ISSN 2477-0531

SUSTAINABILITY OF HOUSEHOLDS' SEAFOOD PROCESSING ACTIVITIES IN MEKONG DELTA

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ABSTRACT

Seafood processing industry including companies and households accounts for 35% of Mekong delta's total agricultural output. The former mainly concentrates on exports; their processing activities are required and supervised to meet many criteria of sustainable development and corporate social responsibility by foreign importers. Meanwhile, the latter's production is for the local market; its processing activities mainly rely on experience and surrounding environment. This study focuses on sustainability of households' seafood processing activities with three pillars including economic, social and environmental ones. The research sample of 300 households was collected in 6 provinces of Mekong delta including Ben Tre, Ca Mau, Tien Giang, Dong Thap, Tra Vinh, Bac Lieu in July 2014. Research findings show that from the economic perspective, physical facilities are outdated; revenues and profits are not stable and household have more difficulties in collecting materials, obtaining loans for their business and selling their products. In addition, from social perspective, the average income for seasonal workers is at low levels with 60% paid from 50 - 80 thousands VND per day and 70% of surveyed households have members and seasonal workers suffering from syndromes of work-related diseases including sinusitis, rheumatism, dermatology, eye itching. Moreover, the environment surrounding seafood processing households is seriously polluted with 71% of households discharging untreated wastewater into nearby seas, rivers and canals and disposing solid wastes around their houses. Therefore, 80% of households fail to control and kill insects such as flies and bluebottles in their processing area, especially up to 50% failing to know the origins of anti-insect chemistries used. Based on these findings, this paper delivers implications and recommendations for the local government and households to improve the sustainability of households' seafood processing activities in Mekong delta.

Key words: *sustainability, household, seafood, Mekong delta.*

INTRODUCTION

Seafood processing industry including companies and households accounts for 35% of Mekong delta's total agricultural output. The former mainly concentrate on exports; their pactivities are required and supervised to meet many criteria of sustainable development and corporate social responsibility by foreign importers. Meanwhile, the latter's production is for the local market; its processing activities mainly rely on experience and surrounding environment. The extant literature shows that although there are many studies on sustainability of fishery with different perspectives, there are few studies on the sustainable development of seafood processing industry. The sustainability of seafood processing activities is commonly investigated from the social and environmental perspective both in foreign countries (Ayer *et al.*, 2009; Thrane *et al.*, 2009; Cappell *et al*., 2007) and in Vietnam (Thong, 2003; Tien and Long, 2007).

World Commission on Environment and Development (1987) initially introduced a concept of processing that: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs". From notion of sustainability, tremendous interest and several publications are generated. According to Norton (1992),''sustainability is a relationship between dynamic human economic systems and larger, dynamic, but normally slower changing ecological systems, such that human life can continue indefinitely, human individuals can flourish, and human cultures can develop - but also a relationship in which the effects of human activities remain within bounds so as not to

destroy the health and integrity of self-organizing systems that provide the environmental context for these activities''. Moreover, Wimberly (1993) posits that ''to be sustainable is to provide for food, fiber and other natural and social resources needed for the survival of a group such as a national or international society, an economic sector, or residential category and to provide in a manner that maintains the essential resources for present and future generations". Constanza (1992) also considers sustainability as the ability of maintaining the structure (organization) and function (vigor) of a system when it is under external stress (resilience). Despite several ways of statement, these definitions of sustainability focus on maintenance, sustenance and continuity.

Literature also shows that many researchers have developed the analysis and evaluation of sustainable development using various criteria, known as the dimensions or pillars of sustainable development. OECD (1999) proposes a model of three dimensions, namely economic, social and environmental ones with corresponding indicators for evaluating the sustainable development of member countries. In addition, the model describes interactions between three dimensions. Manzi *et al*. (2010) use the three dimensions with specific variables and their relationships to analyze the sustainable development in urban areas. Valentin *et al*. (2000) develop OECD's model by adding the institutional dimension as they argue that law and government policy are significant to sustainable development. In line with Valentin *et al*. (2000), Jeong *et al*. (2005) develop the four dimension model with a system of indicators for dimensions and their interactions. Emphasizing "system regulation and governance", O'Connor (2006) focus on the institutional dimension and its impacts on the others.

