

Price risk perceptions and management strategies in Vietnamese pangasius production

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ARTICLE INFO

Research paper

Received: April 12, 2018

Revised: May 20, 2018

Accepted: June 15, 2018

Keywords

Aquaculture

Pangasius

Risk management

Risk perceptions

Sustainability certification

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ABSTRACT

Vietnamese pangasius prices have become more volatile over the past decade exposing the business to risk and uncertainty. This study explored Vietnamese pangasius farmers' perceptions about the sources of price risk and the effectiveness of price risk management strategies through Likert scales. The relationships between farm and farmer socioeconomic characteristics and their perceptions were also examined by using Chi-square analysis. Data were obtained through a structured survey with 110 farmers in three provinces of An Giang, Can Tho, and Dong Thap. Results suggested that pangasius farmers mostly concerned the instability of input prices, the volume of input supply, the instability of output prices, and the legislation of sales contracts between farmers and processors. We further found that price risk management strategies were not perceived as less effective measures to mitigate the price risk. Gender, farmers' experience, farm size, crop period, farm types, and access to credit are positively related to the farmers' perceptions. Findings on the price risk perceptions and management strategies are useful to support public and private of price risk management decision towards increasing the sustainability of pangasius production.

Cited as: Pham, N. T. A., Pham, T. T., Mai, Q. D., & Dang H. T. (2018). Price risk perceptions and management strategies in Vietnamese pangasius production. *The Journal of Agriculture and Development* 17(3), 1-9.

1. Introduction

Pangasius (*Pangasius hypophthalmus*) has become one of the most important export products of Vietnam. In 2015, exports of pangasius were valued more than 1.7 billion USD (FAO, 2017); the total of production to 1.1 million tons. Though it is one of the top export markets for Vietnamese pangasius, EU imports of Vietnamese pangasius decreased from 398,339 thousand USD in 2012 to 268,878 thousand USD in 2016 (Seafood trade intelligence portal, 2017). This decline could be due to a consequence of recent claims about the negative environmental impacts of pangasius production and food safety issues (Bush & Duijf, 2011; Little et al., 2012; Rico & Van den Brink, 2014). Furthermore, customers increasingly demand labelled pangasius,

such as those of the Aquaculture Stewardship Council (ASC), GlobalG.A.P., Best Aquaculture Practices (BAP), and Naturland organic for farm operations, aim to guarantee consumers that the product is produced sustainably (Sahota et al., 2009; Bush & Duijf, 2011; Bush et al., 2013).

To mitigate environmental sustainability concerns and to keep up with the increasing demand for certified pangasius, technological innovations could be applied to reduce water pollution from pangasius farming. Initial investment costs for water purification technologies are relatively high (Pham et al., 2016). In addition, pangasius prices have become increasingly volatile due to the elastic nature of the supply for live pangasius (Pham et al., 2018). Price volatility implies price risk which in turn lead to reduced investment in sustainable production ways (Assefa et al., 2017).

Several studies have estimated risk perception and management in fish farming (Bergfjord, 2009; Dahl & Oglend, 2014; Asche et al., 2015). Literature showed that the risk from price volatility was perceived as the most important risk source in fish production. The main price risk management strategies considered in fish farming were sale contracts, insurance, diversification, future and options, and forward contracts. Although price risk was rated as the most important factor, many authors did not find a mismatch between farmers' perceptions of price risk and the price risk management strategies (Bergfjord, 2009; Le & Cheong, 2010). This raises the question that either fish farmers are not aware of the benefits of price risk management strategies (Le & Cheong, 2010) or the strategies considered are not adopted to mitigate the price risk. While these are no doubt important price risk, it is unknown about the sources of price risk that fish farmers consider to be important and how they manage the particular source of price risk.

The objective of this study was to provide insights into: (1) Vietnamese pangasius farmers' perceptions of the sources of price risk and the effectiveness of management strategies on particular source of price risk; and (2) the relationship between farms' and farmers' socioeconomic characteristics and farmers' perceptions of price risk in pangasius farming. Insight into the price risk and corresponding management strategies in pangasius farming is expected to provide useful information for policy makers and private sectors, which can be used to design policies and measures to help farmers improve their farm management.

