Volume 2, Number 2, 2005, pp. 75-86

Environmental Management and Competitiveness: A Survey on Environmental Awareness in Shrimp Producers in the State of Rio Grande do Norte in Brazil

Anísia Karla de Lima Galvão
Universidade Federal do Rio Grande do Norte, RN, Brazil
E-mail: aklg2@yahoo.com.br

Thaís Bezerril Brandão de Lima
Universidade Federal do Rio Grande do Norte, RN, Brazil
E-mail: thaisbezerril@hotmail.com

Sérgio Marques Júnior
Universidade Federal do Rio Grande do Norte, RN, Brazil
E-mail: sergio@ct.ufrn.br

Abstract
The objective of the work was to investigate the perception of marine shrimp producers on the impacts of environmental management as a driver for improving competitiveness. The proposed methodology was the application of a questionnaire, using 24 variables linked to environmental awareness compounded by questions grouped into four scales: environmental attitudes, environmental behaviors, environmental regulations and farming profile. The questionnaire was applied for producers of three sites located in the northeast of Brazil. To analyze the results, it was used descriptive analysis and the analysis of association among variables, using Pearson chi-square statistic test. Results show that 41% of the shrimp producers believe to face aggressive competitiveness in the market, and that the activity generates few environmental impacts. It was verified the existence of dependence among the perception of the producers on the impact of environmental procedures as a driver for implementing competitive advantage to their business and opinion on the competition in the shrimp market, importance of environmental actions of the company in the decision of consumer purchase, and use of some ecological procedure at the farming.

Keywords: environmental management, competitiveness, environmental awareness

Introduction

Worldwide aquaculture has been increasing rapidly in the last decade, approximately at an average rate of more than 10% per year, mainly due to the combined effects of increasing world population, and the increasing demand for aquaculture products in developed countries (Biao et al., 2004). Undoubtedly, shrimp aquaculture is generating significant benefits in socioeconomic terms. Its high profitability and generation of foreign exchange have provided major driving forces in the global expansion of the industry (Primavera, 1997; Páez-Osuna, 2001). In Brazil, the production in 2003 reached 90,000 ton and the productivity was considered the biggest of the world, around 6.5 ton per hectare. The northeast of the country answered per 100% of exportations and 96% of the national production. Rio Grande do Norte state is the biggest national producer, with around 45% of all shrimp produced in the country (Rocha, 2004).

However, this significant growth has generated many concerns about aquaculture sustainability and competitiveness (Queiroz et al., 2003). Due to poor planning and management and a lack of appropriate regulations, numerous examples of decline in production and environmental impacts have occurred around the world (Páez-Osuna, 2001). Adverse environmental impacts related to shrimp aquaculture have been widely reported in the literature (e.g. Flaherty and Karnjanakesorn, 1995; Primavera, 1997, 1998; Páez-Osuna et al., 1998; Páez-Osuna, 2001). The most serious concerns expressed by both environmental activists and scientists are related to the destruction of mangrove, wetlands, and other sensitive aquatic habitat, conversion of agricultural land to ponds, water pollution resulting from pond effluents, excessive use of drugs, antibiotics, and other chemicals for aquatic animal disease control, inefficient utilization of fish meal and other natural resources, salinization of land and water by effluents, seepage, sediment from brackish water ponds, excessive use of ground water and other freshwater supplies for filling ponds, spread of aquatic animal diseases from culture of organisms to native populations, negative effects on biodiversity caused by escape of non-native species introduced for aquaculture, destruction of birds and other predators, entrainment of aquatic organisms in pumps, conflicts with other resource users and disruption of nearby communities (Boyd, 2003). Water pollution by pond effluents is probably the most common complaint, and this concern has attracted the official attention in most nations (Tookwinas, 1996; Boyd and Gautier, 2000; Boyd and Trucker, 2000, Boyd, 2003).

The environmental dilemma perceived from the environmental impacts generated by the productive activities has modified the competitiveness of goods and services. Environmental deterioration has increased the consumer awareness on the environmental problems, forcing organizations for developing strategies of environmental policy, linked to the development of environmental programs for the whole organization (Min and Galle, 1997). Corporations in North America, Europe and Japan, and in the majority of the industrialized nations, are hugging the environmental protection as part of its international

competitive strategies, defined from the pressure of governments, customers, suppliers and competitors (Berry and Rondinelli, 1998).

