuation of +/-33% due to unbalanced supply-demand cycles.

Both sectors are sensitive to the outcomes of the lack of spatial planning and low branding and imaging of the products, as the small scale of operations, which in the case of finfish leads to uncontrolled consolidations, is inadequate to support the professional marketing of the farmed products. Details about the evolution of both culture sectors are analytically given in Theodorou et al. (2011a; 2014).

2.4 National Agri-Economic Vision 2020

The export-oriented agricultural sector produces goods at the required scale to meet international market demands. It has been proposed that agri-farmed products be concentrated into 4-6 large packing and processing facilities at a country level and the whole production be marketed through a Greek Food Company, thus benefitting from the advantages of economies of scale. As a range of satellite companies to this central scheme, small and medium firms could collaborate through synergies to get access into the international markets.

Aquaculture is mainly included as marine finfish species, due to the industry's leading EU and global position, as well as its future expansion potential. It is proposed to follow the steps of the Norwegian salmon industry and benchmark the export marketing strategy of the product. In addition, it is proposed to diversify the offered farmed seafood by adding mussels and higher value-added fish (ie tuna) into the portfolio. Factors affecting competitiveness, such as economies of scale, labour efficiency and a focus on core products, have to be continuously improved. Production planning and coordination with the market demand have to be systematically monitored and proactive management actions taken to avoid oversupply. Such actions could result in an increase of GVA almost by three (from 0.4 billion to 1.4 billion euros), creating more than 20,000 jobs within 10 years.

2.5 SWOT Analysis

SWOT (Strengths, Weakness, Opportunities and Threats) analysis is a methodological approach to problem formulation and the mapping of possible management strategy solutions (Rauch, 2007). As a knowledge-based tool, it has been recommended for strategic planning in small and medium-sized enterprises (Houben et al., 1999) as well as for a whole-industry sectors such as fisheries (Stead, 2005) and aquaculture (Bolton et al., 2009; Rimmer et al., 2013). The categorization of the critical characteristics of the examined tasks makes clear the objectives and can help to set up action priorities (Stead, 2005). In the present study, SWOT analysis is used at a qualitative level, suitable enough to define the general policy strategies needed for the Greek bivalve shellfish sector (Figure 1) to overcome the financial crisis of the country through a sustainable manner, rather than to define the exact economic result itself – or the contribution to the country's recovery effort.

3. Results and Discussion

3.1 Strengths

Mussel farming is a sustainable and eco-friendly activity that produces animal protein for human consumption (Lindahl et al., 2005; Lindahl and Kollberg, 2009). The most important strengths of the industry are shown in Table 2. Mussel farming installations such as the long lines and hanging parks used in Greece are low-technology, home-made constructions that are affordable investments for local production stakeholders, mainly fishermen and agri-farmers (Zanou et al., 2005; Kontogianni et al., 2012; Konstantinou et al., 2012; 2015; Konstantinou and Krestenitis, 2012). It is a capture-based aquaculture activity where the seed is collected from the wild stock provided by the natural recruitment of the species (Theodorou et al., 2011a). In addition, the food is provided

naturally so there is no need to invest in animal feed supplies, as in the Mediterranean finfish aquaculture. The short production cycle of the animal species in the Mediterranean, up to a 12-month period, is a consequence of the mild environmental conditions, (Theodorou et al., 2011a) in contrast with other production areas in northern countries where the life cycle is much longer. As their biological cycle is similar with other so-called “fruits de la mer”, work is seasonal and flexible employment schemes provide a lower outlay for wages.

In contrast to the country’s unemployment, which ranged between 26.6 to 27.8% in 2014 (Ta Nea, 2014) and the 10% loss of aquaculture jobs in the marine fish sector, mussel farming has preserved its labour force as it is an intensive craftwork. However, the cost of labour remains critical for the activity since it represents 35 % of the total production cost (Theodorou et al., 2011a). As most of the mussel farmers are self-employed and the staff is family members (Theodoridis et al., 2017), possible job losses are restricted only to the part-time seasonal jobs, without any effect on the total employment availability.