2. Materials and Methods

2.1. Data collection

Data for this study were gathered in February 2018 through a questionnaire survey of 110 pangasius farmers. The surveyed pangasius farmers were randomly selected with the help of local aquaculture officers and were from three main production provinces in Vietnam, including An Giang, Can Tho, and Dong Thap. Of the 110 questionnaires, 8 were excluded from the analysis due to incomplete information. The questionnaire was pre-tested with 10 farmers to ensure that the questions were clear and understandable. In total, a sample of 92 farmers were available for statistical analyses. For the identification of

sources of price risk and price risk management strategies in designing the questionnaire survey, we first created a long-list of price risk sources and price risk management strategies from the literature review. Second, 40 stakeholders (30 pangasius farmers, 6 local aquaculture extension officers, and 4 aquaculture researchers) were interviewed through either face-to-face and e-mail to select the existing sources of price risks and management strategies from the list and were asked for additional sources of price risk and management strategies in Vietnamese pangasius farming. The stakeholders were all knowledgeable on pangasius farming. The selected sources of price risk and management strategies to the particular sources of price risk are presented in Table 3 and Table 4, respectively. The questionnaire survey consisted of three parts, i.e. questions related to 1) farmers' perceptions of price risk sources, 2) farmers' perceptions of various strategies to manage price risk, and 3) socioeconomic characteristics of the farm and farmer. Most questions were close questions, mainly in the form of Likert-type scales ranging from 1 to 5 (Churchill & Iacobucci, 2006).

2.2. Data analysis

This study used the descriptive statistical methods, using the means and the standard deviations to measure the perceptions of Vietnamese pangasius farmers of price risk and the efficacy of price risk management strategies. Previous quantitative risk management studies which measured risk perceptions and risk management strategies, also rated the relative impact and effectiveness of different risk sources through Likert scales (Meuwissen et al., 2001; Hall et al., 2003; Assefa et al., 2017). Chi-square analysis was also conducted to explore the relationship between farmers' perceptions of price risk and farm and farmer socioeconomic characteristics.

3. Results and Discussion

3.1. Sample description

The descriptive statistics of the sample of farms and the socioeconomic characteristics of farmers are shown in Table 1. The average age of farmers was fairly young, forty-eight years old, with completed secondary school education and an average experience of 14 years. Farmers were mainly male

Table 1. Summary statistics of surveyed farmers' socioeconomic and farm characteristics (n = 92)

Characteristics	Mean	Percentage (%)	Standard deviation	Minimum	Maximum
Age (years)	48		12.56	23	74
Education (years)	8.81		3.12	3	16
Gender (1-males, 0-females)					
Male		91.7			
Female		8.3			
Experience (years)	13.38		5.08	2	25
Farm size (ha)	1.58		2.03	1	10
Number of months/crop	8.24		1.55	6	12
Access to credit (1=yes; 0 = No)	0.56		0.5	0	1
Technical support (1=yes, 0-No)					
Yes		20.8			
No		79.2			
Source of information support	0.56		0.5	0	1
Extension staffs		20.8			
Input suppliers		48.6			
Processors		1.4			
Aquacultural engineers		8.3			
Friends/relatives		47.2			
Farm types					
Independent		54.2			
Partially integrated		18.1			
Fully integrated		27.7			

(91%) and mostly owned small scale farms with average farm size of 1.6 ha. Seventy-nine percent of farmers took external technical consultancy, mainly from the input suppliers, friend, and extension staff. The majority of surveyed farmers were from independent and fully integrated farming: 54% independent farms, 28% fully integrated farms with processors, and 18% partially integrated farms with input suppliers. Partially integrated farms mean that an input supplier advances feed to an independent farmer for repayment with an interest at harvest or another agreed time when cash available. While fully integrated farms prefer to the vertical integration of pangasius farmers with processors.

3.2. Perceptions of price risk attitude and price volatility

To get insight into a farmer's perception of his or her price risk attitude, the five statements as shown in Table 2 were used. Huirne et al. (2000) and Valeeva et al. (2011) also used similar statements (Huirne et al., 2000; Valeeva et al., 2011). The statement of "Despite of pangasius market volatility, I keep producing live pangasius" was

used to check the consistency of responses. This statement covers not only input and output price volatility, but also the volatility of live pangasius demand. Table 2 shows the percentage distribution of the farmers' answers in relation to each statement.

Table 2 shows that for most of statements, the majority of farmers indicated a 4 (agree) or 5 (totally agree). This implies that most farmers are willing to take risk when the input and output prices volatile. However, when the selling price of live pangasius increases, most of farmers hesitate to expand their pangasius farm size. The hesitation in expanding the pangasius production area could also be explained by the relatively high degree of volatility of pangasius price. Our study found that about 40% of farmers perceived that the average price fluctuated in the past 5 years ranging from 10% to 24%. According to the farmers, the price volatility in pangasius production was mainly caused by the variation in the supply and demand of the market (54%), and the disqualification of the pangasius products for export standards (46%).

