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Households risk management strategies in coastal aquaculture in Vietnam : the case of clam farming in Thaibinh province

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PRESENTATION OF THE AUTHOR

Dr. Thi Thu Hang NGO currently works at Vietnam National University of Agriculture as a lecturer and researcher. She holds a Bachelor's degree in Economics from National Economics University (in Vietnam), and a Master in Professional Accounting from the University of New South Wales, Australia. In 2018, she completed a doctoral fellowship in the field of agriculture economics at the Gembloux Agro-Bio Tech, University of Liege, Belgium. Her thesis "Households risk management strategies in coastal aquaculture in Vietnam : the case of clam farming in Thaibinh province" focus about the coastal aquacutlure risks and farmers' strategies in coping with those risks, as well as the supports of government for them in order of developing sustainable livelihood alongs coastal line.

Her current research interests focus on: (1) Cooperatives Development; (2) Accounting, Audit and Finance; (3) Internal control system and Risk management.

RESUME/TOM TẮT

With over 3,260 kilometers of coastal line and 112 estuaries, 226,000 square kilometers of internal waters and territorial waters, the exclusive economic zone of more than 1 million square kilometers, and more than 4,000 islands, forming 12 bays and lagoons with a total area of 1,160 square kilometers, Vietnam has high potentials for aquaculture development. Vietnam's seafood output has been growing steadily in recent years (since 2000 up to 2016) with an average increase of 9% per year. Despite its advantages and positive development trends, Vietnam aquaculture has faced several issues including asymmetric information and high demand for quality products. The main cause of these issues is risks, from production to market risks. This study has explored the main risks faced by the coastal clam farming sector in Thaibinh province located in northern Vietnam. The risks can be classified into two types in term of the nature of their cause: man-made and natural ones, and three types in term of their impact: production, market and financial risks. The causes of these risks include extreme weather events, wasted water flows, production technics; market access or financial capacity. However, man-made risks are more severe and more difficult to cope with than natural ones. These above risks have serious consequences for clam farming. For the three communes examined in this study, less than half of the farmers were yet recovered from the loss caused by several shocks although majority of them had mobilized capital to restart clam farming. About one third of the farmers had to sell their fixed assets to pay debts related to their clam investment, and ten households had left their villages under the pressure of debts. However, in such risky clam farming environments and increased market difficulties, not all farmers were seriously impacted. Indeed, it is surprising that one fifth of the surveyed farmers succeeded in all their clam raising cycles so far, and another quarter remained well resilient after the shocks. Different household risk management strategies applied in clam farming are thus discussed in the comparative analysis and discriminant analysis. In general, the tactics related to increasing farm size, applying technical innovation and accessing financial sources with no or a lower interest rate, provided better conditions for clam growth, reducing clam farming losses. They also facilitated speedier recovery from shocks. There are many internal and external factors in the application of risk management strategies and

tactics. Of the internal factors identified, include households' financial capacity and the experiences of the head of households had more impact while the education level and the job of the head of household seemed to have little influence on the choice and application of households' risk management strategies. External factors refer to the policy factors and the knowledge capacity enhancing activities in the clam farmers community. Among these activities, those of "groups for experience sharing" were found to have significantly greater impact than the training courses and activities of farmer's union. Besides, the government had played a role in directing farmers in clam farming practices, but not much in risk management. Given that the tactics addressed the capital issues, land uses, and clam farming techniques had positively contributed to the result of household risk management strategies whilst experience gaining and sharing activities strongly impacted the application of these tactics. The intervention and policies of government in all levels to the farmers should therefore focus more on these issues. It is vital that the government's support policies, extension programs, training courses and farmer's union activities be practically oriented and suit farmers' desires. Furthermore, the addition of policies/interventions in market issues (for both input and output) should be taken into account because those risks were considered as meso level, which farmers cannot solve by themselves and thus definitely need the support from the government, from local to the state level. To support farmers in managing risks, several government interventions are needed: (1) improving the support system to household in clam farming such as increasing farm size, promoting linkages to market and training technic; (2) increasing investment in the treatment of the water management issue and protecting the ecosystem; and (3) promoting participatory policy formulation and its enforcement.

Với hơn 3.260 km đường bờ biển và 112 cửa sông, 226.000 km nội thủy và lãnh hải, vùng đặc quyền kinh tế rộng hơn 1 triệu km vuông và hơn 4.000 hòn đảo, tạo thành 12 vịnh, đầm với tổng diện tích 1.160 km^2, Việt Nam có nhiều tiềm năng phát triển nuôi trồng thủy sản. Sản lượng thủy sản của Việt Nam tăng trưởng ổn định trong nhiều năm (kể từ năm 2000 đến năm 2016) với mức tăng bình quân 9%/năm.

Mặc dù có những lợi thế và xu hướng phát triển tích cực, nhưng nuôi trồng thủy sản Việt Nam phải đối mặt với một số vấn đề bao gồm thông tin bất

cân xứng và nhu cầu cao về sản phẩm chất lượng. Nguyên nhân chính của những vấn đề này là sự tồn tại của các loại hình rủi ro, từ khâu sản xuất đến rủi ro thị trường. Nghiên cứu này đã tìm hiểu những rủi ro chính mà ngành nuôi ngao ven biển phải đối mặt ở tỉnh Thái Bình, miền Bắc Việt Nam. Rủi ro có thể được phân thành hai loại theo bản chất nguyên nhân của chúng: rủi ro từ thiên nhiêu và rủi ro do con người tạo ra, và ba loại rủi ro theo tác động của chúng: rủi ro sản xuất, thị trường và tài chính. Nguyên nhân của những rủi ro này bao gồm các hiện tượng thời tiết cực đoan, hệ thống nước thải công nghiệp, kỹ thuật sản xuất; khả năng tiếp cận thị trường hoặc năng lực tài chính. Thực tế cho thất, rủi ro do con người tạo ra thường nghiêm trọng hơn và khó đối phó hơn so với rủi ro đến từ thiên nhiên.