From its beginnings in Greece, mussel farming has been an export-oriented activity, which is a plus in the current crisis as the sector helps to improve the national trade balance (Theodorou et al., 2011a; 2015a) and is an example to other agricultural activities (McKinsney & Co 2012) that focus on the local market. Greek mussels are sold live and, as Greece is close to the major markets of Southern Europe such as Italy, France and Spain, they are delivered within 24-36 hours of harvest (Angelidis, 2007a; Theodorou et al., 2019), giving a competitive advantage over global players such as New Zealand and Chile.

3.2 Weaknesses

The most obvious weaknesses of the mussel farming industry in Greece is shown in Table 3. These arise from production-dependent risks, production-independent market risks and from third parties (Theodorou et al., 2010; 2011b). As mussel farming is an environment-based management activity with limited handling, mainly mechanical during grading and harvesting (Theodorou et al., 2011a; 2014), it is vulnerable to acts of God (Theodorou et al., 2010). Availability and quality can vary according to season (suitable marketable meat yield >22-24%) (Theodorou et al., 2007), and the harvesting plan inoperable due to unexpected harvesting bans caused by harmful algal blooms (HABs) (Theodorou et al., 2012). In addition, seasonal seed recruitment varies from year to year and from site to site, generating an uncertainty as to the availability of suitable amount of seed stocks for the following year’s production (Theodorou, et al., 2011a, b; Rodrigues et al., 2015).

3.3 Opportunities

The “blue evolution” is a national priority and offers several competitive advantages as an export-oriented sector. McKisney & Co (2012) suggest it is a driver to surpass the Greek economic crisis. It is forecast that marine finfish farming GVA will triple from 0,4 to 1.4 billion, creating more than 20,000 jobs within the next 8 years.

As aquaculture is a high priority of the country, there are still EU and national funds available for further development. In order to achieve the benefits of economies of scale, the industry needs to be restructured, and larger schemes created through producer’s

organizations or cooperatives. With the mussel farmers cooperating, the cost of production could be drastically lowered and common marketing actions created, adding value to the local and the export market. New production concepts as the multi-trophic aquaculture (IMTA) is a current challenge that could possibly add some income to the mussel farmers' households (Holdt and Edwards 2014). The new species, as a niche business, may become important and require a new concept approach as the co-culture (Slater and Carton 2007; Rößner et al., 2014; Giangrande et al., 2014). Furthermore, the ecosystem services provided by the bivalve shellfish, nutrient removal from the water due to biofiltration, will be recognized in the near future, as has happened in other countries (Lindahl et al., 2005), and this may give an extra income to the mussel farmers (Lindahl and Kollberg, 2009). The conservation of other threatened species, such as native oysters (*Oyster edulis*) (Angelidis et al., 2001) and fun mussels (*Pina nobilis*) (Theodorou et al., 2015b; 2017), may also become a task for mussel farmers. Mussel farming contributes to the food security, currently a hot global task, as it uses minimal natural and energy resources (Lozano et al., 2010; Iribarren et al., 2010). Insurance policies have been recently recognized as an important factor for industry sustainability and will be further promoted to mitigate the risks inherent in the industry (Theodorou et al., 2011b; EU Regulation No 508/2014, 2014). The opportunities for mussel farming are summarized in Table 4.

3.4 Threats

The most important threats to the mussel farming industry due to external reasons are demonstrated in Table 5.

As the mussel farming industry is an environment-based management aquaculture activity, acts of God are normally taken into account, even pre-crisis. These include seasonal seed quantity availability as well as the seasonal quality of the product, mainly the meat flesh content (CI) being >22-24%. Both affect the operational outcomes and sales (volumes and price definition) (Thong, 2012). The results from a bivalve mollusc producers' survey (Rodrigues et al., 2015) demonstrate that several threats are surfacing in Mediterranean aquaculture due to climate change. The increase of invasive species (Zenetos et al., 2015) and bio-foulants have become evident over the past decade as well as the explosion of diseases in certain bivalve farming areas (Karagiannis et al., 2006; Karagiannis & Angelidis 2007; Karagiannis et al., 2013).

