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HOUSEHOLD RISK MANAGEMENT STRATEGIES FOR COASTAL AQUACULTURE RISKS: THE CASE OF CLAM FARMING IN THAIBINH PROVINCE, VIETNAM

Ngo Thi Thu Hang[1*], Tran Huu Cuong[2], Philippe Lebailly[1]

[1] Gembloux Agro Biotech Gembloux, University of Liege, 5030, Belgium
[2] Faculty of Accounting and Business Management, Vietnam National University of Agriculture, Vietnam

Email[*]: ngohangvn@gmail.com

ABSTRACT

Endowed with 3,260 km of coastal line and 112 estuaries, Vietnam has a high potential for aquaculture development. However, long coastal line is also embedded with natural high risks under climate changes and sea level rise. Vietnam is ranked at the 18th in the 2015 world risk index and the vulnerability index of 50.9%. Relying on coastal resources, aquatic farmers have adopted a number of strategies to cope with aquaculture risks. By using the OECD holistic approach, this research used several research tools to identify farmer's performance on clam farming practices and their risk management strategies (RMS) in Thaibinh province (the largest area of the clam production in the north and north central coastal part of Vietnam). RSMs are found of diversification and flexibility among farmers. For production risks, the RSMs are: (1) enlarging clam raising size and (2) actively controlling clam production by experience and technical innovations. For market risks, the RSM is searching for more clam market channels in both input and output market. For financial risks, RSMs are (1) securing family from clam farming loss by diversifying livelihood activities and (2) accessing secure financial sources in term or interest and bond conditions. Although some RSMs had resulted positive impacts but in overall, the clam farming risks have not managed well by those strategies due to the limitation in capacity of households comparing with level of risks. To cope better with different risks in clam sector, besides the adjustment in RSMs of farmers themselves, it is necessary to have the intervention from government (from national to local level) to address the aquaculture risks which the farmers cannot handle by themselves, such as (1) addressing the issue of polluted wastewater to the clam field; and (2) more focusing in supporting farmer in linkages to the both formal financial market and output market. In addition, supports for technical training targeting on improving farmer's skills and knowledge in farming decision making and market information is also of high value to clam farmers in coping with farming risks.

Keywords: Clam, farmer, risk management strategies, Thaibinh province.

1. INTRODUCTION

Risks are often more embedded in agricultural production and business sector which largely depend on external factors. Agricultural risks are basically categorized into five types, such as: production risk, marketing risk, financial risk, legal risk and human one (N.Musser and F.Partrick 2002). Agricultural risks can cause large losses for farmers and traders. However, as driven by commercialization, many farmers are trying to spend more investment for their farms, without adequate agricultural risk management and mitigation strategies. As consequences, many rural households have

been suffered losses in agricultural production (Minot and Hill 2007).

Given a longer production cycle, as well as more initial investments needed, aquatic farms are often faced with a higher risk as compared to farmers of annual crop production (Engle 2010), especially in the context of climate changes and their unpredicted hydrological cycle changes. Handosyde *el al.,* (2006) and Silva and Soto, 2009 (cited in (Barange and Perry 2009), noted that climate changes have caused various impacts on aquaculture in both direct and indirect ways, exaggerating stress and vulnerability of this sector, thus with a higher loss probability. Meanwhile, aquaculture production and its share of the fisheries market are predicted to expand continuously as it's set to play an increasingly important role in meeting increasing global demand on aquatic products (Handisyde, Ross *et al.*, 2006). These two trends will probably exaggerate risks in the aquatic sector which require more active and effective actions and strategies of different actors involved in the sector to help farmers better capable in coping with risks. Ability to survive and/or recover from aquatic farming risks varies among different farms. It could be largely that farmers have various options and strategies in managing and coping with agricultural risks, varying in different farming contexts and risk scope and nature. Household's risk management strategies have thus certain impacts on reducing farmer's vulnerability as well as improving their resilience towards risks (Engle 2010).

Thaibinh province has the largest clam farming area and production among coastal provinces in the north Vietnam (ThaibinhDARD 2014). In the early 1990s, increased market demand for clam coupled with a reduction of wild clam had created a demand for clam production, started with a small area of about 150 ha. Clam production area was slowly expanded in the following years and increased to 500 ha in 2006. In 2009, local governments started paying attention to clam production through zoning and bidding production area with some financial supports to farmers. However, government policies/interventions on clam-farming land-use were officially launched in 2011. Clam production area quickly increased, especially in 2011 and 2012. Given bad hits on clam farming productivity and market demand and price, clam production area expansion was slow down in following years.