Table 2. Farmers' perceptions of price risk attitude and the percentage distribution of farmers over categories (1= totally disagree, 5 = totally agree)

	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)
Despite of input price volatility, I keep producing live pangasius	8	8	9	25	51
Despite of decreased output price, I keep producing live pangasius with expectation of increased output price in the next crop	8	9	16	32	35
When the output price increases, I want to expand my pangasius farming	35	16	20	21	9
Despite of decreased output pangasius price, I will not produce other fish	16	8	10	27	39
Despite of pangasius market volatility, I keep producing live pangasius	9	9	10	24	49

3.3. Perceptions of sources of price risk

In total, 12 sources of input and output price risk were considered in this study. The second, third and the fourth columns of Table 3 show the frequency of appearance of input and output sources related to price risk, the average scores of farmers' perceived impacts of each source of price risk, and their ranks, respectively. The impacts of risks, which were estimated by the frequency of risk occurrence multiplies with severity, were ranked by their means in descending order to evaluate the perceived importance of sources of price risk. The results show that high and unstable input prices, instability of the volume of input supply, and low and inconsistent quality of input supply were the greatest concerns by pangasius farmers, with mean scores of impact at 4.13, 3.10, and 2.33, respectively. A study of Loc (2016) also found that unstable input price at farm stage was the key challenge for upgrading the Vietnamese pangasius value chain. When the pangasius selling price is high, many farmers enter the industry. This often leads to the over-demand of fingerlings supply in the period of increased selling price. Furthermore, the result by Le & Cheong (2010) and Loc (2016) suggested that uncontrolled input quality (fingerlings and feed) was highly associated with the price risk (Le & Cheong, 2010; Loc, 2016). This over-demand of pangasius fingerlings in a particular period of time together with the inconsistent input quality inevitably drive the unstable supply of the volume of inputs and unstable input prices. Poor on time delivery of inputs purchase, imbalance of bargaining power with input suppliers, and water in-pond pollution related to the input quality were less concerns by pangasius farmers with

mean score of impact less than 3. This is likely explained by the fact that there is a competition between various input suppliers. As such, are generally accepted the offers by input suppliers.

With regard to the output selling related risks, low and unstable output prices, instability in demand volume, and weak legislation on sales contracts between farmers and processors gave the highest scores with mean scores of impact at 5.00, 3.79, and 3.43, respectively. Concern about the instability in output price and weak legislation on the sales contracts are likely to reflect that pangasius farmers were producing their fish without any guarantee of a sales price. Variability in prices were also found as the most important risk source in pangasius farming (Le & Cheong, 2010; Trifković, 2014). Imbalance bargaining power with the processors, lack of capacity of fulfill high quality specifications of customers, and poor on-time payment to the farmers are less concerns by pangasius farmers with mean score of impact less than 3. This likely reflects that farmers have relatively equivalent power in negotiating prices with processors which was similarly found by Pham et al. (2018). Also there does not often have delayed payment from processors. In addition, farmers perceived that they are capable of meeting the requirements of customers.

3.4. Perceptions of price risk management strategies

Farmers' perceptions of particular source of price risk management strategies are summarized in the fourth and fifth column of Table 4. In order to manage the input sourcing related risks, pangasius farmers mainly partially inte-

Table 3. The percentage of price risk appearance, mean (1 = very low impact, 5 = very high impact), and rank by mean for sources of price risk.

ID	Source of risk	Percentage (%)	Mean	Rank by mean
	Input sourcing related risks			
1.1	High and unstable input prices	93	4.13	1
1.2	Instability of the volume input supply	56	3.10	2
1.3	Low and inconsistent quality of input supply	60	2.33	3
1.4	Poor on time delivery of inputs purchase	17	2.25	4
1.5	Imbalance of bargaining power with input suppliers	29	2.06	5
1.6	Water in-pond pollution related to the input quality	51	0.83	6
	Output selling related risks			
2.1	Low and unstable output prices	85	5.00	1
2.2	Instability in demand volume	60	3.79	2
2.3	Weak legislation on sales contracts between farmers and processors	33	3.43	3
2.4	Imbalance bargaining power with the processors	39	2.26	4
2.5	Lack of capacity of fulfill high quality specifications of customers	36	1.68	5
2.6	Poor on-time payment to the farmers	63	1.27	6

grated with input suppliers (33%), cut production (32%), diversified suppliers (42%), bought inputs from suppliers with certification (32%), carefully checked the quality of inputs (56%); while adopting to prolong the sales (58%), follow market information (47%) and choose the prestige retailers (58%) were popularly used to manage the output selling related risks.