Although there are many studies on sustainability of fishery with different perspectives such as conservation paradigm (Charles, 1994), rationalization paradigm (Anderson, 1986) or social/community paradigm (Charles, 2001), there are few studies on the sustainable development of seafood processing industry. The sustainability of seafood processing activities is commonly investigated from the social and environmental perspective (Ayer *et al*., 2009; Thrane *et al*., 2009; Cappell *et al*., 2007). Likely, research on seafood processing industry in Vietnam focuses on social and environmental impact of seafood processing industry nationwide (Thong, 2003) and in a province (Tien and Long, 2007). This study focuses on sustainability of households' seafood processing activities with three pillars or dimensions including economic, social and environmental ones in 6 Provinces of Mekong delta including Ben Tre, Ca Mau, Tien Giang, Dong Thap, TraVinh, and Bac Lieu.

RESEARCH METHOD

Literature shows that there are two popular models to analyze the sustainable development; however, the original model of three dimensions suggested by OECD (1999) is chosen as the authors intend to present the performance of households' seafood processing activities from the perspective of sustainability (Table 1). Hence, the interactions between dimensions are not investigated in this study and this limitation can be eliminated in further research. Specific indicators attached to evaluation criteria of three dimensions are proposed on the basis of The National technical standard on seafood trading and producing plants-general conditions for ensuring food safety and hygiene - QCVN 02-01: 2009/BNNPTNT, The Circular No.14/2009/TT-BNN dated March 12th 2009 guiding environmental management in seafood processing and experts' recommendations.

Sample selection

To collect information for this study, the authors conduct a questionnaire survey on seafood processing households. Before making the official survey, the questionnaire draft is sent to 60 professionals, each of whom is an expert at the Department of Agriculture and Rural Development in Ben Tre, Ca Mau, Tien Giang, Dong Thap, Tra Vinh, and Bac Lieu province to ask for their comments. After revising the draft based on experts' comments, we conduct a preliminary survey of 10 households in each province. The official survey by questionnaire was conducted in July 2014 with a sample of 300 households (50 households per province), in which the household representatives gave answers to surveys for their households and workers responded to the survey for employees. Surveyed households were selected at the recommendation of the experts at the Department of Agriculture and Rural Development in the province. The number of workers in each household surveyed accounts for 20% of workers working (rounded to integer part), except for those with less than 3 laborers, there is still 01 worker surveyed. Investigators directly examine the validity, completeness of information in the survey.

Table 1: The framework to assess the sustainability of the seafood processing activities

Dimensions	Criteria	Indicators
Economic	Facilities	Processing areas: area, peculiarity and condition Equipment
	Materials and finished products	Volume, structure, availability
	Food safety and hygiene	Material quality Processing procedure Equipment cleaning room Training
	Capital and business outcomes	Utilizing and raising capital Revenue, profit Stability in business outcomes
Social	Laborers	Number of laborers Types of laborers Education background, qualification
	Income and working conditions	Income Healthcare Occupational diseases
Environmental	Harmful insect control	Prevention and killing methods The impact on the environment
	Solid waste management	Collection and processing methods The impact on the environment
	Effluent management	Collection and processing methods The impact on the environment

RESULTS AND DISCUSSION

Economic criteria

Facilities

The research findings show that most seafood processing households in the Mekong Delta produce on a small-scale, 40% of the sample have a seafood processing area (not including drying yards for processing dried seafood households) of less than 30 m^2 and 32% have an area that ranged from 30-60 m^2 (Table 2) In addition, 10% of households own functional areas for seafood processing and the remaining performs seafood processing activities together with other family activities; e.g. fish receipt and washing area is also the area for washing cooking appliances, laundry; drying area is also the home kitchen. No separation between these areas is not subject to the requirements of food safety and hygiene.

For the current state of processing areas, most of them are built at the same time when houses are built or renovated. About 37% of the 300 households surveyed built processing areas before 2000, 25% of households built from 2001 to 2005 and those who built after 2005 accounts for 38% (Table 3). Although the seafood processing areas of households were built long ago, only 20% perform periodical repairs. As a result, the majority of processing areas fail to meet the sanitation standards. Moreover, tools and means used for seafood processing are old and degraded.

Table 2: Seafood processing areas of households

	Number of households	Percentage (%)
Under 30 m^2	120	40
30 - 60 m^2	96	32
60 - 90 m^2	30	10
Above 90 m^2	54	18
Total	300	100

Source: Survey conducted by the author in July 2014

Table 3. Year starting construction of the seafood processing areas of households

	Number of households	Percentage (%)
Before 2000	111	37
2001 - 2005	75	25
After 2005	114	38
Total	300	100

Source: Survey conducted by the author in July 2014

In addition, only about 3% of households have processing areas which are in absolutely good condition, 49% have a number of areas which need renovating, and 48% have many areas that need to be renovated (Table 4). The processing areas which should be repaired are characterized with their thatched roofs, walls leaf, ground or cement floor have been damaged and floors with stagnant water. In addition, the sanitation in these areas is not guaranteed when the pets (dogs, cats, chickens, ducks) enjoys their freedom of movement. There are not so many flies and other insects, but the people take no measures to prevent or kill them. There is also odor; whereas the raw seafood in their preliminary processing stage is usually put directly on the floor.