The increase in clam production area coupled with higher farming clam density resulted in a sharp increase in clam production, especially in 2009 and 2010. However, increased natural and artificial disasters and low quality of clam breeds (see further below) had resulted in a sharp reduction of clam yield in 2011. Since then, clam yield fluctuated around 18 tons/ha (Figure 1). Clam market price was on increased trend in the period of 2006-2009. In this period, clam was considered as a "golden" farming subsector in Thaibinh as well as in other coastal provinces having clam farming practices in the whole Vietnam. However, shortly enjoying such golden period, farmers were faced with reduced clam market price and increased clam farming risks in the following years. These combining impacts have caused a sharp reduction in clam gross output of the province (Figure 2).

The largely fluctuated trend of clam yield and market price reflects intensity of risks. Different from other aquacultural animals like shrimp, craps, and fishes, clam production cycle is relatively longer, i.e., two to three years, and more vulnerable to risks , both natural and

artificial ones. Clam farming losses have driven thousands of farmers into underemployment and even financial debt traps. After the market shock in 2012, the loan provided to 1,752 clam farmers and enterprises were VND 457.6 billion which has been difficult to retaken by the banks. In Namthinh commune, financial value of unmarketable clam was estimated at about VND 160 billion. In addition, un-harvested clam farms accounted for 70% of total clam farming areas (Tú 2013).

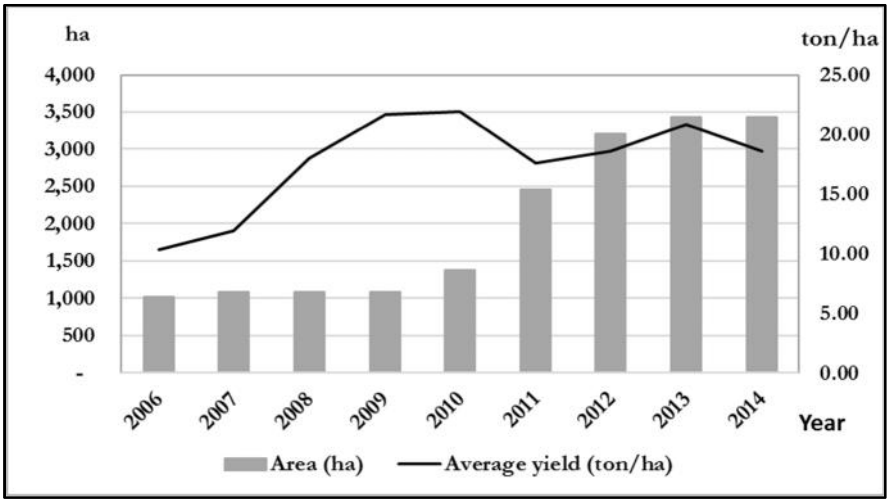

Figure 1. Clam production area and yield (2006-2014)

Source: Thaibinh Statistical Office, 2015

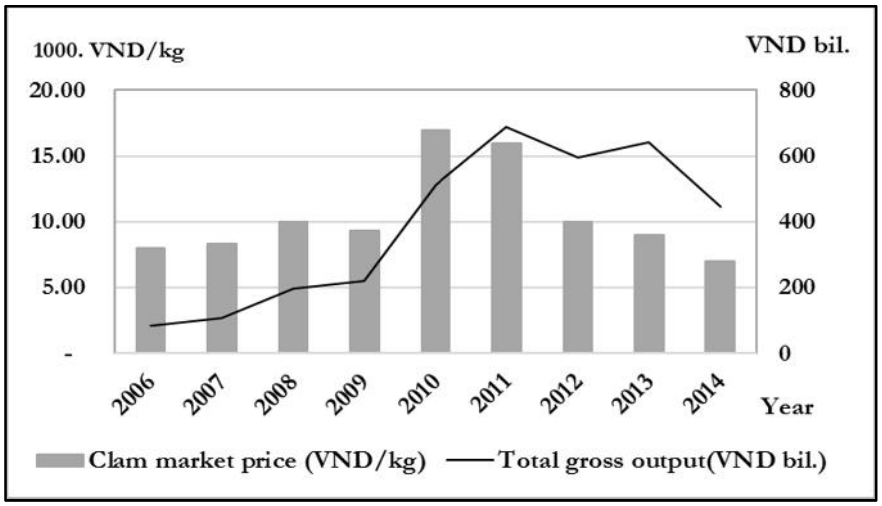

Figure 2. Total gross revenue of clam production (2006-2014)

Source: Thaibinh Statistical Office, 2015

Figure 3. Map of the research sites

Note: ● *Selected communes for the research* ★ *Thaibinh province*

However, there are small number of farmers still survive relatively well despite clam production and market risks. What are risk management strategies that these successful farmers developed and adopted that have survived them from clam farming and marketing risks? This is the major research question of this paper. In specific, the paper aims to provide empirical insights in to: (1) which are the household risk management strategies for clam farming in Thaibinh coastal area? and (2) which are the strategies or tactics significantly contributing to farmer's success in their household risk management strategies?