As the environmental quality can be considered as one of the basic components of the competitiveness in the international market of commodities, the aquaculture industry has been induced to create procedures that aim to minimize the generation of environmental impacts at the farming level. Some companies of shrimp aquaculture have already implemented environmental management systems (EMS) based on ISO 14000 standards, a step to reach sustainable development in the activity.

Based on this context, the main objective of this work was to investigate the perception of shrimp producers about the impacts in the competitiveness of the company when adopting environmental procedures. As a basic premise for the implementation of environmental programs in any organization, it is necessary to define efficient procedures to influence the environmental awareness of all stakeholders of the process, aiming to create an efficient environment to the appropriation of environmental content in the decision-making of any organization.

Environmental Management, Market Segmentation and Competitiveness

Environmental practices have become frequent in several business strategies, as related to process management or the final result in the form of a new product or service. However, there is not consensus on the effect of adopting environmental management as an efficient driver to generate competitive advantage for the organizations. Reinhardt (1998) states that the debate on business and environment is still a polarized subject. If superior environmental performance can creates more profitability for the organization, becoming the core principle of the business, on the other hand, the focus in the environmental affairs can lead to the loss of competitiveness because of the lose of the focus in the vision of the shareholders.

In these terms, the principal question to be placed is in which conditions the use of environmental procedures can increase organizational performance and, consequently, increase organization profitability. Eventually, under certain conditions, the definition of an established competitiveness standard in the market is derived from the aggregate value that the environmental procedure generates to the product or service, focusing the managerial decision of adopting environmental practices in the vision and expectations of the final consumer. According to Gil et al. (2000), the concern of consumers with relation to the environmental damages and the health, has led to a significant increase in the demand for the organic food production. In a study carried through two regions of Spain, the authors had identified the existence of market segmentation with relation to the organic products, when considering the life style of the consumers as a decision variable. Results of the work indicate that consumers worried about a healthful diet and

environmental degradation, are those that probably will consume organic products, even when paying a higher price for the product.

Barrett et al. (2002) state the increasing demand for organic foods in the United Kingdom. The authors identify an increasing market of organic products in EU, where producer countries such as Brazil, Mexico and Sri Lanka are distinguished as main involved countries in the global market of organic products commercialization. According to the authors, the global market of organic products is around US$ 11 billion, equivalent to 2% of the total food market. Barrett et al. (2002) also state that, although increasing, the demand for organic foods in the Europe surpasses its capacity of production, requiring importation; it is estimated that the imported value of organic foods is close to US$ 500 million.

The market segmentation related to organic products generate the need to create production strategies based in the knowledge of the consuming market profile, in terms of the factors affecting purchase decision. Torjusen et al. (2001), in study carried through the region of Hamar (south of the Norway), identified that consumers that buy organic foods are worried about questions related to the ethics, environmental problems and health. The increase in organic food purchase among consumers who already buy organic products, through the improvement in the availability of market preferences, can represent a bigger potential for the increase of the market segmentation.

As a driver element of the product quality and, consequently, competitiveness, the use of environmental management practices in aquaculture sometimes may creates conflicts among fisherman, aquafarmers and environmentalist. Barg and Wijkström (1994) states that, in essence, reasons for conflicts include the decline in quality and quantity of food fish consumption, resulting in reduced consumer confidence and decreasing fish marketability. According to the authors, patterns of social disruption due environmental degradation and resource depletion may decrease employment opportunities with shifts toward unskilled and seasonal labour.

However, a further difficulty in developing resource management and instigating environmental strategies to strengthen competitiveness is that there are no clear development of environmental awareness among aquafarmers and fishering managers. In fact, the productive process involved has been traditionally linked to reactive positions, related to the fulfillment of a stringent environmental legislation, apart from the benefits of the environmental management to the enterprise competitiveness. This premise creates the necessity of studying the mechanisms of improving environmental awareness in shrimp producers, main object in this work.

Research Methodology

A descriptive survey was used to study environmental awareness among shrimp producers. According to Forza (2002) descriptive survey research is aimed at understanding

the relevance of a certain phenomenon and describing the distribution of the phenomenon in a population. Forza (2002) also states that the primary aim of descriptive survey research is not theory development, even though through the facts described it can provide useful hints both for theory building and for theory refinement.