The households' processing work is mainly manual because there is no modern equipment as well as machinery. In addition, the utensils used for storing processed seafood are not under guaranteed sanitary conditions. Only 15% of households invest in semi-manual equipment, special tools that serve the seafood processing and ensure sanitary conditions.

Table 4. Current conditions of processing areas

Conditions	Number of households	Percentage (%)
Absolutely good	9	3
A few areas in need of renovation	147	49
Many areas in need of renovation	144	48
Total	300	100

Source: Survey conducted by the author in July 2014

Materials and finished products

Seafood processing households in the Mekong Delta provinces only process mainly dried goods (fish, squid, shrimp, baby shrimp) accounting for 64% of the surveyed sample, followed by 18% of the flower crab, fish sauce is 6%, 7% of shrimp paste, and other products which ar not significant (fried fish, fresh fish curettage) (Table 5). Among the dried items, dried fish products are mostwidely processedby households (30%) due to thier non-complex processing, low risk, and not requiring much capital investment. Only 7% of households process dried squid, 1% of which directly process on board upon catching.

The statistics of the quantity of finished products and materials consumed by seafood processing households are difficult job because most of households do not have records, rely on seasonality and sources of materials provided by material suppliers. On the other hand, households fail to have information about where their products are distributed since they sell the products to the intermediary purchasers. The selling price of each household was kept confidential under the provisions of these purchasers.The volume of sales is not stable, depending on the needs of the purchasers.

Table 5: Distribution of seafood processing households in the sample by commodity

Commodity	Number of households	Percentage (%)
Dried shredded squid	21	7
Dried salted fish	90	30
Dried shrimp	45	15
Dried baby shrimp	36	12
Fish sauce	18	6
Shrimp Paste	21	7
Flower crab meat	54	18
Others	15	5
Total	300	100

Source: Survey conducted by the author in July 2014

Food safety and hygiene

For households, the management and control of product quality are neglected as there are many factors making households unable to control and govern the quality of the product; particular input sources. Households have to purchase materials under the terms and conditions stated by their suppliers and fail to have choices. These materials are normally of low quality due to households' weak bargaining power. In particular, when asked about the criteria for selecting salt and marinating spices in processing, about 82% out of 192 dried seafood processing households (dried squid, dried fish, dried shrimp, dried baby shrimp) respond that their choice is based on intuitive; the rest 18% do not care about quality. They just buy the products from providers without any care about the quality as they buy on credit.

In terms of processing, according to the results of observations and interviews, 100% of workers involved in the processing of materials at households frequently skip gloves when working. They fail to focus on seafood processing and do other things during processing but they fail to wash their hands before continuing their work.

For restrooms, there are 5% out of 300 households in the survey sample fail to have restrooms due to being close to the river and all the waste water is discharged into the waterways. Of the other 95%, they only clean the rooms once a day and the majority of households' facilities in the toilets do not meet the full requirements of the sanitation standards in processing facilities. Among 192 dried seafood processing households, 173 households used suitable materials for drying frame in accordance with the industry's standards (bamboo, nylon mesh), while 19 households still dry seafood on the roof. The frames of households are subject to the requirements, being 0.5 m above the ground or higher. A few households have actively used PVC pipe as the foot of the frames to avoid mice. However, the sanitary conditions under the frames of households do not get much attention when there is a lot of stagnant water and animals frequently crossing.

Regarding training of food safety and hygiene, approximately 80% of the 300 households surveyed receive training on food safety and hygiene every year, of which 37% are trained 01 times/year; 36.3% are trained 02 times/year and 6.3% are trained more than 02 times/year (Table 6). When interviewed, the answer is that training is not conducted on a regular basis; when receiving an invitation, households always attend. However, they replied that the application of knowledge was very limited due to the lack of capital and infrastructure condition. Even good performance does not bring additional profit for households but more labor intensive and increase costs than when not done.

