

RISK PERCEPTIONS AND RISK MANAGEMENT STRATEGIES OF THE GREEK MUSSEL FARMERS.

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ABSTRACT

Mussel farming as an aquaculture activity based on the natural primary productivity, faces risks similar to those of the agriculture sector. Consequently, much theoretical risk research has been applied to aquaculture as in agriculture, livestock, forestry, conservation and its management. Nevertheless, limited studies have so far focused on risk perceptions strategies of the aquaculturists. This study was conducted in the context of Mediterranean mussel farming risk assessment in order to explore the farmers perceptions of risk and risk management, to examine relationships between farm and farmer characteristics, and highlight the prevailing risk perceptions and strategies. The data were collected through a sampling survey of the Greek mussel farmers based on personal questionnaire-interviews. Results show that the ex-farm price of the mussels were perceived to be the major source of risk while the financial/credit reserves were the most preferred risk management strategy. Farmers seem to resort to such practices as the activity is characterized by negligible banking support, production unpredictability, marginal profitability and low turnover, all of these rendering it a high risk activity for the financial institutions. Finally, the farmers' attitudes and comments on loss compensations bring up the need to develop a more effective and versatile insurance system.

Keywords: Mediterranean mussel, farming, risk perception, risk management strategy

INTRODUCTION

Aquaculture is the most rapidly growing sector of the food production in the world, and the bivalve mollusc sector represents approximately the 26 % of the total output by volume and 14 % by value. The bivalves cultivated volumes from just 1 million tonnes in 1970 have risen to almost 12 million tonnes in 2005 (Mc Leod, 2007; Bondad-Reantaso *et al.*, 2008). The cultivation approach is based on the principles of the captured based aquaculture (Ottolenghi *et al.*, 2004), whereas the "raw" material the seed, is collected from the wild natural stocks and the growing take places extensively in suitable farming areas with enough the natural productivity to support the production (Costa-Pierce, 2002).

Despite these achievements, there is a limited knowledge about the risk perceptions of the bivalve shellfish farmers and the risk management strategies used to support the financial sustainability of the sector (Theodorou & Tzovenis, 2004; Le Grel & Le Bihan, 2009). This "gap" of knowledge is tried to be covered with the present empirical effort to assess the risk perceptions and management strategies of the Greek mussel farmers. This study could be used as a tool to highlight the industry's beliefs on risk management priorities based on farmers experience and as a tool for developing policies to address certain risks either on the state or on the private level. The bivalve production in Greece pertains to a vast

extent to farming of the Mediterranean mussel *Mytilus galloprovincialis* covering about 380 ha by ca. 520 farms of 100 tonnes licensed production capacity, mainly located in the northern part of the country.

MATERIALS & METHODS

Structured questionnaires distributed to all Greek mussel farmers during the period November 2008-February 2009 and completed either on their own or guided through personal interview and site-visits. A list of 33 sources of risks and 15 risk management strategies were developed based on the opinion of 4 mussel farming experts, and pretested through 5 farmers of high education and experience profile, before presented to the respondents. Questions on risk sources were prepared to be answered on a Likert scale 1 (no impact) to 5 (very high impact); on management strategies on a Likert scale 1 (not relevant) to 5 (very relevant); on risk attitude on a Likert scale 1 (I do not agree) to 5 (I agree).

Data were analysed via descriptive statistics, principal component analysis and factor analysis in order to highlight the most important risk factors and identify possible general drives governing risks or strategies (Malhotra, 2004).

All statistics were done using the STATISTICA v.7.02 software (StatSoft, 2006 and references there in).

RESULTS & DISCUSSION

Total number of questionnaires 49 were completed and 3 of them completed by representative of farmer associations of 6, 40 and 53 members respectively.

In Table I results are presented for the Greek mussel farmer perception of the 33 sources of risk identified by the opinion experts. Given that the farmers assign the highest mark 5 to what they perceive as highest risk it is evident that they highlight the ex-farm prices they get as the highest risk they face. This problem might not be disassociated with the fourth source of risk in their rank, as a HAB occurrence draws harvest bans which, if critically long, affect the price when finally lifted and all farmers are anxious to sell their products as fast as possible to minimize losses. Farmer and farmer's family health are crucial also as the mussel farming in Greece is to a vast extent family business. The top-five of risks according to farmers includes also the availability of the vessel necessary for their work as the acquisition cost is high and when in damage or service it is almost impossible to lease or otherwise find an alternative one at normal working hours i.e. during the daylight. Evidently, disease, pollution or weather phenomena are not perceived as high risk issues as it might be expected from other aquaculture or husbandry sectors. The explanation lies within the extensive nature of the production method as the farms are situated near-shore at close coves or estuaries with more or less unpolluted waters to avoid heavy microbial loads and get a veterinary inspection pass from the authorities.