The interviewed population was composed by shrimp producers from Canguaretama, Goianinha and Tibau do Sul, sites located in the state of Rio Grande do Norte, Brazil, registered in local environmental agency. This area was chosen because of the significant concentration of farms in Curimataú, Cunhaú river estuary (Canguaretama) and in Guaraíra, Papeba and Papari estuaries (Goianinha and Tibau do Sul). Because of the shrimp farming, the swamp area covered with mangroves has suffered diverse interferences from the environmental point of view (Wainberg, 1999).

The used survey instrument was a questionnaire structured from variables related to environmental awareness, with 24 questions subdivided in alternatives of fixed answers, using a Likert scale. The questions had been grouped in four groups of variables: environmental attitudes, environmental behaviors, environmental regulations and farming profile, based on Polonsky and Mintu-Wimsatt (1995). The set of variables is presented in Table 1.

The variable COMD (opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market) was considered the dependent variable used to the analysis model.

The statistical techniques for analysis of data were the descriptive analysis and the analysis of interdependence among variables, using Pearson chi-square statistic test. The main objective in using the descriptive analysis of the absolute values was to present the perception of shrimp producers about the relationship between environmental management and the enterprise competitiveness, some attributes and its dimensions. With regard to the analysis of interdependence of variables, it was used Pearson chi-square statistic test to verify the degree of association between variables and, thus, to define which variables can intervene with the environmental awareness of the shrimp producers about the environmental impacts generated in the activity. To this work, it was adopted as significant for differences comparison among averages, values of probability p lesser or equal to 0.05 ($p \leq 0.05$), i.e. the differences among averages were considered when the value of probability p of the variance analysis was lesser or equal to 0.05.

Findings are presented and discussed at the following section.

Findings

The research was carried through using personal interview as a technique of data collection from August to October, 2003. The interviews were carried through in all the studied shrimp farming. The total population of individuals registered in local environmental agency was composed of 77 shrimp producers, from which 41 answered to

Table 1 – Set of Variables used in survey.

Variable	Variable Description	Group of Variable
COMP	Opinion of shrimp producers on the competition in the shrimp market	Environmental Attitudes
PRIC	Opinion of shrimp producers on the importance of the product price to the consumers decision when purchasing	
QUAL	Opinion of shrimp producers on the importance of the product quality to the consumers decision when purchasing	
SOCA	Opinion of shrimp producers on the importance of social actions to the company for the consumers decision when purchasing	
ENVA	Opinion of shrimp producers on the importance of environmental actions used in the farm for the consumers decision when purchasing	
IMAG	Opinion of shrimp producers on the importance of corporate image to the consumers decision when purchasing	
PROM	Opinion of shrimp producers on the importance of sale promotions to the consumers decision when purchasing	
FACI	Opinion of shrimp producers on the importance of sale facility to the consumers decision when purchasing	
COMD	Opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market	
EFFI	Opinion of shrimp producers on effectiveness of environmental advertising to shrimp market	
BUYD	Opinion of shrimp producers on when environmental concerns will be important to consumers decision when purchasing	
IMPL	Opinion of shrimp producers on the degree of environmental impact generated in the shrimp production	
EFLU	Frequency of effluent treatment in farm	Environmental Behaviors
FERT	Frequency of chemical fertilizers uses in the water	
ANTI	Frequency of antibiotics uses in the water	
STRA	Frequency of environmental training of employees in the farm	
PROC	Use of procedure in the process of shrimp production considered by producer as environmental correct	
SWAT	Use of procedure to save water in the shrimp production	
SENE	Use of procedure to save energy in the shrimp production	
ATRE	Producer participation in any training about environmental practices	
ETRE	Existence of some program of environmental training to employees in farm	
LKNO	Level of knowledge about environmental legislation related to shrimp production	Environmental Regulations
PROS	Size of the farm	Farming Profile
STOD	Density of shrimp stock used in the production process	

questionnaire, representing a rate of 53%. The questionnaire used as a survey instrument was pre-tested, being applied for 10 shrimp producers with similar characteristics to the population in study. The intention was to verify possible ambiguities of reply, answers that had eventually not been foreseen, a possible occurrence of lack in variability of answers in any question and the time of questionnaire application. Difficulties or ambiguities in the formulated questions were identified from each interview.

Table 2 presents the analysis of association using the chi-square test, between the variable related to the opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market (dependent variable COMD) and environmental attitudes variables.