Những rủi ro trên gây hậu quả nghiêm trọng cho nghề nuôi ngao. Trong phạm vi ba xã được khảo sát trong nghiên cứu này, chưa đến một nửa số nông dân có thể phục hồi được sau thiệt hại do một số cú sốc gây ra mặc dù phần lớn trong số họ đã huy động vốn để bắt đầu lại nghề nuôi ngao. Khoảng 1/3 số nông dân đã phải bán tài sản cố định để trả các khoản nợ liên quan đến việc đầu tư nuôi ngao của họ, và 10 hộ đã bỏ làng ra đi vì áp lực tài chính nợ nần. Tuy nhiên, trong môi trường nuôi ngao đầy rủi ro và khó khăn về thị trường gia tăng, không phải người nuôi nào cũng bị ảnh hưởng nghiêm trọng. Một phần năm số nông dân được khảo sát đã thành công trong tất cả các vụ nuôi ngao của họ cho đến thời điểm được khảo sát (2016), và một phần tư khác vẫn phát triển tốt sau các cú sốc. Từ sự khác biệt này, các chiến lược quản lý rủi ro hộ gia đình áp dụng trong nuôi ngao được thảo luận, so sánh và phân tích biệt số.

Kết quả phân tích cho thấy, nhìn chung, các chiến thuật liên quan đến tăng quy mô trang trại, áp dụng cải tiến kỹ thuật và tiếp cận các nguồn tài chính không lãi suất hoặc lãi suất thấp hơn đã tạo điều kiện tốt hơn cho nghề nuôi ngao phát triển và giảm thiệt hại cho người nông dân. Các yếu tố này cũng góp phần tạo điều kiện để phục hồi nhanh hơn sau các cú sốc.

Có nhiều yếu tố bên trong và bên ngoài tác động đến việc áp dụng các chiến lược và chiến thuật quản lý rủi ro. Trong số các yếu tố bên trong được xác định, bao gồm năng lực tài chính của hộ gia đình và kinh nghiệm của chủ hộ có tác động nhiều hơn trong khi trình độ học vấn và công việc của chủ hộ dường như ít ảnh hưởng đến việc lựa chọn và áp dụng các chiến lược quản lý rủi ro của hộ gia đình. Các yếu tố bên ngoài đề cập đến các yếu tố chính sách và các hoạt động nâng cao năng lực kiến thức trong cộng đồng người nuôi ngao. Trong số các hoạt động này, những hoạt động của “nhóm

chia sẻ kinh nghiệm" có tác động lớn hơn đáng kể so với các khóa đào tạo và hoạt động của hội nông dân. Bên cạnh đó, chính phủ đã đóng vai trò định hướng cho người nông dân trong việc thực hành nuôi ngao, nhưng chưa có nhiều vai trò trong việc quản lý rủi ro. Cụ thể, các chiến thuật giải quyết các vấn đề về vốn, sử dụng đất và kỹ thuật nuôi ngao đã đóng góp tích cực vào kết quả của các chiến lược quản lý rủi ro hộ gia đình trong khi các hoạt động thu thập và chia sẻ kinh nghiệm tác động mạnh mẽ đến việc áp dụng các chiến thuật này. Do đó, sự can thiệp và các chính sách của chính quyền các cấp đối với người nông dân nên tập trung nhiều hơn vào những vấn đề này. Điều quan trọng là các chính sách hỗ trợ của chính phủ, các chương trình khuyến nông, các khóa đào tạo và các hoạt động của hội nông dân phải được định hướng thiết thực và phù hợp với mong muốn của nông dân. Hơn nữa, cần tính đến việc bổ sung các chính sách / can thiệp vào các vấn đề thị trường (đầu vào và đầu ra) vì những rủi ro đó được coi là mức trung bình mà người nông dân không thể tự giải quyết và do đó chắc chắn cần sự hỗ trợ từ chính phủ và chính quyền địa phương. Để hỗ trợ nông dân quản lý rủi ro, cần có một số biện pháp can thiệp của chính phủ: (1) cải thiện hệ thống hỗ trợ hộ nuôi ngao như tăng quy mô trang trại, thúc đẩy liên kết với thị trường và đào tạo kỹ thuật viên; (2) tăng cường đầu tư vào việc xử lý vấn đề quản lý nước và bảo vệ hệ sinh thái; và (3) thúc đẩy xây dựng chính sách có sự tham gia của người dân.

1. INTRODUCTION

"Risk" is a term that has been widely used in various sectors, including agriculture, in recent decades. In the most general terms, the USDA Risk Management Agency (RMA) defines risk as "the chance of something bad happening" (McIntosh 2008). This definition mentions two important components of risk, that is, "something bad", which refers to an event or outcome that is adverse or failure", and "the chance", which implies a degree of possibility that an adverse event will occur. Although the definition of risk may vary depending on the sector, those two important concepts are incorporated in all explanations of risk (Harwood, Heifner et al. 1999, Bondad-Reantaso, Arthur et al. 2008, Keil, Zeller et al. 2008). Agricultural risks are basically categorized into five types: production risk, marketing risk, financial risk, legal risk and human risk (Musser and Patrick 2002). Due to increasingly extreme weather events and social-economic conflicts, agricultural risks have been intensifying all over the world each year (Cardona 2004, Fischer and Buchenrieder 2010, Yang 2010). Risks are more often embedded in agricultural production than in other sectors given its vulnerability to and dependence on nature, and when risks happen, they always cause large losses for both farmers and agribusiness traders.