After the Principal Component technique was used to reduce the factors and highlight potential driving forces governing the majority of them a set of 7 over imposing sources of risk were identified and presented in Table II. Highest risk contribution was given by financial risks, personal welfare and market risks having to do with the ability of the farmer to finance its work at times of cash-flow shortage, to work when ill and get the desirable prices when harvesting proceeds. Other sets of risk factors having to do with the environment (pollution, seasonal rainfall, optimal eutrophication present, predators, seed availability, HABs etc) are perceived as less strenuous by the farmers, the same standing also for the institutional sources of risk (licensing, sea rental fees, state support or services, media attitude, etc). At this point it has to be underlined the fact that the farmers are in most cases simple people, of usually low

education, running a family business of no traditional character as most of them come from fishermen families. Therefore, it is easy to understand why they disassociate the institutional framework from the more apparent risks e.g. the lack of policies to soothe the consequences of a HAB harvest ban and the low ex-farm prices achieved afterwards for maybe a fraction of their potential harvest as they suffer losses due to the prolonged stay of the product in the sea.

Table I. Risk perceptions for 33 identified risks by farming experts.

<i>Risk</i>	<i>Mean</i>	<i>STD</i>
Ex-farm price	4.490	0.820
Disability /health of farm operator	4.204	1.172
Vessel availability	4.184	1.467
HABs	4.122	1.111
Farmer family health	4.020	1.127
Absorption of the Supply	3.939	1.029
Production cost	3.918	0.731
Environmental policy-Areas of Organized Aquaculture Development (AOAD).	3.857	1.323
Grading machines availability	3.653	1.378
Public Authorities –Services	3.653	1.451
Changes in interest rates	3.490	1.431
Family situation (e.g. divorce)	3.490	1.325
Freshwater availability (rainfall)	3.408	1.171
Technology availability	3.408	1.206
Recruitment/seed availability	3.408	1.153
Mussel meet yield	3.327	1.197
Ability to redeem loans	3.327	1.491
Labour availability	3.286	1.429
New licences availability	3.224	1.373
Division of tasks within family	3.224	1.433
Media	3.204	1.620
Weather impact	3.082	1.222
fouling organisms	2.980	1.031
Governmental support elimination	2.857	1.399
Predators	2.857	1.646
Health & Safety	2.714	1.429
Pollution	2.469	1.371
Environmental Impact	2.367	1.410
Sea Rental	2.184	1.269
Illegal actions	2.020	1.250
NGO Environmental	1.898	1.085
Transports	1.857	1.118
Diseases	1.755	1.199

In the context of their experience and not on expert opinion availability (lack of such services from state or private bodies) Greek mussel farmers gave their views on how to deal with the sources of risks they are dealing with. Strategy options were proposed based on experience and market knowledge by 4 opinion experts i.e. experienced farmers with specialty studies on the subject (marine biology, aquaculture etc). The perceptions of the Greek mussel farmers on risk management strategies are given in Table III. Undeniably the best option was found to be the creation of a financial reserve for the farm to be in a

position to cope with unforeseen adversities and survive financially until the next season. These practises may include personal or family bank savings, and/or bank credit achieved through long-term good business cooperation with them and keeping their farm in a financially healthy state. It is noteworthy that agreements with wholesalers offering them stable price long-term contracts, are not priorities and the same stands for private insurance policies. This attitude might again be explained by referring to their background which renders them suspicious against modern business tools possibly needing more time to be convinced. Finally, the diversification seems to be least priority as the farmers' traditional stance does not allow for the easy adoption of new products (associated of course with novel technology for their experiences) let alone their need for new market opening. As practice has shown so far in Greece, pioneers in aquaculture business are entrepreneurs with themselves or their close associates, being of strong scientific background, vectors of new technology in need to apply it in new markets with low or no competition.

Table II. Driving forces of the Greek mussel farmers' risk perceptions.

<i>Risk component identification</i>	<i>factor</i>	<i>Explained Variation</i>	<i>Proportion of Total</i>
Financial risks	1	2.45	14.38
Personal welfare	2	2.30	13.54
Market risks	3	2.20	12.93
Public health & safety	4	1.74	10.26
Environmental risks	5	1.66	9.76
Institutional risks	6	1.63	9.59
Seed availability	7	1.23	7.25

Table III. Greek mussel farmer risk management strategies.