The small scale of SMEs, even the scale of cooperatives and consolidated schemes (take into account that the total annual scheme turnover is approx. 10 million euros) is in itself a threat since it can be very difficult to find the money and incentive to invest in order to be compatible with the new EU Regulations (Muehlbauer et al., 2014; Brenner et al., 2014) and Codex Alimentarius-proposed guidelines and recommendations (Angelidis 2007b). Institutional risk due to the continuous changing of the rules has been recognised as a restrictive factor of growth in Greece. The increasing costs, including taxes, preserve the marginal profitability. The characterization of mussels as a "cheap product" is an opportunity and threat together. It is a delicacy for poor people but the turnover remains stable for the producers. The low-income consumer spending creates cash shortages which affects the operating management of the companies.

4. Conclusions

The economic disadvantage of the insufficient financing from the banking sector before

the crisis becomes an important advantage during the crisis as producers have limited exposure to bank loans. The family-operated business model of mussel farming, even at a part-time job basis, supports the family income even in the crisis environment. Most of the business opportunities are available despite the crisis, such as EU funding, but new investments (except to replace basic requirements) are not affordable due to budget limitations. The optimization of sustainability in all levels (production, product quality, marketing) of the activity is a must for the future food-security socio-eco-sustainability. The sector has to be enlarged by vertical and horizontal schemes development in order to achieve economies-of-scale benefits (decrease production costs and minimize efforts). The competitive advantage of the mussel farming, as most risks come from its nature and are vulnerable to the acts of God, has to be protected through insurance policies tailor-made for the industry and careful studies concerning future global changes. For these purpose regulators and producers and the rest of the stakeholders (including also fish farmers) have to work closer on the proactive setting up of aquaculture industry policies.

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Appendix

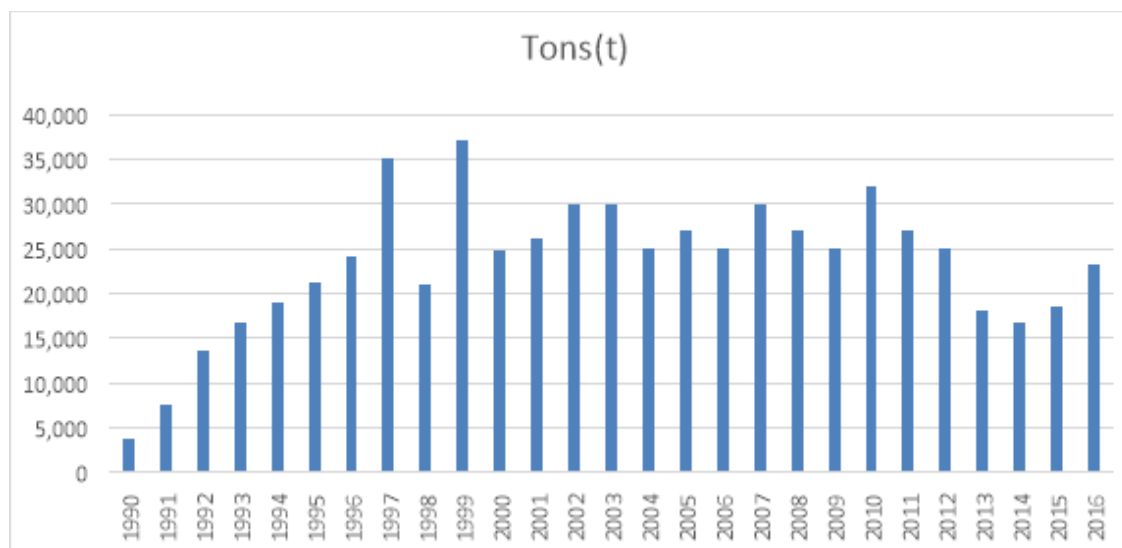
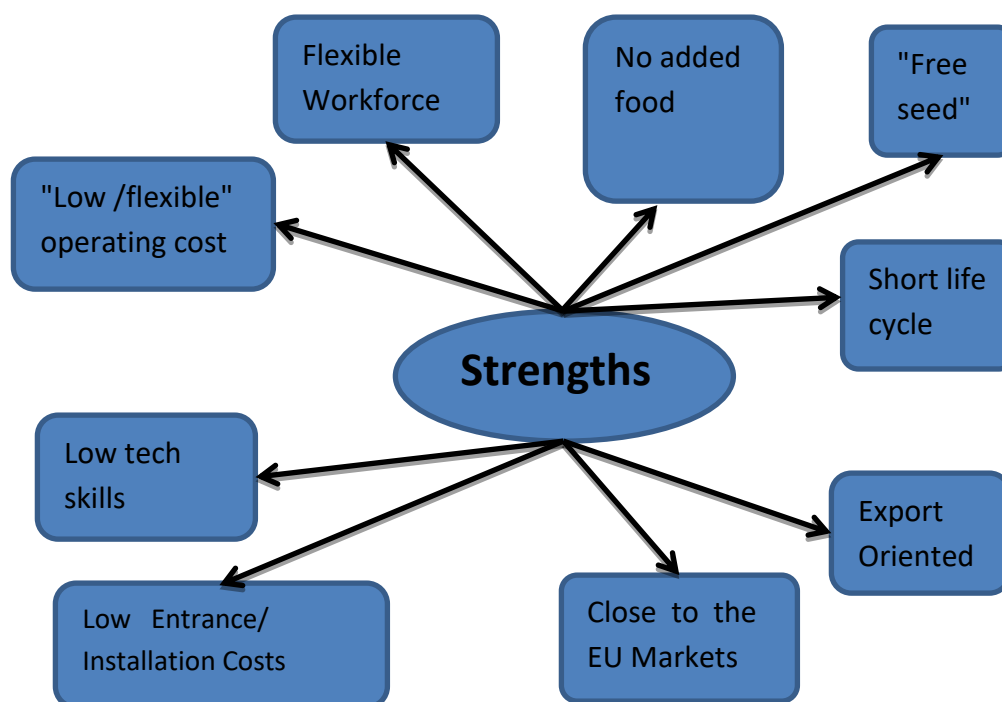