Table 4 clearly shows that all the strategies are perceived as the less effective way to manage the sources of price risk. The standard deviation of less than 1 indicates a high level of consensus among surveyed farmers. The current strategies that Vietnamese pangasius farmers used to manage price risk are relatively limited into two categories (survival and adaptive strategies) (Assefa et al., 2017). Survival and adaptive strategies aimed at minimizing production losses, improving efficiency, and flexible adaptation to market price movements (Assefa et al., 2017).

There is mismatch between farmers' perceptions of output selling related risks and the perceived importance of risk management strategies in dealing with output price volatility. For example, farmers mentioned that selling price volatility was their most concerns. Surprisingly, they did not perceive the contract farming by fully integrated farms with processors as an important risk management strategy. Although contract farming is often argued to minimize risk and uncertainty

(Heyder et al., 2010; Trifković, 2014). The less effectiveness of contract farming (with average score of below or equal 2.00) confirms the findings of Le and Cheong (Le & Cheong, 2010), who indicated that the law governing sales contracts between pangasius farmers and processors is weak and unreliable. The less effective price risk management in pangasius production confirmed the fact that pangasius farmers were producing their fish without any guarantee of a sales price.

3.5. Variables that relate to the perceptions of price risk

Table 5 shows the results of the chi-square analysis carried out to explore the relationship between the perceptions of price risk and pangasius farm and farmer socioeconomic characteristics. With respect to the input sourcing related risks (risk ID from 1.1 to 1.6), the table shows that gender, farmers' experience, farm size, crop period, farm types, and access to credit have statistically significant and positive impacts to the farmers' perceptions at 1%, 5%, and 10% level. This explains that male farmers with more experience, accessibility to credit and their farms with larger scale, longer crop length perceived input sourcing related risks as important.

Similarly, in the case of the output selling related price (risk ID from 2.1 to 2.6), the table shows that gender, crop period, farm types, tech-

Table 4. The percentage of price risk management strategies application, mean (1 = very low effective, 5 = very high effective), and standard deviation

ID	Source of risk	Risk management strategies	Percentage (%)	Mean	Standard deviation
Input sourcing related risks					
1.1	High and unstable input prices	Substitute expensive inputs	7	1.08	0.44
		Store input in the short time	8	1.11	0.68
		Partially integrate with input suppliers	33	2.00	1.54
		Fully integrate with processors	8	1.15	0.64
1.2	Instability of the volume input supply	Cut production	32	1.78	1.26
		Adjust farming practices	28	1.68	1.23
		Fully integrate with processors	7	1.18	0.68
1.3	Low and inconsistent quality of input supply	Diversify suppliers	42	2.17	1.48
		Buy inputs from suppliers with certification	32	2.04	1.57
		Carefully check the quality of inputs	56	1.56	1.53
		Fully integrate with processors	6	1.15	0.71
1.4	Poor on-time delivery of inputs purchased	Contract with suppliers	8	1.21	0.75
1.5	Imbalance of bargaining power with input suppliers	Compare prices between different input suppliers	17	1.45	1.09
1.6	Water in-pond pollution related to the input quality	Select the improved ingredients in input supply based on farmers experience	14	1.31	0.83
		Efficiently use the inputs	31	2.00	1.57
Output selling related risks					
2.1	Low and unstable output prices	Prolong the sales	58	2.19	1.27
		Fully integrate with processors	13	1.38	1.04
		Diversify production	17	1.38	1.04
		Follow market information	47	2.15	1.36
2.2	Instability in demand volume	Cut production	29	1.56	0.95
		Follow market information	11	1.24	0.72
		Temporary stopped farming pangasius	24	1.35	0.77
		Diversify production	3	1.08	0.52
2.3	Lack of capacity to fill high quality specification of customers	Apply best farming practices	14	1.47	1.23
		Financial management for best farming practices	2	1.04	0.35
		Follow information about standards	6	1.14	0.61
		Fully integrate with processors	11	1.39	1.14
2.4	Imbalance bargaining power with the processors	Fully integrate with processors	6	1.19	0.83
2.5	Poor on-time payment to the farmers	Strong sales contracts	24	1.53	1.14
		Choose the prestige retailers	58	2.78	1.63
2.6	Weak legislation on sales contracts between farmers and processors	Strong sales contracts	14	1.35	0.94
		Choose the prestige retailers	28	1.82	1.44

nical support, and access to credit have statistically significant and positive impacts to the farmers' perceptions at 1%, 5%, and 10% level. This explains that male farmers with accessibility to credit and their farms with longer crop length, technical support perceived output selling related risks as important.