Table 6. Participation in food safety training per year

Number of times per year	Number of households	Percentage (%)
No	61	20.3
Once a year	111	37.0
Twice a year	109	36.3
More than two times	19	6.3
Total	300	100

Source: Survey conducted by the author in July 2014

Capital and business outcomes

Capital shortage occurs frequently. About 50% of households do not have enough capital to buy materials; as a result, their bargaining power is weakened under the pressure of suppliers. About 85% of households have no knowledge of cost accounting, which results in excessive spending, no separation between production costs and living costs and deficit in their equity. Moreover, 100% of households hope to receive financial support from the government but when asked about plans to expand the business on the condition that capital is provided, 80% give general answers on how to implement and achieve the expected goals.

In addition, 70% of households respond that they are unable to estimate revenue and profit in the seafood processing accurately because there is no book to record. Saving profits to reinvest and buying materials for the next season are conducted by few households, for almost all households have no thought of this. Obviously, these households lack the business accounting skills on household scale required to assess business performance and long-term oriented production.

Besides, research results indicate that households realize the lack of sustainability in their production and business results. Only 6.7% of households surveyed respond that manufacturing operations and business gradually advance, while 52.7% posit that they gradually deteriorate, and 40.7% rate as erratic (Table 7). When asked about causes of the difficulties and instability in seafood processing activities, households explained that raw material input is unstable and increasingly scarce while product sales increasingly difficult due to fewer buyers and lower prices.

Table 7. Households' remarks on seafood processing activities over the last three years

	Number of households	Proportion (%)
Gradually advance	20	6.7
Gradually deteriorate	158	52.7
Unstable	122	40.7
Total	300	100.0

Source: Survey conducted by the author in July 2014

Social criteria

Laborers

The total number of labor working in 300 seafood processing households surveyed is 1615 people, including 1061 workers employed seasonally in 251 households. Households with less than 10 laborers (including seasonal workers) account for approximately 88% of the total sample; households from 1 to 5 labourers are about 40%, those and from 6 to 10 are 48% (Table 8). A large percentage of households with less than 10 laborers and high percentage of seasonal laborers imply the un-sustainability which can be explained by instability of job, income and small-scaled production.

Table 8: Distribution of the research sample by number of laborers

Number of laborers	Number of households	Percentage (%)
1 - 5 persons	119	39.7
6 - 10 persons	144	48.0
11 - 15 persons	18	6.0
16 - 30 persons	19	6.3
Total	300	100

Source: Survey conducted by the author in July 2014

The number of the seasonal workers at the households is often from 1 to 5, which accounts for 70% of the surveyed sample. The hired workers include those who were hired based on productivity by flower crab meat processing households and those who were hired based on daily basis by dried seafood and paste processing households. The hired labor is often the neighbors of these households. In addition, the female workers typically constitutes up to 80% of the work force because the job requires ingenuity, not physically demanding. Moreover, young laborers are not favorable, with only 9% of households employing labor of less than 15 years old.

In the surveyed sample, workers processing seafood have low educational background, including the heads of households. Those who have finished secondary level account for 87.7%, the others goes to elementary level. Workers are also not well-trained in seafood processing and mainly follow the experience. The experienced help the newcomers.

Income and working conditions

The daily average wage of a seasonal worker commonly ranges from 50 to 80 thousand VND per day (60% of households in the surveyed sample pay at this level) (Table 9); however, each year, the employees work only a few months for seafood processing households, depending on the material, the business situation of the household and the sentiment of households. With many seafood processing households based on a small scale, precarious seasonal labor's job, low and unstable workers' income, the seafood processing jobs at the local Mekong Delta provinces are not considered fully sustainable. Due to moderate earnings from seafood processing, households cannot care much about health check-up and the implementation of social insurance, health insurance for their laborers. All of the households in the survey fail to schedule for periodic health checks for both family members and employees. Only when recognizing the syndrome, they go to the health center for examination. When encountering health problems such as burns, wound infections, skin disease and diarrhea, they still work as usual if they have enough energy.

The symptoms of occupational diseases are severe. About 70% of surveyed households have members and seasonal workers suffering from syndromes of work-related diseases including sinusitis, rheumatism, dermatology, eye itching. When there are symptoms of occupational diseases, the majority of workers often go to the nearby medical center for examination and treatment.

Table 9. Distribution of the research sample by wage paid to seasonal labor

	Number of households	Percentage (%)
30 – less than 50 thousand VND per day	42	14
50 - 80 thousand VND per day	180	60
More than 80 - 120 thousand VND per day	78	26
Total	300	100

Source: Survey conducted by the author in July 2014.

Environmental criteria

The prevention and killing of insects and pests in 80% of households are not effective as there are a lot of flies, rats in the processing area, which generally believed to be caused by dirty environment. There are a few households (about 5%) who do not take any measure to kill insects and pests, not even insecticide sprays. Only about 50% of households use pesticides with transparent origins and the others purchase pesticides without label from retailers. Compared with insecticides, rodenticide measures are only used with a lower frequency. Instead, households often preserve goods in plastic bag or covered container.