Fig. 1. -Mediterranean mussel production in Greece (GNSS, 2017).

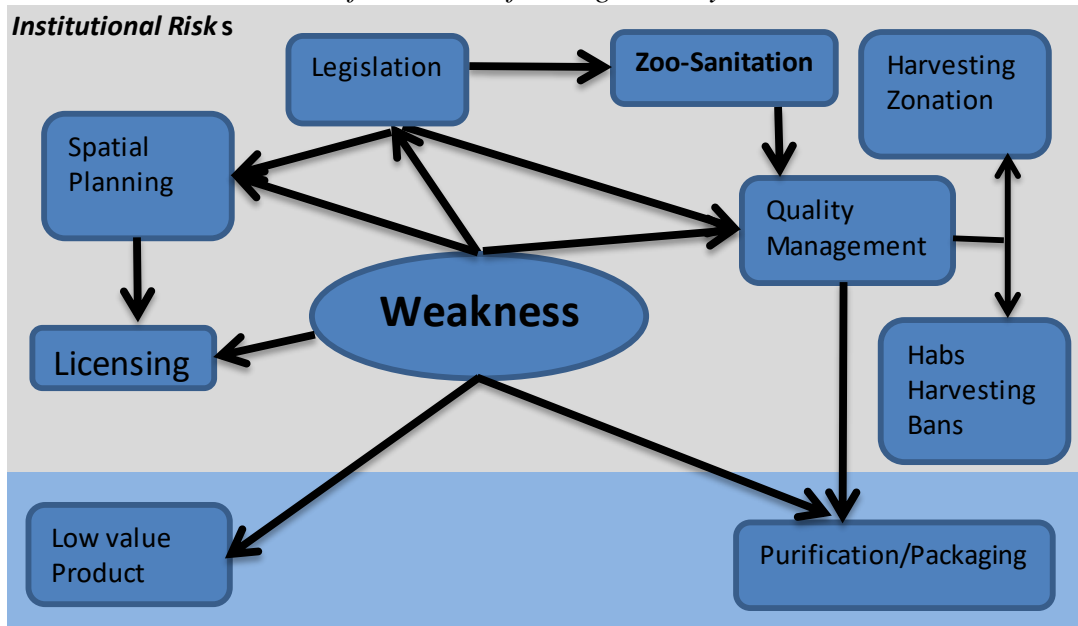
Tab. 1. - Questions based on Rauch (2007) to feed a SWOT analysis matrix, relevant to the mussel aquaculture management policies of the Greek Crisis.