Clam farming requires a longer production cycle and greater initial investments, and farmers are often faced with a larger scope of risks, both in type and in magnitude, compared to farmers who produce annual crops (Engle 2010); this is especially true in the context of climate change and its unpredictable changes to the hydrological cycle. Handisyde et al. (2006) and De Silva & Soto (2009) noted that climate change has caused various impacts on aquaculture in both direct ways (i.e., the increase in mortality rates caused by extreme weather shocks) and indirect ways (the fluctuation in output volume and the availability of aquatic species will lead to a sudden change in the price of both inputs and outputs), which exacerbate the stress and the vulnerability of this sector, resulting in a higher probability of loss. In addition, aquaculture production and its share of the aquatic products market are predicted to continue to expand given increasing global demand for aquatic products. These trends will certainly increase the risks in the aquatic sector, which requires more active and

effective actions and strategies by different parties involved in the sector to help farmers become more capable of coping with aquaculture risks.

Vietnam, given its long coastline (over 3,260 km) and numerous estuaries (i.e., 112 estuaries), was ranked 18th in the 2015 world risk index, with a vulnerability index of 51% (Garschagen, Hagenlocher et al. 2016). Climate change and natural resource degradation are considered the two major factors contributing to Vietnam's recent reduction in agricultural productivity. There has been a declining trend in the contributions from the agricultural sector to Vietnam's trade balance for the period of 2013-2015. The agricultural growth rate was even reaching a negative rate in the first quarter of 2016 (Nguyen 2016). In addition, further integration into the global market economy, with its unpredictable market demands, will lead to additional risks for this farming industry and its marketing practices.

Based on the country context and the actual clam farming situation at the study sites, the following hypotheses have been formulated in this study: (1) Clam households in the coastal aquaculture sector face different risks in clam cultivation; (2) Household risk management strategies in clam farming may vary among households, leading to different degrees of resilience to aquaculture risks; and (3) Household risk management strategies in clam farming are impacted by many factors and reflect issues related to government policies that support (or impede) the sector.

The study aims to provide insights on farming and marketing practices and on the underlying reasons for the success or failure of farmers' risk management strategies. These insights will not only provide valuable lessons for the farmers themselves but also provide guidance to different levels of government with respect to the development and implementation of policies that aim to support clam farming and the aquacultural sector in general. Specifically, the study aims to do the following: (1) Understand clam farming risks based on the actual clam farming situation and practices in Thaibinh province; (2) Analyze household risk management strategies in clam farming; (3) Identify the factors that affect household risk management strategies in clam farming; and (4) Develop recommendations to improve clam farming risk management for local farmers and different levels of government.

2. METHODS OF THE STUDY

2.1. Study site

Thaibinh is an agriculture-based province, located in the "rice bowl" of the Red River Delta of Vietnam. Sixty-six percent of the provincial workforce is devoted to the agricultural sector. Even though the provincial gross regional domestic product (GRDP) structure has changed, with greater shares being taken by the industrial and service sectors over the last 30 years, agriculture, forestry, and aquaculture maintain an important share of the GRDP, with approximately 25%–35% of the total provincial production value in Thaibinh in recent years. In 2016, the total value of GRDP for Thaibinh was estimated at USD 2.77 billion, and the GRDP per capita was approximately USD 1,562; in which, aquaculture production alone generated USD 390 million (ThaibinhSO 2017). Approximately 26% of farmers living along coastal areas seek their livelihood through coastal aquaculture activities, mostly in combination with other traditional livelihood activities. Other farmers have traditionally made a living by producing food crops and raising animals. There are 12 communes conducting clam farming along coastline of Thaibinh. These communes are located along 50 km of coastline in the province. Three communes were selected for the study. The three chosen communes were those that have the largest clam farming areas and the longest history of clam production in the province. These characteristics allow researchers to capture risks and farmers' resilience/capacity in clam farming over a relatively long period of time, i.e., from 2006–2014. There are 1,310 households having clam farming in the three communes in period 2006-2014.

2.2. Data collection

Fieldwork activities were carried out in the study site from 8/2014 to 5/2016. In addition to the secondary data obtained from local government offices and published papers/reports, three major research tools were used to gather information on clam production, marketing, farming and marketing risks, as well as information on farmers' capacities and strategies to address different clam farming risks in the period of 2006-2014.

The main data collection tools are as follows:

(1) *Farmer focus group discussions (FGDs).* One FGD was conducted in each selected commune, and 8-10 farmers with clam farming experience participated in the discussion. FGDs aimed to explore the historical trends in clam farming, marketing practices, and household risk management strategies.

(2) *Household survey.* The sample size of households for the survey was calculated by the equation:

$$n = \frac{N * t^2 * S^2}{N * \Delta_x^2 + t^2 * S^2}$$

where "n" (the sample size), "N" (total number of households in the research site) = 1,310, and "t" (the confidence interval) = 2.17 (with a 97% confidence level). Sample variance and sample errors were estimated based on the trial survey (of the total loss area for each household) of 31 households from the three communes. The actual sample size then needed to be increased from 137 to 157 in order to have a sufficient number of households to be representative of the commune.