2. RESEARCH METHODOLOGY

Study site. Among provinces located in the coastal line of north and northern central of Vietnam, Thaibinh has the largest clam farming areas (i.e., 3,430 ha in 2013), followed by Namdinh (1,710 ha), Thanhhoa (1,200 ha) and Quangninh (1,000 ha) (MARD 2014). According to Thaibinh Agriculture and Fishery Extension Center, salinity in estuary areas is just around 1.5-2.5% with a plentiful source of feeds that is very favourable for the development of aquaculture in the province. Total estuary area having potential for aquaculture is around 17,000 ha (Nguyên 2013) of which 15,119 ha (or roughly 89% of the total estuary area) have been brought into aquaculture production. In 2013, total aquaculture production generated a value of VND 723 billion (based on fix-price level in 1994) for the Thaibinh province (ThaiBinhDARD 2014).

Out of 12 communes farming clam along 50 km coastal line of Thaibinh province, three communes were selected for the research because these have the largest area as well as the longest history of clam production in the whole province (see Figure 3). This allows a better trace of clam farming risks and farmer's resilience capacity development and strategies in coping with risks in a relatively long period of time (i.e., 2006-2014). There was a total of 1,310 households raising clam in these three communes at the time this research was conducted.

Data collection. Fieldwork activities were carried out in the study site from 8/2014 to 4/2015. In addition to secondary data obtained from local government offices and published papers/reports, the three major research tools were used to gather information on clam production, marketing, farming and marketing risks, and farmer's capacity and strategies to deal with different clam farming risks in the period of 2006-2014. The main data collection tools are:

(1) Focus Group Discussion (FGDs). One FGD was conducted in each selected commune with a participation of 8-10 farmers having experience with clam farming and marketing. FGDs aimed to explore historical trend of clam production and market, and the name of household risk management strategies which have been applied in research area and the characteristics of households which probably impacted to the applications of those strategies.

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

$$n = \frac{N * t^2 * S^2}{N * \Delta_x^2 + t^2 * S^2} \quad (1)$$

In which: "n" (sample size); "N" (total households in research site) =1,310; "t"(confidence interval) = 2.17 (with 97% confidence level). Sample variance and sample errors were estimated based on the trial survey (on the total loss area for each household) of 31 households from the three communes. The statistic results of the survey showed the amount of sample variance ($\boldsymbol{S^2}$)=194.88 and sample errors ($\Delta_{\boldsymbol{x}}^{\boldsymbol{2}}$) = 2.52. The actual sample size was then needed to be increased from 137 to 157 since the sample from Thai Do commune was increased from 11 to 31 in order to have sufficient number of households to be representative of the commune.

Case study: Several cases had been studied with in-depth interviews to explain for the quantitative analysis results from data of household survey.

Data analysis. In this research, factor analysis is applied to define the impact of household's characteristics to the applications of household risk management strategies. It is then followed by a discriminant analysis to measure the level of impacts of each tactic in household risk management strategies to the performance of three clam farmer groups, which have the difference in the results of their risk management strategies.

3. CLAM FARMING RISKS AND HOUSEHOLD RISK MANAGEMENT STRATEGIES

3.1. Clam farming risks

Majority of clam farmers experienced farming risks (i.e., 86% of the survey households underwent at least one massive loss of clam production so far), that is similar to the result in the research on clam farming productivity in some coastal provinces in the North and Northern Central Vietnam (Thuyết and Dũng 2013). Most serious risk has been of high clam mortality rate during farming process because of unsecure quality of juvenile clam; uncontrolled water source; natural disasters such as flood, storms, and drought (for shallow raising areas) (Lebailly, Bui Thi et al. 2015). In addition, market risks caused by reduced market demand and price have been increasingly plagued farmers in recent years. Many farmers have been trapped into financial debts without ability to escape. Rate of loss in clam investment is estimated at

52% in Thaibinh province in the period of 2006-2014.[1]

Results from survey revealed that risks which make clam farmers most worried are the high mortality rate (production risk) and the sudden reduced clam market prices (market risk). In recent years, those risks happened quite frequently and have caused serious losses. Clam farmers have even accepted 30% as the mortality rate for a normal clam farming cycle. However, since 2009, the mortality rate had increased up to 40%-55%, mainly caused by polluted water discharged from inlands or by the extreme weather events (storms or hot weather). In parallel, reduced clam market prices since 2012 led to extreme chaos in clam production sector. The fluctuation in clam farming productivity and price causes a seriously financial impact to farmers. Hundreds of billion VND investment lost each year in the period of 2012 - 2014. Thousands of farmer have been faced with bankrupt. About 457.6 billion VND borrowed from banks couldn't be paid back yet (Long 2013). In group of 157 interviewed households, 16% stopped their clam farming as the result of capital bankrupt; 38 % had to sell their fix assets (like houses, cars, motorbike or even clam fields) to have money to repay borrowed loans.