Using the value of probability p lesser or equal to 0.05 as criteria for differentiation of averages variable, it is verified through the results presented in Table 2, that there is association between COMD (opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market) and COMP (opinion of shrimp producers on the competition in the shrimp market). It was observed through expected and observed frequencies tables that the observed frequency of shrimp producers that consider aggressive the competition in the market and that evaluate the environmental concern as a very important driver to competition, is bigger than the expected frequency. Probably, the perception of the existence of high competitiveness in the activity is a factor that intervenes with the opinion of shrimp producers on the use of environmental actions as competitive advantage to the business.

The same inference can be used when it is observed that there is association between dependent variable COMD and ENVA (opinion of shrimp producers on the importance of environmental actions used in the farm for the consumer's decision when purchasing). It was noticed that the observed frequency of shrimp producers that evaluate as very important the environmental concern and consider that environmental actions used in farm are very important factors in the decision of consumer purchase, is bigger than the expected frequency (through expected and observed frequencies tables).

However, it is interesting to verify that there is no association between the dependent variable COMD and EFFI (opinion of shrimp producers on effectiveness of environmental advertising to shrimp market) since the value of probability p corresponds to 0.132. Probably, the perception of the shrimp producers on the use of environmental marketing strategies is not associated with the perception of a possible increase in competitiveness.

Table 2 – Analysis of association between variable COMD and environmental attitudes variables.

Variables	Pearson chi-square	df	n	p-level
COMP	4.48959	1	41	0.034104
PRIC	0.50971	1	41	0.475265
QUAL	0.06646	1	41	0.796551
SOCA	1.49721	1	41	0.221104
ENVA	6.93041	1	41	0.008476
IMAG	1.07287	1	41	0.300301
PROM	1.07287	1	41	0.300301
FACI	0.42302	1	41	0.837046
EFFI	2.25900	1	41	0.132843
BUYD	3.34864	1	41	0.067263
IMPL	2.91371	1	36	0.087833

The descriptive analysis shows that only 48.8% of the interviewed believe that an environmental advertisement certainly would attract more customers, showing that the majority of the interviewed does not believe in the effectiveness of environmental marketing for increase of the competitiveness of the product. Such fact also can be perceived when it is not observed the existence of dependence between dependent variable COMD and IMAG (opinion of shrimp producers on the importance of corporate image to the consumer's decision when purchasing).

Table 3 presents the analysis of interdependence between dependent variable COMD (opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market) and the variable of the environmental behavior, environmental regulations and farming profile groups.

Through the results presented in Table 3, it is observed the association between dependent variable COMD and PROC (use of procedure in the process of shrimp production considered by producer as environmental correct). Through expected and observed frequencies tables, it was verified that the observed frequency of shrimp producers that consider very important the environmental concern as a competitive driver and use any ecological procedure is bigger than the expected frequency.

However, there is no statistical dependence between COMD and EFLU (frequency of effluent treatment in farm), FERT (frequency of chemical fertilizers uses in the water) and ANTI (frequency of antibiotics uses in the water). Probably, the use of what shrimp producers judge as being an environmental procedure, is not directly linked with action that aim to minimize the main environmental impacts of the activity, i.e. use of chemical fertilizers and antibiotics in water and the lack of effluent treatment. This fact can be considered a critical factor, in terms of environmental management in the activity, especially when descriptive analysis points that only 14% of the interviewed group consider that the shrimp production generates high environmental impact. In terms of environmental

Table 3 – Analysis of interdependence between dependent variable COMD and the variable of the environmental behavior, environmental regulations and farming profile groups.

Variables	Pearson chi-square	df	n	p-level
EFFT	0.37852	1	34	0.538395
FERT	2.47514	1	34	0.115662
ANTF	1.52702	1	35	0.216563
STRA	0.39656	1	34	0.528872
PROC	8.46410	1	41	0.003623
SWAT	0.02087	1	41	0.885131
SENE	0.36044	1	41	0.548264
ATRE	0.72989	1	41	0.392921
ETRE	0.02861	1	41	0.865664
LKNO	0.59134	1	41	0.441901
PROS	0.22285	1	39	0.636873
STOD	0.13928	1	39	0.708993

regulation, it was verified that 73.1% of the interviewed possess little or no knowledge about environmental legislation pertinent to shrimp production.