(3) *Case study.* Several cases of failures and successes in clam farming had been studied with in-depth interviews to explain the quantitative analysis results (i.e., cost and revenue analysis, Spearman's rho test and Kendall's tau-c test about the impact of factors on the application of risk management strategies in each household).

2.3. Data analysis

In this research, differentiating comparative analysis (Pickvance 2001) was used to find the differences in household risk management strategies applied by the three groups (which had different outcomes of strategies in responding to the clam farming risks) in order to discover which strategies and tactics critically contributed to the success of household risk management. Simultaneously, multiple discriminant analysis (Brown 1998, Hoang Trong and Chu Nguyen Mong Ngoc 2008) was used to measure the impacts of household risk management strategies on the performance of different clam farming groups, which were categorized by the outcome of their risk management strategies. This analysis was followed by factorial analysis (with several tests, such as ANOVA, Welch's test, Spearman's rho,

and Kendall’s tau-c test) to measure possible links and correlations between household characteristics and household risk management strategies.

3. RESULTS

3.1. Clam farming risks in Thaibinh province

Table 1: Information about clam production (at household level)

Indicator	Unit	Mean	Min.	Max.
Number of plots/1 household	Plot	1.82	1	5
Number of cycles in a plot	Cycles		1	4
Total area of clam plots/household	Ha	2.63	0.20	20.00
Profit per year/household	USD	3,600	-79,330	63,904

Source: Household survey 2015-2016

In general, clam production plays an important role in the livelihood of most farmers who live in coastal areas and in the total aquaculture production value and provincial annual income in Thaibinh province. Clam farming havs exsited in Thaibinh province since 1980s and have changed significantly over time. Initially, the sector was quite extensive in terms of clam raising density, labor and facilities investment. Over time, especially since the end of the 2000s, as the benefits of clam farming increased, the sector has become increasingly intense, with expanded farming areas, increased raising densities, and higher investments in labor, facilities, and even certain feeding practices.

Clam farming has certain unique characteristics that differentiates it from other aquacultural practices. Clam farming is primarily undertaken along the shallow coastal area, because plankton floating in the sea is a source of nutrients for clams. Food for clams is mainly a mix of organic matter (70-90%) and seaweed (10-25%) and may change throughout the seasons. The clam raising cycle depends on juvenile size, the availability of natural food sources, and even market prices. Farmers can keep their clams in raising plots for quite lengthy periods before they harvest the clams for sale. However, the clam farming cycle in the study site is often not more than 4 years. According to the technical instructions of Thaibinh DARD, it takes approximately 12-18 months to raise clams from the juvenile size of 1,000 heads/kg to the size of 70 heads/kg. The FGDs revealed that 6-7 years

earlier, the length of a clam raising cycle was approximately 12-18 months; however, more recently, the cycle is between 18 and 30 months, primarily due to increased clam raising density, which has led to reduced feed source availability and other disadvantages (like environmental pollution) that are unfavorable for clam growth. Among the 157 surveyed households, there were total of 285 clam raising plots. In the 2006-2014 period, 47% of those plots completed 3 clam raising cycles, 27% completed 2 raising cycles, 24.6% completed only 1 raising cycle, and 0.4% completed 4 or more raising cycles (table 1). The average area of clam plots per household is 2.63 ha and ranges from 0.2 ha to 20 ha. Reasons for differences in plot size include the location of the land and the regulations of each commune (e.g., certain communes have an equal allocation policy (including Thaido), whereas others apply the auction principle (including Dongminh and Namthinh)). Moreover, clam plot size can vary due to differences in land use among farmers (Ngo, Tran et al. 2016).

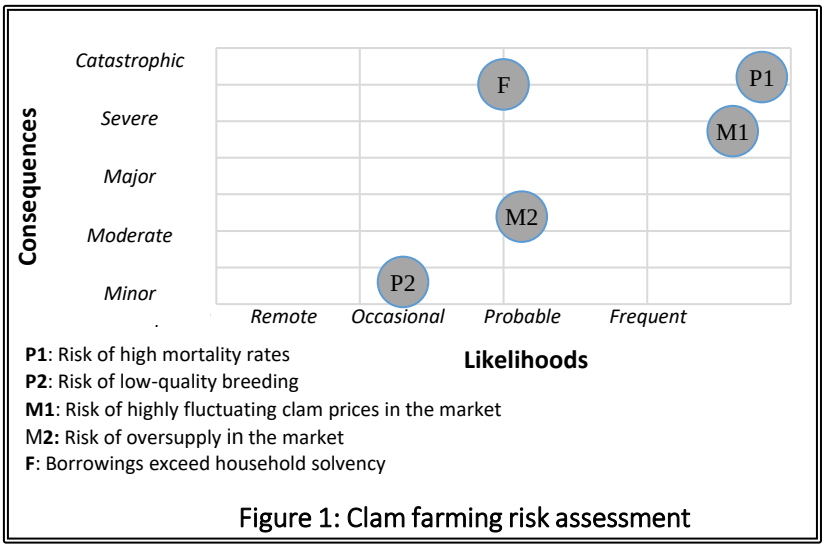

Figure 1: Clam farming risk assessment

After enjoying lucrative economic returns in the early 2000s, the clam farming sector has faced increasing risks, including production risks (e.g., high mortality rates, slow growing capacity and the deformation phenomenon), market risks (e.g., unpredictable changes in market prices, especially sudden reductions in prices in recent years), and financial risks (e.g., substantial investment requirements, high interest rates in the informal credit system). These risks, which interact with each other, have exacerbated the vulnerability of clam farming and farmers. In addition to risks originating from nature, which have increased in the context of climate change, there are several paradoxes in clam farming that exacerbate farmers' difficulties: (1) the farmers face high risks in clam farming, but nearly all of those risks are man-made; (2) farmers continue to increase investment in juvenile clams, but the effectiveness of such

investments decreases as their volume increases; and (3) women have less involvement in decision making but are more vulnerable compared with men. Although the origins of these paradoxes are unique characteristics of clam farming, it may nonetheless be possible to resolve them.