Different from other farming investments that have a relative definite harvest time, clam harvest can be extended relatively long, up to 1 to 2 years. However, the longer clams stay in the field, the more production risks for farmers caused by bad weather events or polluted water discharges. To cope with these risks, clam farmers have developed some farming strategies, which are going to present in the following sections.

3.2. Farmer's Risk Management Strategies (RMSs)

There are several RMSs were applied with numerous tactics in farmer households in order to manage the clam farming risk and to reduce the vulnerability level probably caused by risks (Table 1). The number of tactics applied in each household were different, as it depended on the household characteristics.

Reducing the mortality rate is crucial purpose in RMSs of clam farmers. For this purpose, there are two main strategies namely enlarging clam plots size (RMS1) and actively controlling clam production by farming experience and innovations (RMS2).According to Decision 11/2012/QD-UBND for clam farming land-use reallocation to farm households, each clam plot should not be bigger than 2 ha. However, according to farmers, small area not only cost farmers more for labor (such as farming practices and protection) and facility investments (such as living shed, boat, protection fences) but also disadvantage for raising clams at different ages.[2] For this strategy, there have been two strategies applied by farmers. The first strategy is to hire land from other farmers nearby. After 2013, a number of farmers have given up their clam farming because

[1] Resulted from Monte Carlo Simulation by application of Crystal Ball software, based on production data's collected from household survey.

[2] Normally, clams of different ages are raised separately, i.e. close to harvest, young, juvenile. However, as revealed by farmers, big raising plot will allow them to combine raising clams at different age, simply separated by a net system. This better allow farmers coping with market risks and production risks (because different clams have different sensitivity to extreme weathers or pollutants discharged from inlands. Moreover, investment on (super) juvenile clams is not much. Once juvenile clams grow and ready for commercial production, mortality rate will reduce because clams have been familiar with local production conditions.

of the previous farming losses. About 50% of these farmers agreed to rent out their land to neighbours and among the surveyed farmers, 70 hire additional lands to enlarge their clam farming plots. As a result, average clam raising plot is 2.46 ha and 2.90 ha in Dongminh and Namthinh commune, respectively while only 1.68 ha in Thaido commune. The second is to form "joint-groups" among farmers who owned the plot close to each other for large raising plots. In 2011, there is 21% of clam farmers in Dongminh and 46% in Namthinh communes decided to group themselves to enlarge farming plot to save production costs and minimize production risks.

RMS2 is adopted by farmers who know which intertidal area is safer and better for clam production as well as dangerous periods in the year for clams. There have been three relevant tactics adopted by farmers. The first tactic (T2.1) was bidding plots that are good for clam raising according to farmer's experience. However, this tactic was applied in Dongminh and Namthinh where the local government allowed farmers to bid with specific land-use renting price (while in Thaido commune, the place of land was assigned by random ballot selecting). For the second tactic (T2.2), farmers try to control starting time of clam cycle and/or juvenile age to minimize impacts of weather shocks on young clams and harvest clams before storm season. This tactic is not too complicated but not easy for all farmers since it requires farmer's ability to purchase juvenile clam and access to market for selling harvested clams in the time they prefer. Besides, it required the careful observations and experiences because the best time for clam production depends on the characteristic of clam raising zones even plots which are corresponding with sea currents and nutrient availability. Among the surveyed households, about 55% are confident on following this tactic. In addition, pressure from risks also helped initiating some innovations associated with clam production at local level to improve clam production as well as to reduce loss rate such as fill-in new sand into clam plots (to reduce pollution and enrich nutrient for clams); better fencing and cleaning practices (for fencing net systems) 71% of surveyed clam farmers in Thaibinh had applied those techniques innovations, but in different levels.

In parallel with coping with production risks, farmers also developed strategies for dealing with market risks. To reduce loss caused by reduced price and/or lack of clam market, farmers tried to search for more clam market channels, for both input and output market (RMS3). For input market, there are two main sources for farmer to buy juvenile clam, and 56% of surveyed households purchase juvenile clams from producers in Namdinh province while 18% directly from wholesalers in commune. The rest (26%) started from juvenile nursery practices (those juvenile clams were in very small size, i.e. 100,000 heads of clam/kg) to reduce cost of purchasing juvenile clam as well as to be more independent for their clam practices. For selling adult clam, while in 2006-2012 there are two type of collectors: local and external ones. In this period, 52 % of farmers sold clams to external collectors because these offered higher price than local ones. Some external collectors did not pay farmers after collecting clams. From middle of 2012 afterward when clam market price getting down, external clam collectors suddenly disappeared.