Results also reveal that there is a significant relationship between types of farm (i.e. independent farms, partially integrated with input suppliers, and fully integrated with output suppliers) and the perception of input sourcing related risks and output selling related risks. This is in line with the study of Ahsan (2011) and Trifković (2014) who stated that farmers tend to do contract farming as a market risk management strategy (Ahsan, 2011; Trifković, 2014).

4. Conclusions

The management of price volatility and uncertainty is considered to be an important step to increase sustainable investments in Vietnamese pangasius farming. The goal of this study was to obtain empirical insight into Vietnamese pangasius farmers' perception of price risk and the effectiveness of risk management strategies and variables related to price risk perceptions.

Results suggest that pangasius farmers mostly concerned the instability of input prices and volume of input supply, the instability of output prices and volume of market demand, and the legislation of sales contracts between farmers and processors. Nevertheless, price management strategies were perceived as less effective by pangasius farmers. The price risk management strategies are limited to few traditional instruments such as cut production, diversified suppliers, bought inputs from suppliers with certification, carefully checked the quality of inputs, prolong the sales, follow market information, and choose the prestige retailers. In terms of the relationship between perceptions of price risk and farm and farmer socioeconomic characteristics, gender, farmers' experience, farm size, crop period, farm types, and access to credit are positively related to the farmers' perceptions of input sourcing related price risk. While gender, crop period, farm types, and access to credit positively related to the farmers' perceptions of output selling price risk.

For price stabilizing policy interventions, pol-

Table 5. Results of chi-square analysis for price risk

Variables	Input sourcing related risks (ID1.1 to 1.6) and output selling related risks (ID 2.1 to 2.6)											
	1.1	1.2	1.3	1.4	1.5	1.6	2.1	2.2	2.3	2.4	2.5	2.6
Age (years)	0.78	0.88	0.27	0.32	0.82	0.82	0.38	0.44	0.97	0.41	0.38	0.38
Education (years)	0.60	0.51	0.61	0.25	0.24	0.10	0.28	0.22	0.88	0.56	0.27	0.90
Gender (1-males, 0-females)	0.15	0.37	0.20	0.09*	0.09*	0.14	0.08*	0.41	0.66	0.60	0.17	0.90
Experience (years)	0.05*	0.04	0.12	0.74	0.04**	0.19	0.59	0.70	0.40	0.41	0.16	0.39
Farm size (ha)	0.07*	0.17	0.47	0.25	0.43	0.42	0.55	0.63	0.65	0.53	0.46	0.64
Number of months/crop	0.02**	0.37	0.42	0.08*	0.18	0.49	0.07*	0.34	0.86	0.17	0.15	0.79
Technical support (1=yes, 0-No)	0.49	0.51	0.90	0.70	0.38	0.12	0.30	0.54	0.80	0.90	0.03**	0.54
Farm types	0.09*	0.19	0.01**	0.28	0.39	0.02**	0.00***	0.02**	0.06*	0.05*	0.01**	0.02**
Access to credit (1=yes; 0 – No)	0.65	0.33	0.00***	0.67	0.23	0.49	0.04**	0.03**	0.78	0.48	0.05**	0.40

Values with *, **, *** statistically significant at 10%, 5%, 1% are in bold.

icy makers could provide the timely dissemination of improved and accessible market price data and predictions. Such price data could be used to support pangasius farmers in production decision, as well as contract decisions. Given the importance of socio-economic characteristics of farmers and their farms on the input and output price risk perception, effort should be stepped up at introducing more effective price risk management strategies to male farmers with more experience, accessibility to credit and their farms with larger scale. These farmers concern more about the price risks and thus likely increase their willing to adopt the better risk management, such as strengthening the conditions of contract farming, improved information system, and price insurance.

Acknowledgements

This research was funded by the Nong Lam University. The authors acknowledge the helpful comments and suggestions of the committee of scientists at the Economics faculty, Nong Lam University. We are grateful to the aquaculture officers in An Giang, Can Tho, and Dong Thap provinces for supporting us during the main survey. We also thank the farmers for sharing their preferences.

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