These above risks have serious consequences for clam farming. For the three communes examined in this study, less than half of the farmers were yet recovered from the loss caused by several shocks although majority of them had mobilized capital to restart clam farming. About one third of the farmers had to sell their fixed assets to pay debts related to their clam investment, and ten households had left their villages under the pressure of debts. However, in such risky clam farming environments and increased market difficulties, not all farmers were seriously impacted. Indeed, it is surprising that one fifth of the surveyed farmers succeeded in all their clam raising cycles so far, and another quarter remained well resilient after the shocks. Different household risk management strategies applied in clam farming are thus discussed in the comparative analysis and discriminant analysis. In general, the tactics related to increasing farm size, applying technical innovation and accessing financial sources with no or a lower interest rate, provided better conditions for clam growth, reducing clam farming losses. They also facilitated speedier recovery from shocks.

3.2. Household risk management strategies in clam farming

Various household risk management strategies have been applied in in clam farming and marketing practices at household's level. In general, adopted tactics relate to the expansion of plot size, application of technical innovations, and utilization of financial sources with no or low interest rates. Such tactics improved conditions for clam growth, decreased clam loss, and helped farmers to reduce aquaculture risks and recover more quickly from shocks.

Table 2: Risk management strategies and tactics adopted by households

Risk	Strategy	Tactic	
Production risk	**RMS1:** *Enlarging clam plot size*	Renting/purchasing additional intertidal land	T1.1
		Forming share groups	T1.2
	RMS2: *Improving clam farming practicing*	Bidding for clam plots in locations favorable for clam production	T2.1
		Carefully planning clam production cycles (start and harvest)	T2.2
		Applying innovative techniques	T2.3
Market risk	**RMS3:** *Securing juvenile clam sources and diversifying harvested clam market*	Purchasing juvenile clams directly from production sources	T3.1
		Diversifying clam sales channels	T3.1
Financial risk	**RMS4:** *Diversifying livelihood activities*	Raising other aquatic animals	T4.1
		Engaging in rice production	T4.2
		Raising livestock	T4.3
		Other activities	T4.4
	RMS5: *Accessing financial sources with no or a lower interest rate*	Using family savings and/or borrowing from relatives	T5.1
		Forming share groups	T5.2
		Accessing the formal credit system	T5.3

Source: Household survey 2015-2016

The data from the household survey revealed the result of each RMS, only some of which achieved their purpose. The table below shows the result of comparison tests for the outcomes of households who adopted each risk management strategy and those who did not. A discussion of each risk management strategy is presented in the following part.

Table 3: Comparison tests for the results of each RMS among 157 surveyed households

(Period: 2006-2014)

		Group of HHs that adopted RMS	Group of HHs that did not adopt RMS	Notes
RMS1	*Number of HHs*	n=85	n=72	
	Results of RMS1	Mean of mortality rate after adopting RMS1: 41%	Mean of mortality rate: 47%	*The difference in mortality rates between the two groups is significant at the 0.1 level*
RMS2	*Number of HHs*	n=125	n=32	
	Results of RMS2	Mean of mortality rate after adopting RMS2: 39%	Mean of mortality rate: 61%	*The difference in mortality rates between the two groups is significant at the 0.001 level*
RMS3	*Number of HHs*	n=143	n=14	
	Results of RMS3	Average clam crop length after adopting RMS3: 25 months	Average clam crop length: 22 months	*The difference in clam crop length between the two groups is not significant*
RMS4	*Number of HHs*	n=157	n=0	
RMS5	*Number of HHs*	n=151	n=6	
	Results of RMS5	WACC after adopting RMS5	WACC	*The difference in WACCs between the two groups is significant at the 0.001 level*

Different RMSs adopted by households have resulted in differences in each household's resilience in coping with clam farming risks. Of the surveyed households, approximately 20% had not been or were only slightly affected by the risks they had experienced within their clam farming practices ("group A" in table 4), and 25% were seriously affected by clam farming risks but had been able to recover and restart their clam production (group B in table 4). Farmers in the FGDs revealed that considering the average clam market price of 2006-2014, approximately 20% of the expected income from clam harvesting would cover for their financial investments in juvenile clams and facilities, but there would be no return for labour. In this case, farmers can still secure their capital for reinvestment in the new clam raising season. In contrast, 44% of farmers had not yet recovered from previous clam farming losses, even though they had restarted clam farming, and 11% of farmers had not yet been able to restart clam farming at all (group C) (table 4). Among the surveyed households, it is estimated

that 38% of farmers had to sell their fixed assets to pay debts related to their previous clam investment. At the time of the survey, the three communes reported that 38 households had quit clam farming and that 10 others had left the villages because of bankruptcy (3 in Dongminh, 5 in Namthinh and 2 in Thaido).