Table 1. Households Risk Management Strategies in clam farming

Clam farming risks	Strategy	Tactics	Code of tactic	% of HSH applied
Production risk	RMS1: Enlarging clam plots size	Hiring land	T1.1	15%
		Forming up share group	T1.2	40%
	RMS2: Actively controlling clam production by farming experience and innovation	Choosing good place for clam plot (1)	T2.1	50%
		Actively controlling the point for starting & harvesting the clam crop	T2.2	55%
		Applying techniques innovations	T2.3	71%
Market risk:	RMS3: Searching for more clam market channels, for both input and output market	Actively searching for good juvenile clam source	T3.1	84%
		Diversifying in clam selling channel (2)	T3.2	52%
Financial Risk:	RMS4: Diversifying livelihood activities	Carrying out other aquaculture activities	T4.1	52%
		Carrying out rice production	T4.2	64%
		Carrying out livestock activities	T4.3	20%
		Carrying out other activities	T4.4	74%
	RMS5: Accessing to more secured sources of capital	Using family/relatives saving money	T5.1	82%
		Forming up share group	T1.2	40%
		Trying in access the formal credit market	T5.3	79%

Notes:(1): Applied only in Dongminh and Namthinh commune, (2): Applied only before 2014

For financial risk management, having alternative income source is a central theme in RMSs of clam households. There are two strategies contributing to secure households from clam farming loss are: (1) diversifying livelihood activities (RMS4); and (2) accessing to more secured sources of capital (RMS5). RMS4 is considered as a strategy to fulfil household daily spending and contribute to debt payment when clam farming facing with loss. All of clam households have other livelihood activities other than clam production. For instance, households having other aquatic production such as shrimp and fishes account for 52 % of total surveyed households. Households having paddy rice production, livestock raising are 64%, 20% of the total surveyed households, respectively. The reason of RMS5 because the nature of high capital requirement of clam farming and the uncertain of financial market in recent years, farmers had to try to access to more secured financial sources, for instance: (1) T5.1: Using family/relatives saving money: (2): T5.3: Trying to access formal credits with lower interest rates; and (2) T1.2: Forming up "self-credit groups" which can provide members a certain volume of money when necessary. The extent of relying on different financial sources also very much depends on prospects of clam production and marketing. For example, for 94 households who started clam cycle in 2012, 34% used their own capital and/or from self-credit groups, 49% borrowed from formal credit market and 17% borrowed from informal credit market. In 2013, those figures were 39%, 49 % and 12%, respectively. In whole period 2006-2014, roughly 70% of farmer's investments and reinvestments (after facing with farming

losses caused by risks) originated from (formal and/or informal) credit systems. Meanwhile, by September 2013, there were 1,752 borrowing applications from farmers and small enterprises for money to invest into clam production, with a total cash amount of 457.6 billion VND from state banking systems (Long 2013). This amount was just equal to one-third of the total cash requirement from farmers for clam production. From 2006-2014, among surveyed households, there were 81 turns of borrowing from informal credit systems (to invest on clam production or to repay overdue debts of the banks or private creditors).

3.3. Evaluation the results of RMSs

In overall, results of RMSs adopted by farmers in clam farming have brought varying results to different farmers in different locations. For instance, among surveyed households, 15% reported that they have been successful in all clam cycles whilst 18% lost in all clam farming efforts, among these households, 8 stopped clam farming after experiencing loss in the first clam cycle. There was even one farmer who joined in 8 farmer's groups with 8 clam raising plots in 2012-2013, and all failed. To understand hidden reasons which caused the difference in performance and resilience of clam households, those 157 households had been classified into 3 groups based on profits/losses in clam production and their recovery from losses (Table 2).

Discriminant analysis test had revealed that among 13 tactics mentioned above, at significant level 5% there were only 7 tactics had critically impacted to the result of RMSs in clam farming households (Table 3), namely (1) T4.1: Carrying out other aquaculture activities; (2) T2.3: Applying techniques innovations; (3) T2.2: Actively controlling the point for starting & harvesting the clam crop: (4) T5.1: Using family/relatives saving money; (5) T4.2: Carrying out rice production; (6): T1.1: Hiring land; (7) T4.3: Carrying out livestock activities.