It was not observed dependence relation between COMD and variable of the farming profile group, i.e. PROS (size of the farm) and STOD (density of shrimp stock used in the production process). In a probabilistic view, the perception of the shrimp producers on the environmental practices as a factor of competitiveness is not influenced by the size of the farm or density of stock of produced shrimp.

Results Implications

Considering the premise that environmental practices in shrimp production can be regarded as a significant element of competitive differential, it can be observed that the relationship between the perception on the competitiveness in industry and the perception of the benefits in creating a green policy. This can be explained by the relationship between dependent variable COMD (opinion of shrimp producers on the importance of environmental practices as drivers of competitive advantage in the market), COMP (opinion of shrimp producers on the competition in the shrimp market) and ENVA (opinion of shrimp producers on the importance of environmental actions used in the farm for the consumer's decision when purchasing), both variables related directly with environmental concerns and competitiveness. Based on this perspective, it is necessary to create a more efficient mechanism of communication on the relationship between environmental management, market segmentation and competitiveness, aiming to improve awareness in shrimp producers. It was verified through the descriptive analysis that 41.4% of the interviewed believe to face aggressive competition in the market, against 58.5% that believe to face pacific competition. In a universe business-oriented, with high competitiveness, probably it was not established, in the surveyed sample, a clear vision of the competitive level that we can find in the shrimp market. In this situation, it seems to be difficult the incorporation of environmental strategies as a competitive business strategy.

Conversely, managerial risks can discourage the adoption of green policy by shrimp producers. It was verified that it exists significant deficiencies in terms of knowledge about environmental procedures, for example, such as the lack of knowledge on the environmental impacts generated by the shrimp production. This can mean the lack of concern or knowledge about the environmental thematic as well as the importance of the environment management or natural resource depletion in a context of business. Another observed significant fact was the lack of knowledge of the interviewed group about environmental legislation. Actually, it can be observed that the concern of environmental legislation are linked exclusively to enforcement, situation that enables to sprout environmental practices in farms, i.e. a reactive attitude not a proactive one. Due the fact that legislation has become more complex, it is also posed that the need to create efficient mechanisms of educational training on environmental aspects and impacts and

communication channels focusing environmental legislation, both pertinent to shrimp production.

Conclusions

Through the results, it can be observed that the environmental perception of the shrimp producers is essentially related to its perception of the competitiveness in the shrimp market. The interviewed shrimp producers that perceive the existence of competitiveness in the market perceive the importance to use environmental practices as a competitive strategy. Similarly, shrimp producers aunts value to environmental practices when they perceive how much the consuming market values environmental practices in the shrimp productive process.

The results pointed in this work, related to the lack of producers perception about the implications of the environmental dimension in the set of the activities of an organization (in competitive terms) reflect, on a point of view of strategic management, the necessity of adopting efficient mechanisms of environmental training, mainly information on environmental practices and competitive aspects of the activity.

It is important to emphasize that in many places of shrimp production, environmental management practices already can be seen as a prescribe requisite in the effective environmental legislation, indispensable for production licensing. In a near future, the lack of adoption of environmental procedures in business might mean the loss of important market segments, mainly abroad. It is evident the sprouting of market segments composed by green consumers, worried in purchasing environmentally benign products. The question that arises is how to reach such markets. We understand that any solution encompass the improvement of environmental awareness among producers, focusing in the relationship existent between environment, business and competitiveness.

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Biography

Anísia Karla de Lima Galvão is graduated in Animal husbandry from Federal University of Rio Grande do Norte (UFRN), where she was awarded as the best student of the group of Animal husbandry. She holds a Master of Science in Production Engineering at Industrial Engineering Graduate Program at UFRN. Currently, she was selected for a doctorate course in the graduate program in tropical agronomy of the Federal University of Amazonas.

Thaís Bezerril Brandão de Lima is graduated in Animal husbandry, receiving his degree from the Federal University of Rio Grande do Norte (UFRN) in 2004. She is currently a Master of Science researcher at the Industrial Engineering Graduate Program at UFRN.

Sérgio Marques Júnior is an agronomist, working at the Federal University of Rio Grande do Norte. He has involved in research in the Production Engineering Program, where he is a assistant professor on Environmental Strategy and Environmental Management System. His areas of research are related to the environmental theme, developing studies on environmental strategy, environmental management and industrial ecology.