Table 4: Result of risk management strategies of 157 surveyed households (Period: 2006-2014)

Clam farming performance	Household resilience (%)		
	Restarted [(1)] and recovered[(2)]	*Restarted but not yet recovered*	*Not yet restarted or recovered*
Success in all clam raising cycles	15[(A)]		
Losses in < 20% of all clam raising cycles	5[(A)]	0	0
Losses in ≥ 20% of all clam raising cycles	25[(B)]	31[(C)]	6[(C)]
Losses in all clam raising cycles	0	13[(C)]	5[(C)]

Notes:

(1): Restarted: Household restarted clam farming after previous clam losses.

(2): Recovered: Households financially recovered from previous clam losses.

(A): Group A: Households were not affected or were only slightly affected by previous clam farming and marketing risks.

(B): Group B: Households were seriously affected by previous clam farming and marketing risks but had restarted clam production and recovered from farming losses.

(C): Group C: Households were seriously affected by previous clam farming and marketing risks and restarted clam production but had not yet recovered from previous farming losses.

3.3. Lessons learned based on the performance of three groups

Lesson 1: Tactics that address capital issues, land, and clam farming techniques have a positive impact on the results of household risk management strategies

There are significant differences in the adoption of RMSs among household groups A, B, and C (as defined above). Significant differences are found with respect to household adoption of tactics T1.1, T1.2, T2.1; T2.2; T2.3, and T5.3, whereas smaller differences are found for the other tactics (table 5).

Table 5: Discriminant analysis test about the impacts of the tactics to the result of household risk management

Name and code of tactics	Wilks' Lambda	F	df1	df2	Sig.
T1.1: Renting/purchasing additional intertidal land	.88	4.00**	2	60	.02
T1.2: Forming share groups	.96	1.32	2	60	.28
T2.1: Bidding for plots in favorable locations for clam production	.92	2.62*	2	60	.08
T2.2: Actively controlling start & harvest times for clam crops	.73	11.38***	2	60	.00
T2.3: Applying innovative techniques	.61	19.10***	2	60	.00
T3.1: Actively searching for good sources of juvenile clams	.99	.11	2	60	.90
T3.2: Diversifying clam sales channels	.99	.19	2	60	.83
T4.1: Raising other aquatic animals	.42	41.58***	2	60	.00
T4.2: Engaging in rice production	.83	6.25***	2	60	.00
T4.3: Conducting livestock activities	.89	3.88**	2	60	.03
T4.4: Conducting other activities	.99	.19	2	60	.83
T5.1: Using family savings and/or borrowing from relatives	.75	10.35***	2	60	.00
T5.3: Accessing the formal credit system	.92	2.84*	2	60	.07

Notes: **** Significant at the 0.01 level (2-tailed)*
*** Significant at the 0.05 level (2-tailed).*
** Significant at the 0.10 level (2-tailed).*

The adoption of RMS2 tactics, which relate to clam farming techniques, has allowed farmers to reduce the mortality rate of each crop. Tactic T1.1, enlarging clam plots, allowed farmers to benefit from economies of scale (Ngo, Tran et al. 2016). Tactic T5.3 enhanced household resilience by reducing financial risk; this finding is similar to that in (Wainwright and Newman 2011) regarding the role of the formal credit market in household risk coping strategies in rural Vietnam and to that in (Hurri and Nguyen 2015) regarding the specific case of coffee smallholders in Vietnam. This finding is also consistent with the results of the discriminant analysis regarding the impacts of tactics on outcomes of household risk management strategies (table 5). Although there are also differences in the adoption of tactic T1.2 among the three groups, this tactic has not contributed to the success of household risk management like tactic T1.1 did, because tactic T1.2 was implemented for only 1-2 years after land re-allocation. As revealed by FGDs, after several raising seasons, a lack of effective coordination, different interests and contradictory opinions among group members about clam farming activities, marketing practices

and technical innovation caused problems in farmers' groups. By 2015, 81% of established groups in the Thaido commune had disbanded. The corresponding figures for Dongminh and Namthinh were much lower, at 17% and 19%, respectfully. Consequently, in 2015 (when the fieldwork was conducted) the average clam raising plots in Dongminh and Namthinh communes were 2.46 ha and 2.90 ha, respectively, whereas the average plot size in Thaido commune was only approximately 1.68 ha.

The results of both analytical and comparative tests show that the tactics included in RMS3, which aims to reduce market risk, are unlikely to explain differences in household resilience to clam farming risks among the 3 groups; therefore, none of these tactics significantly contributed to household risk management. One reasons for the lack of contribution is that these tactics were implemented prior to 2013 and were not well planned prior to starting clam production. In addition, market risks are more easily explained at the meso/macro levels (Ngo, Tran et al. 2015) and are thus largely beyond individual farmers' control. Similar failures in market risk management among Vietnamese catfish farmers were observed in the research of Le & Cheong (2010), indicating that such tools are not practicable for farmers.

<u>Lessons 2:</u> To be effective, certain tactics require active and appropriate implementation rather than simple imitation.

The results of the discriminant analysis test show that certain tactics significantly contribute to household risk management, namely, T4.1, T4.2, and T5.1 (table 5), while the the data from the survey show no difference in adoption among the three household groups (table 6. The hidden reason for differences in outcome was the methodology used to implement these tactics. For example, diversification is one of the most common risk management strategies of clam farmers to protect their families and clam farms from agricultural risks, as is the case for other farmers in Southeast Asia (Fischer and Buchenrieder 2010), as well as farmers in Africa (Barrett, Reardon et al. 2001) and even the EU (EC 2001). However, although nearly all farmers in all three household groups applied tactic 5.1 to overcome collateral constraints in the formal credit market, farmers in group C were able to finance only 6% (on average) of the total capital required to restart clam production from their own savings (or the savings of relatives). The corresponding figures for groups A and B were 27% and 24%, respectively.