Table 2. Clam farming performance in 157 surveyed households (Period: 2006-2014)

Profit/Loss results in clam crops	Number of households			
Gain in all clam crops	23[(1)]			
		Resilience after clam losses		
		Restarted[(a)] and Recovered[(b)]	Restarted but not Recovered yet	Not restarted
Percentage of loss crops < 20%	8	8[(1)]	0	0
Percentage of loss crops > =20%	98	39[(2)]	49[(3)]	10[(3)]
Lost in all clam crops	28	0	20[(3)]	8[(3)]

Notes: (a): Restarted: Household restarted a new clam crop after the loss in previous clam crop;
(b): Recovered: The loss from previous clam crops had been covered by the profit of the clam crops started after that;
(1): Classified in Group A: Households had not been impacted, or had been slightly impacted by the risks and good resilience (31 households);
(2): Classified in Group B: Household had seriously impacted by the clam farming risks but had been able to restart clam production and recover from losses (39 households);
(3): Classified in Group C: Households had been able to restart clam production but had not yet recovered from losses and households had been unable to restart clam production (87 households)

Table 3. Tests of Equality of Group Means

Name and Code of Tactics	RMS	Wilks' Lambda	F	df1	df2	Sig.	
T1.1: Hiring land	RMS1	.88	4.00	2	60	.02	x
T1.2: Forming up share group		.96	1.32	2	60	.28	
T2.1: Choosing good place for clam plot	RMS2	.92	2.62	2	60	.08	
T2.2: Actively controlling the point for starting & harvesting the clam crop		.73	11.38	2	60	.00	x
T2.3: Applying techniques innovations		.61	19.10	2	60	.00	x
T3.1: Actively searching for good juvenile clam source	RMS3	.99	.11	2	60	.90	
T3.2: Diversifying in clam selling channel		.99	.19	2	60	.83	
T4.1: Carrying out other aquaculture activities	RMS4	.42	41.58	2	60	.00	x
T4.2: Carrying out rice production		.83	6.25	2	60	.00	x
T4.3: Carrying out livestock activities		.89	3.88	2	60	.03	x
T4.4: Carrying out other activities		.99	.19	2	60	.83	
T5.1: Using family/relatives saving money	RMS5	.75	10.35	2	60	.00	x
T5.3: Trying in access the formal credit market		.92	2.84	2	60	.07	

Table 4. Impact of the plot size to the Profit/Cost ratio (Period: 2006-2014)

Groups Statistics					Ranks	
Groups	N	Mean	SD	SE	Mean Rank	Sum of Ranks
Group1: Plots ≤ 2 ha	458	0.24	1.12	0.05	304.89	139641.50
Group2: Plots > 2ha	181	0.48	1.06	0.08	358.22	64838.50
Mann-Whitney U: 34530.50; Wilcoxon W: 139641.50; Z: -3.29; Asymp. Sig. (2-tailed):.001						

Results of RMS1 (with tactic T1.1) was tested by Mann-Whitney U test which revealed the differences of profit per cost ratios between household groups of different clam plot size (maximum of 2 ha – Group1 and larger – Group2) (Table 4). The differences between two groups were caused by three factors, including: (1) Cost: both variable and fix cost is found to be inversely correlated to the field sizes; (2) Clam density: Plots in Group2 has lower density, therefore lower mortality rate as compared to Group1. Lower density allows clam growing faster which helps shortening clam production cycle and reducing production risks; and (3) Farming arrangement: Larger plot size allows Group2 raising clams in combine models, which is less risky than the model raising juvenile clam or adult clam only (according to the experiences of farmers). As revealed by farmer's FGDs, about 10% lower in clam mortality rate in Group2 as compared to Group1.

The tactic T2.2 created good result because the active control over clam production cycle helped to reduce the mortality rate with juvenile clam and having clam harvest before storm season. Parallel with that, the tactic T2.3 with innovation techniques applied such as double net fencing system, fill new sand into clam raising plots, clam catching machine, clam cleaning machine also contribute to not only reduction of risks but

also increase of clam productivity. However, these techniques help farmers to cope relatively good with natural disasters (such as storm, strong wave, lack of food), but not with man-made disasters (i.e. polluted water discharges or clam thief's) since these are still beyond farmer's capacity to cope with.

The group of tactic T4.1; T4.2; T4.3 (RMS4) importantly contributed to the success of household risk management by creating the financial source for farmers to invest in clam farming. This is similar to the findings of Fischerand Buchenrieder (2010) that income diversification is the most common risk management strategies in developing countries, as it has many likenesses to the financial instruments, which consequently reducing the dependence of them to the debts as well as financials risks (Harwood, Heifner et al. 1999).

Last but not least, tactic T5.1 (RMS5) also played an important role in risk management because the farmer's confidence about financial capacity was one of three important factors contributing to household resilience capacity to clam farming risks in Thaibinh province (Hang, Cuong et al. 2016). The reason is accessing to informal credits with high interest rates is easy but risky especially for poor farmers (Nguyen, James et al. 2013). Informal credits of higher interest rate (5-10% higher than formal credits) and higher pressure for repayment brought poor farmers into a dilemma of "easy to borrow money but also easy to fall into debt trap." Certainly, using family/relatives saving prevented them to fall in that trap, as well as protect farmers from uncertainty (Hang and Sheng 2005).