<i>Risk Management Strategies</i>	<i>Mean</i>	<i>STD</i>
Financial/Credit Reserves	4.837	0.426
Producing at lowest possible costs	3.653	1.182
Off-farm employment (agri-farming, commerce, services)	3.653	1.653
Collaboration in production (horizontal)	3.531	1.401
Collaboration in the trading -commerce (vertical)	3.469	1.529
Enterprise diversification (processing, fishing, distribution)	3.449	1.582
Government Supporting program Participation	3.449	1.444
Off-farm investment(i.e. agritourism, stock market)	3.367	1.395
Buying Boat insurance	3.245	1.479
Applying strict hygienic-environmental Rules	3.245	1.146
Buying business insurance	3.102	1.447
Geographic dispersion	3.061	1.773
Price contracts for sales	2.653	1.549
Buying personal insurance	2.224	1.373
Spatial diversification (other species)	2.082	1.288

Attempting to reduce the risk strategies to a few driving forces behind them it was found (Table IV) that the most important was the security gained by either income certainty or the excellence in their work providing a somewhat in-farm insurance. As the majority of the mussel farms are rather small most of the farmers try to ascertain a sustainable income and reduce their financial risk-exposure, by seeking a supplementary and secure income from off-farm employment (agriculture, commerce, services) or off-farm investments (e.g. tourism, stock market) (Theodorou *et al.*, in press).

The seek for business, state or personal insurance as a means to ascertain their farm is quite strong but as seen already in the previous Table (III) also quite diverse, as state provided security is perceived higher as a priority than other private products of the sort.

The limited preference of the Greek mussel farmers for insurance as an important risk management strategy is similar with the salmon producers in Norway but for different reasons. As recently reported by Bergjord (2009) the insurance providers emphasized on certain risks such as diseases (which are insurable) most of other insurable risks (biophysical shocks, technical failures, escapes) are considered relatively unimportant. As firms grow larger and more internationally diversified, self-insurance will become more attractive as opposed to regular insurance services.

On the other hand, mussel farms may not yet be of the size of a business that could attract insurers to develop relevant policies and, unless they grow to an insurable standard, any rational terms and conditions might be uneconomical for Secretan (2006a). The real question for the moment is whether the major and foreseeable losses due to widely accepted risks could be covered by state insurance programmes, custom-made for this aquaculture sector. If so, they should be based on loss adjustment for true spreading of risks, otherwise it would be a subsidy (Secretan, 2006b) covering risks *sensu lato* reducing thus the relief for the needy when a loss occurs. At any rate, a thorough survey on mussel farming risk assessment should be carried out in order to take care of all aspects needed by private companies, banks or governmental funds to formulate a valid plan for the operational risk management of the sector. Meanwhile, special programmes providing training in labour and environmental safety procedures may improve the risk management of the farms and therefore decrease losses (Theodorou *et al.*, in press).

Table IV. Driving forces of the Greek mussel farmers’ risk management strategy perceptions.

<i>Risk Management component identification</i>	<i>factor</i>	<i>Explained Variation</i>	<i>Proportion of Total</i>
Income certainty	2	2.32	15.46
In-farm insurance	3	2.12	14.12
Insurance	4	2.04	13.58
Association	1	1.95	12.98
Vertical integration	5	1.62	10.82

When the eagerness of each farmer to take risks was taken in account analysis of the questionnaires showed that Greek mussel farmers are more eager to take risks in a field that they understand better that is in the course of their everyday work in the farm there including also their every day deals with wholesalers for their harvest. When asked if they would take risks in financial issues for instance asking for a bank loan to finance modernization, or flexibility in dealing with wholesalers the Greek farmers showed a moderate attitude scoring a little below average. Their overall stance regarding risky attitude was over average coinciding with their eagerness to take more risks than the others in the same business.

Table V. Greek mussel farmer eagerness to take risks. Figures are means ($n=49$) of responses to questionnaires; (*): mean of all responses by each farmer.

<i>Scale</i>		<i>Eager to take risks in production</i>	<i>Eager to take risks in marketing</i>	<i>Eager to take risks in financial issues</i>	<i>Eager to take risks in farming in general</i>	<i>Eager to take risks more than others</i>	<i>Farmer risky attitude*</i>
1-5	<i>mean</i>	3.16	3.12	2.43	3.02	2.98	2.94
	<i>std</i>	1.33	1.39	1.40	1.20	1.23	1.21
1-100 %	<i>mean</i>	63.27	62.45	48.57	60.41	59.59	58.86
	<i>std</i>	26.57	27.88	27.99	23.98	24.66	24.26

CONCLUSIONS

The aim of this study was to obtain an empirical insight into the Greek mussel farmers' perceptions of risk and risk management and into variables relating to these perceptions. Mussel farmers' perceptions of and responses to risk are important in understanding their risk behaviour. The present work demonstrates that the major sources of risk for mussel farmers in Greece are related with the financial risks followed by the personal welfare and the market risks of the mussels.

The mussel farmers prefer an income certainty from other resources as a risk management strategy, while the optimization of the in-farm management is widely acceptable practice to eliminate the losses.

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