Similarly, although 100% of households have diversified into activities other than clam farming, the contributions of those activities to family income differ substantially. Specifically, whereas the households in groups A and B earned more than USD8,000 per year, on average, from other activities, the average for households in group C was just over USD3,000. This level of additional income provides only enough for basic daily household spending, meaning that clam farmers in group C cannot rely on those activities for funds to invest in clam farming or to recover from losses. This difference among the groups explains the dissimilar results obtained by households that adopted the same strategy/tactic.

There are also significant differences in the opinions/approaches of farmers regarding the application of new techniques in clam farming. The farmers in group A are more active and endeavor to master new techniques. In contrast, 15% of the households in group B and 91% of households in group C adopt new techniques simply because they see other farmers or neighbors using such techniques rather than fully understanding implementation and value of new techniques. This difference explains how farmers can employ similar RMSs and tactics but achieve different results. The lesson here is that strategies for risk management should be selected carefully and not applied simply by relying on or imitating others. RMSs are useful only if they are applied at appropriate times and in the proper contexts. The implementation of new techniques also requires that the correct methods be used.

3.4. Factors affecting the application of household risk management strategies in clam farming

Many factors affect the application of risk management strategies and tactics, including both internal and external factors. Internal factors that have significant impact include household financial capacity and experience of the household head, whereas the education level and job of the household head have little impact on the selection and application of household risk management strategies. External factors include policies and the enhancement of knowledge within the community. Among the activities in which clam farmers engage in their communities, “experience-sharing groups” were found to a have greater impact compared with training courses and farmers’ unions. In addition, the government

influenced farmers' clam farming practices but had little impact on risk management strategies.

Several government policy packages have been introduced in Thaibinh since 2009 to promote the clam farming sector by improving the input market and providing financial assistance. It is not easy to access the ultimate impacts of these policies in such a short period, but the results thus far indicate that the policies have failed to achieve their stated purposes. Several reasons for this failure have been discussed, including gaps between policies and farmers' actual needs; an absence of local government intervention to connect farmers to output markets; and the difficulties of balancing various equities and efficiency objectives in government support programs.

Taking a holistic approach, there are three closely interrelated axes in clam farming in Thaibinh province: (1) clam farming risks; (2) household risk management strategies; and (3) government policies. Nearly 20 years of spontaneous investment in clam farming expanded clam raising areas to a size of 1,500 ha. In contrast, in the three years since provincial policies were introduced to expand clam farming, nearly 2000 ha of new intertidal land has been claimed for clam farming and many new (and inexperienced) farmers joined the clam farming sector. The sudden and significant increase in clam farming area has had massive consequences on farming practices and farmers' lives. The expanded clam farming area and increased farming density have led to higher clam farming risks, i.e., a higher mortality rate. They also created higher demand for juvenile clams, which in turn caused prices to increase. Substantial investments in clam farming create risks for clam farmers. Moreover, the expanded farming area has generated a surplus of harvested clams that greatly exceeded market demand; as a result, clam prices decreased. This decrease brought chaos to the clam farming sector and to farmers in Thaibinh province shortly after the policies related to clam farming development became effective.

Given that tactics addressing capital issues, land, and clam farming techniques positively contribute to the outcomes of household risk management strategies and that experience-gaining and knowledge-sharing activities have a strong influence on the application of these tactics, government interventions and policies related to clam farming – at all levels of the government – should focus more on these issues. The government should take practice-oriented approach (and address farmers'

stated needs) by implementing not only support policies but also extension programs, training courses and farmers' union activities. Furthermore, policies/interventions related to market issues (for both inputs and outputs) should considered, because those risks are at the meso level, meaning that farmers can not address them alone and thus need support from government at both the local and state levels. Together with the regulation about conditions for entering the clam farming sector (in term of knowledge and experiences), the financial support from government should focus on the group of farmers who qualified, rather than equal distribution the little capital support for every farmer as present.

4. CONCLUSION AND RECOMMENDATIONS

4.1. Conclusion

Clam farmers have experienced different types of risks that have been further exacerbated by the rapid expansion of clam farming areas and the increased market difficulties in recent years. These risks have caused lethal consequences for most of the clam farmers: in total, about four-fifths of the surveyed farmers were seriously impacted. However, in such risky clam farming environments and with increased market difficulties, it is surprising that one-fifth of the surveyed farmers succeeded in all of their clam raising cycles so far. The application of diverse household risk management strategies in their clam farming practices was evaluated in this study. In general, tactics adopted by households are among the following: (1) enlarging clam farm size; (2) applying technical innovations in clam farming; (3) diversifying livelihood activities; and (4) seeking and relying on loans with no or low interest rates.

In general, the clam households' adoption of specific risk management strategies/tactics is affected by various internal and external factors. Internal factors include farmers' characteristics, including average annual income, average clam plot size and frequency of participation in learning and experience-sharing groups. To successfully deploy these tactics, farmers must be creative and take actions appropriate for their own farming contexts rather than simply imitating others. External factor such as "the group sharing among the farmers" have significantly impacts to farmers' successful implementation of risk management strategies in clam farming, while "the training courses offered from extension service" have been found as no impacts. Meanwhile, "the interventions/support from government" as a role in directing farmers in clam farming practices, but not much in risk management. With the exception of local government efforts to institutionalize clam production by zoning and allocating intertidal land to clam farmers in the mid-2000s, which helped to boost local clam production, government actions have played a very modest role in supporting clam farmers. For example, the bureaucracy involved in applying for government loans has often deterred farmers from taking advantage of such loans.