Table 5. The difference in application of the tactics of the RMSs in 3 groups

			Group A	Group B	Group C
T1.1: Hiring land			32%	35%	-
T2.2: Actively controlling the point for starting & harvesting the clam crop			100%	61%	42%
T2.3: Applying techniques innovations	Often		58%	67%	13%
	Sometimes		39%	23%	39%
	Never		3%	10%	48%
T4.1: Carrying out other aquaculture activities	High contribution		65%	23%	-
	Moderate Contribution		29%	19%	-
	Low Contribution		-	-	-
	No contribution		6%	58%	-
T4.2: Carrying out rice production	High contribution		3%	6%	32%
	Moderate Contribution		23%	32%	45%
	Low Contribution		26%	19%	13%
	No contribution		48%	42%	10%
T4.3: Carrying out livestock activities	High contribution		0%	-	6%
	Moderate Contribution		13%	-	23%
	Low Contribution		3%	-	-
	No contribution		84%	-	71%
T5.1: Using family/relatives saving money	Percentage of family/relatives' money in total capital investment to clam farming	Mean	27%	24%	6%
		Max	100%	50%	13%
		Min	0%	0%	0%
		Median	11%	22%	11%

Comparing the RMSs of these 3 groups, several differences were found in the application of the RMSs and related activities (Table 5). Although the RMSs and its tactics were not secret for every farmer, there have been constraints for certain households to follow. For example, to enlarge size of clam raising plot (RMS1), given limitation of financial resource, none of household in Group C hired additional land but 45% of them decided to join farmer's groups. Meanwhile, 32% of Group A hired land and 23% joined farmer's groups. For farmer's groups, initially profits were shared for all members. However, after some crops, different interests and contradictory opinions about clam production and RMSs among members constraining them for keep going as groups or further enlarging their clam farming plots. In 2013, many groups have been broken up, mainly caused by different decisions on clam selling times and practices. Similarly, majority of farmers in Group A and B were able to mobilize their own savings (or saving from their relatives) for restarting clam production whilst those sources of farmers in Group C had to finance only 6% (in average) of total capital needed for restarting clam production. Diversification of farming practices has better supported for Group A and B than Group C.

4. CONCLUSIONS AND IMPLICATION

To cope with risks in clam farming practices, farmers have applied several RMSs, separately or in combination. For production risks, the RSMs are: (1) enlarging clam raising size and (2) actively controlling clam production by experience and technical innovations. For market risks, the RSM is searching for more clam market channels in both input and output market. For financial risks, RSMs are (1) securing family from clam farming loss by diversifying livelihood activities and (2) accessing secure financial sources in term or interest and bond conditions. Some tactics had critically impacted to the result of RMSs, namely (1) T4.1: Carrying out other aquaculture activities; (2) T2.3: Applying techniques innovations; (3) T2.2: Actively controlling the point for starting & harvesting the clam crop: (4) T5.1: Using family/relatives saving money; (5) T4.2: Carrying out rice production; (6): T1.1: Hiring land; (7) T4.3: Carrying out livestock activities. However, more farmers have been suffered from clam farming and marketing losses than those with success. The reasons were the difference in the tactics of each RMSs due to the limitation in capacity of households comparing with level of risks.

Apart from the above reasons, the failures in risks management of majority of households (87/159 households in surveyed group) was partly caused by the absence of RMSs for the man-made risks (such as death clam phenomenon because the impacts of waste water from rice production activities or from industrial zone). While the success of aquaculture is greatly dependent on the quality of the cultivating environment, clam farmers in Thaibinh have not got an appropriately strategy for protecting water environment, except to choose the good place for the clam plots which are far enough from polluted water flow. Moreover, the non-correspondence RMS3 with the level of market risks also explained for the inefficiency of this RMS despite the efforts of farmers. According to the holistic approach introduced by OECD (2009), RMSs of households are only efficient in addressing the risks which are in micro level. However, due to the level of the

consequences and likelihoods, the market risks and financial risks in clam farming are at meso/macro level (Hang, Cuong et al. 2015), which really need the interventions/policies of government (from state to local level) to deal with. In fact, clam farmers in Thaibinh had tried to connect with input/output market by themselves, without any supports/protection from government, even when clam farmers working with strange foreigners in local area.

To cope better with different risks in clam sector, besides the adjustment in RSMs of farmers themselves, it is necessary to have further interventions/policies from government (from national to local level) to address the aquaculture risks which the farmers cannot handle by themselves, such as (1) addressing the issue of polluted wastewater to the clam field; and (2) more focusing in supporting farmer in linkages to the both formal financial market and output market. In addition, supports for technical training targeting on improving farmer's skills and knowledge in farming decision making and market information is also of high value to clam farmers in coping with farming risks.