During processing, only after finishing the final batch, households clean the processing area. They collect waste and spray water to wash the floor. Depending on the level of hygiene, they can use soap to clean and use a broom to sweep. Overall, cleaning the processing area at the household is only to collect waste and clean up tools to facilitate the processing of the next day without meeting hygiene standard.

The majority of households consider discharging waste water into the surrounding environment as normal. In the 300 surveyed households, there are 208 households (representing 82.7%) discharging waste water directly into rivers, sea, or canals near their houses without treatment (Table 10). Therefore, the pollution of water sources around seafood processing households is extremely severe. The water turns black (especially in areas where the flow is not strong) and very foul.

Table 10: The discharge of household waste water

	Number of households	Percentage (%)
Discharging directly into rivers, seas, canals	248	82,7
Discharging into sewers	36	12,0
Discharging at their own yards	10	3,3
Discharging into the septic lakes	6	2,0
Total	300	100

Source: Survey conducted by the authors in July 2014

Regarding solid waste, 78% of households have implemented garbage collection to deliver to the environment protection force locally. However, the situation of solid waste spilled into the surroundings of the households is still popular.

CONCLUSION AND RECOMMENDATION

Conclusion

The analysis of sustainability of households' seafood processing activities in Mekong delta shows several weaknesses in the three dimensions including economic, social and environmental. Based on these findings, we suggest recommendations for both local government and seafood processing households. The local government should make a long-term plan for the industry, train business accounting skills for households, develop programs to reduce laborers' occupational diseases and support households to reduce environment pollution. On the other hand, households should learn business skills and pay more attention to ensure hygiene and environment protection requirements.

Recommendations for the local government and households

Based on the analysis of sustainability of households' seafood processing activities in Mekong delta with three original dimensions, the research finds that there are several weaknesses. Firstly, from the economic perspective, physical facilities are outdated; revenues and profits are not stable and household have more difficulties in collecting materials, borrowing money for their business and selling their products. In addition, from social perspective, the average income for seasonal workers is at low levels with 60% paid from 50 - 80 thousands VND per day and 70% of surveyed households have members and seasonal workers suffering from syndromes of work-related diseases including sinusitis, rheumatism, dermatology, eye itching. Moreover, the environment surrounding seafood processing households is seriously polluted with 71% of households discharging untreated wastewater into nearby seas, rivers and canals and disposing solid wastes around their houses. Therefore, 80% of households fail to control and kill insects such as flies and bluebottles in their processing area, especially up to 50% failing to know the origins of anti-insect chemistries used. Based on these findings, we propose recommendations for the local government and households to improve the sustainability of households' seafood processing activities in Mekong delta.

Recommendations for the local government

Planning seafood processing industry in the province with three main contents: (1) planning aquaculture, seafood processing areas by products such as frozen and dried seafood with both industrial and manual production; (2) planning the development of processed seafood products by market (domestic and foreign) for each category of materials(fish, shrimp, squid and clams); planning systems of seafood processing facilities associated with ensuring sustainable operation of capital, raw materials, technology, labor, business developing plans.

1. Training business accounting skills for all seafood processing households, especially skills of keeping tracks of accounting records and managing business costs and expenses.
2. Researching and developing programs to raise awareness, reducing the incidence of occupational diseases for processing workers. The program requires two contents including: (1) providing common knowledge for both households and workers about workplace safety, occupational diseases and how to prevent them; (2) calling forsupports from non-governmental organizations, seafood processing households and allocate appropriate funds to hold health care check-ups, dispensing free medicine for workers in the fisheries sector quarterly or yearly.
3. Financing and supporting households to purchase seafood processing waste water treatment system; especially encouraging the installation of wastewater treatment system serving many households in the same location.

Recommendations For Households

1. Learning experiences of families doing well or attending the training sessions on how to manage their business activities.
2. Paying more attention to the preservation, maintenance of workshops, equipment for seafood processing to ensure hygiene requirements.
3. Contacting with the local health authorities to learn, obtain information about prevention and treatment of occupational diseases which are often acquired in the seafood processing sector.
4. Collecting solid waste and using public garbage services, not littering waste into the surrounding environment; collecting waste before spraying water to wash the processing floor and investing in building drainage system for the processing area.
5. Proposing to the local government for funding or contracting on treating the sewage collectively to limit discharging into the surrounding area.

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