Furthermore, governments have failed to effectively coordinate and mediate conflicts of interest between and among different farming groups and other actors. For instance, pollution discharged from inland agricultural and industrial practices causes serious problems for clams. Moreover, the technical support provided by the government to clam farmers is of little value. Specifically, market forecasts for clams based on clam production statistics or information regarding the clam market in China – both of which are beyond farmers' capacity to obtain – have not been officially considered or supported by governments. In addition, there is no government support for bankrupt farmers. Instead, bankrupt clam farmers trying to repay debts have sold their assets – even their houses – or have taken out more private loans to reinvest in clam farming, hoping for positive results. In addition, self-learning of clam farming techniques by farmers through experience-sharing practices was found to have better results than training courses offered by governments through public extension systems.

Based on the research findings, several recommendations are made to help farmers better manage clam farming risks. These recommendations can be categorized into two groups: (1) those targeted directly at clam farmers and (2) those related to the implications of government policies on aquaculture development in particular and on rural development in general.

4.2. Recommendations for clam farmers

Adopt strategies related to clam plot enlargement, technical innovation, and loans: The research results show that tactics related to the expansion clam raising plots, application of technical innovations, diversification of livelihood activities, and gaining access to financial sources with no or low interest rates have yielded better outcomes for farmers and thus give farmers a greater chance to successfully raise and market clams (as reflected in the reduction of clam loss (mortality and/or drift) and other farming risks) and allow farmers to enhance their capacity to recover from encountered risks.

Be more active in learning and sharing farming experiences: Farmers encounter various and unpredictable risks. Because the acquisition of knowledge will help farmers to make better decisions regarding their

farming practices, it is strongly suggested that clam farmers actively seek and share farming and marketing experiences with other farmers.

Be creative in the adoption of risk management strategies: Given the differences among farmers in terms of characteristics and farming conditions, the adoption of risk management strategies/tactics by individual farmers/groups of farmers needs to be an active and creative endeavor rather than the mere imitation of others. Risk management strategies are effective only when they are applied in the proper farming context.

4.3. Policy Implications

Improve the support system from government to household in clam farming: Government intervention is needed to provide farmers with necessary information about clam farming and marketing practices, such as (1)better re-zoning of clam farming areas in parallel with an increase in the farm size of each household, (2) promoting sustainable linkages between the farmers and the formal financial market and output market, and (3) investing more funding into research and extension related to sustainable clam farming practices and to the improvement of farmers' skills in cooperative works and management. Governments should play a larger role in coordinating and managing different stakeholders in order to minimize man-made risks. The role of cooperatives should also be promoted to improve farmers' links to markets, input suppliers, new technologies, and loans, as well as to provide protection from certain risks, such as unscrupulous business practices.

Increasing the investment in improving the treatment of the water management issue and protect the ecosystem: Given the factual situation about the negative impacts of wastewater from industrial zone and rice cultivation activities to the clam farming, it is necessary to have the role of government to balance the benefits among different groups including rice farmers, clam farmers and industrial sectors through increasing more investment in in improving the treatment of the water management issue, developing human livelihood activities together with protecting the ecosystem. Series of activities need to be carried out such as: (1) Mobilizing from many resources (from central government, local government and non-state budget) to invest in material facilities to support the wastewater

treatment; (2) Developing the examination, inspection all of the organizations and individuals that generating wastewater from production, business and daily-life activities in the land. Discharges of treated wastewater into marine areas must ensure that the conditions related to the dynamics, environment, ecology, biodiversity, vulnerability and capacity of the marine area. Punitive sanctions should be imposed to prevent the discharge of untreated water, while at the same time can be used as providing financial investment for other technical solutions which aim to limit the harm impacts of wastewater to the community; (3) Investing in the development of high technologies for the discharge system from the inland to the coastal zone so that they can be discharged even when the tide is high, therefore minimizing the impact on the clam fields. In addition, it is also important to improve the marine environmental protection institutions as well as to enhance the awareness for businesses as well as coastal communities.

Promote participatory policy formulation and enforcement: Greater participation of farmers in policy formulation and enforcement is essential, not only to ensure the effectiveness of policies but also to minimize clam farming and marketing risks and improve the well-being of clam farmers. However, the increased participation of farmers will undoubtedly create complications and costs in policy making and enforcement. Therefore, future studies should focus on this subject to identify not only suitable approaches to increase farmer involvement but also appropriate trade-offs between increased farmer participation and minimization of the costs involved in effective policy making and enforcement. / .

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GRAESE : Groupe de Recherches Asie de l'Est et du Sud Est

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En pratique le **GRAESE** a pour objectif :

1) de stimuler la recherche interdisciplinaire concernant les problèmes et les enjeux du développement en Asie orientale et sud orientale
2) de publier sous forme de Working Papers (format papier ou online) des résultats de recherche liés aux projets en cours et aux questions concernant les diverses thématiques du développement appliquées à l'Asie orientale et sud-orientale, avec une attention particulière aux thèmes évoqués ci-dessus.
3) de réaliser des publications scientifiques de divers types concernant ces problèmes et réalisées par des chercheurs des différents centres partenaires en Europe et en Asie.
4) de fournir un lieu de rencontres entre chercheurs concernés par ces thèmes, particulièrement dans le cadre des doctorats en cours.
5) d'organiser des activités d'enseignement et d'information sur les problèmes du développement de l'Asie de l'Est et du Sud Est, notamment à travers l'organisation de conférences et séminaires donnés par des académiques et chercheurs asiatiques de passage en Belgique.

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