REFERENCES

Barange, M. and R. I. Perry (2009). Physical and ecological impacts of climate change relevant to marine and inland capture fisheries and aquaculture. Expert Workshop on Climate Change Implications for Fisheries and Aquaculture. K. Cochrane, C. D. Young, D. Soto and T. Bahri. FAO Headquarter, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS.

Engle, C. R. (2010). Managing Risk in Aquaculture Businesses. Aquaculture Economics and Financing: Management and Analysis: 93-103.

Engle, C. R. (2010). Risk Analysis in Production Aquaculute Research. Aquaculture Economics andFinancing: Management and Analysis, Wiley_Blackwell: 197-206.

Handisyde, N. T., Ross L.G., Badjeck M-C, Allison E.H. (2006). The Effects Of Climate Change On World Aquaculture: A Global Perspective, Department For International Development.

Hang, B. and C. Sheng (2005). "The study of precautionary saving of China's farmers." Chinese Rural Economy, 3: 44-52.

Hang, N. T. T., Cuong T.H., Azadi H., Lebailly P. (2015). Clam farming risks in Thaibinh province, Vietnam: impacts and causes. Workshop "Vulnerable Coastal Areas", Royal Academy for Overseas Sciences (RAOS) – Belgium.

Hang, N. T. T., Cuong T.H., Azadi H., Lebailly P. (2016). Factors contributing to household-resilience capacity to farming risks: Case study of clam farming in Thai Binh, Vietnam. XXXIIth ATM Development Days 2016: Disasters, Vulnerability and resilience in developing countries. Lille University – French.

Harwood J. L., Heifner R., Coble K., Perry J., Somwaru A. (1999). Managing risk in farming: concepts, research, and analysis, US Department of Agriculture, Economic Research Service.

Lebailly, P., Richard H., Keith C., Janet P., Agapi S. (2015). Capacity building and services to assist local farmers to improve aquaculture management in Vietnam. SAADC2015: The 5th International Conference on Sustainable Animal Agriculture for Developing Countries, Thailand, Rajamangala University of Technology Isan.

Long, H. (2013). No way for selling ThaiBinh clam (Be tac loi ra cho ngao o Thai Binh), Thanhnienonline.

MARD (2014). Report about clam production in provinces of North coastal Vienam, Department of Processing and Trading Agricultural Forestry Aquatic Products and Salt

Minot, N. and R. V. Hill (2007). Developing and connecting markets for poor farmers. 2020 FOCUS BRIEF on the World's Poor and Hungry People, INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE.

N.Musser, W. and G. F.Partrick (2002). How Much does Risk Really Matter to Farmers? A

Comprehensive Assessment of the Role of Risk in US Agriculture. R. E.Just and R. D.Pope, Springer US: 537-556.

Nguyen, K. V., James H., James H.J. (2013). "Measuring household resilience to floods: a case study in the Vietnamese Mekong River Delta". Ecology and society, 18(3): 13.

Nguyên, P. (2013). Thái Bình: Phát triển nuôi trồng thủy sản nước mặn, lợ theo hướng GAP.

OECD (2009). Managing Risk in Agriculture, Organization for Economic Cooperation and Development (OECD) Publishing.

Tú, M. (2013). Ngao ứ đọng hàng nghìn chục tấn: liệu cung đã vượt cầu? (Thousands tons of stagnant scallop: Is that supply over demand?), Truy cập ngày 20/8/2016, tại: http://www.nhandan.com.vn/kinhte/chuyen-lam-an/item/21771002-ngao-u-dong-hang-chuc-nghin-tan-lieu-cung-da-vuot-cau.html.

ThaiBinhDARD (2014). 2013 Year Report.

ThaibinhDARD (2014). Preliminary Summary Report after two years carrying out "2011-2015 planning proposal" (Bao cao so ket 2 nam thuc hien de an nuoi ngao), Thaibinh Department of Agriculture and Rural Development.

Thuyết, B. Đ. and T. V. Dũng (2013). "Status of Hard Clam Farming in Some Coastal Provinces of North and Northern Central Vietnam." Journal of Science and Development 11.

ThaiBinhDARD (2014). 2013 Year Report.

ThaibinhDARD (2014). Preliminary Summary Report after two years carrying out "2011-2015 planning proposal" (Bao cao so ket 2 nam thuc hien de an nuoi ngao), Thaibinh Department of Agriculture and Rural Development.

Thuyết, B. Đ. and T. V. Dũng (2013). "Status of Hard Clam Farming in Some Coastal Provinces of North and Northern Central Vietnam." Journal of Science and Development 11.