Internal Strengths	Internal weaknesses
What are the advantages of Mediterranean mussel farming in Greece?	What could be improved?
What is done well in the industry in Greece?	What is actually done inefficiently?
What do outsiders see as the advantages of the mussel industry?	What should not be realised?
External Opportunities	External threats
Which opportunities can arise for the Greek mussel sector from these trends?	What global mussel producers as competitors do?
	What mussel production & trade barriers are there?
Which trends (financial, market, innovation, etc.) are affecting the mussel farming sector?	Are there financial problems due to the Greek Crisis in supply chain?
	How mussel wholesale customers and consumers react to the global financial crisis?
	Are there changes in the context of the mussel farming business?

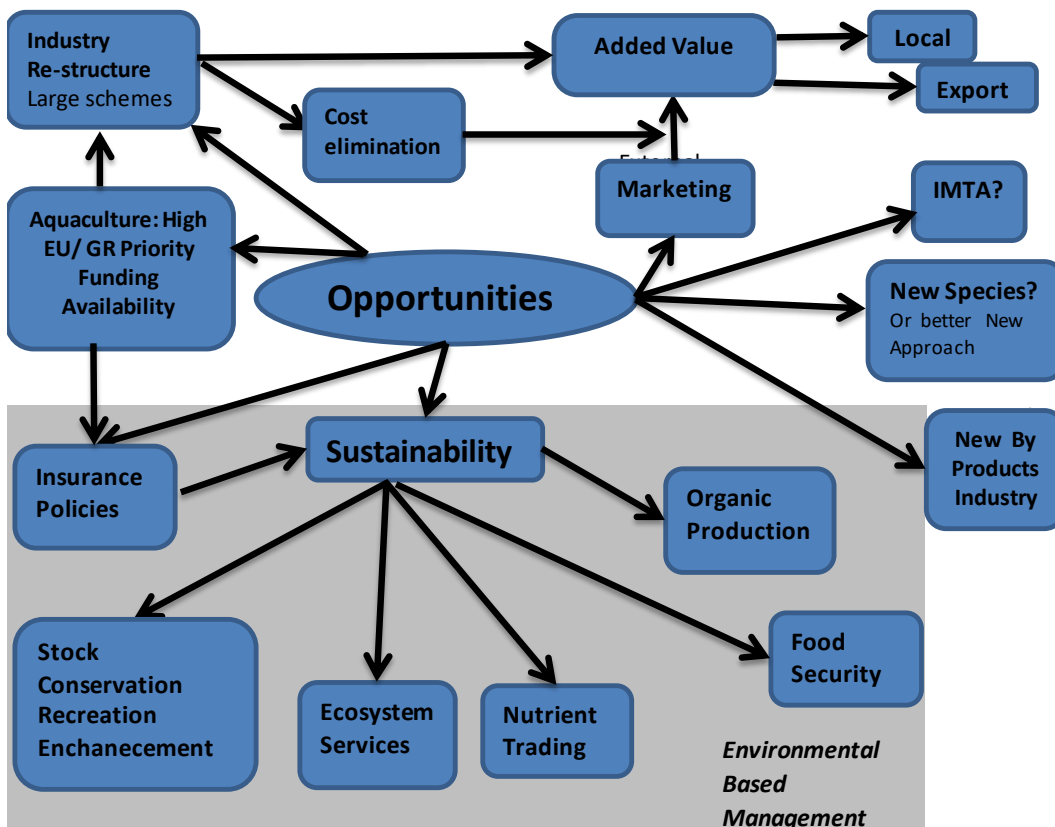
Tab. 2. - Strengths of the mussel farming activity in Greece.



Tab. 3. - The weaknesses of the mussel farming industry in Greece



Tab. 4. - The opportunities of the mussel farming industry in Greece



Tab. 5. - The threats to the mussel farming industry in Greece.

