Factors Affecting Small Scale Fish Farmers in Accessing Markets: a case study of fish value chain in HaiDuong Province, Vietnam.

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Abstract

Traditionally, small farmers sell their crops or/and animals at the farm gate to intermediaries, often at a low price. However, innovations in marketing arrangements can transform market relations in favour of smallholders, and producer organizations are well-positioned to take advantage of these new approaches. Factor analysis was applied on twelve components of output markets in Haiduong province. The results show that there are patterns that are observable in terms of access and use of output market by fish farmers. The most commonly used output markets by aquaculture farmers are local fresh output market, the best retail produce markets as well as the wholesale fresh fish markets. The study reveals that farmers tend to sell their fish to the wholesale fresh fish markets. The best retail output markets also provide an important market outlet for produce by aquaculture farmers. Improving road conditions and transport services in the projected regions of aquaculture production as well as rural areas will not only improve accessibility of external markets, but will also improve accessibility of local output markets.

Key words: *Factors, small scale, market access, fish farmer*

I.   INTRODUCTION.

Many of the world's poor belong to agriculturally based rural households. In this context, attempts to reduce global poverty must necessarily focus on smallholder agriculture. While some of these households are self-suficient, most are linked to markets, domestic, national, regional and international. There is increasing recognition that the opportunity for smallholders to raise their incomes from agricultural production, natural resource management and related rural enterprises depends on their ability to participate successfully in markets. As a consequence, the focus of research and development has broadened from building up farmers' production capabilities to facilitating farmers' access to markets (Shepherd, 2007).

Simultaneously, changes in the global agricultural economy provide smallholder farmers with new challenges and opportunities. Due to increases in purchasing power and the increased opportunity cost of the time required for food preparation, the demand for higher value and processed food products has grown worldwide (Gehlhar and Regmi, 2005). Farmers are increasingly supplying long and sophisticated supply chains and have to meet stringent food safety standards, expecially in discerning international markets. Meanwhile, the emergence of supermarkets in developed and developing countries has implications not just for their immediate suppliers, but also for the entire food marketing system, for example, by forcing competing wet markets to upgrade their facilities and improve attainment practices (Reardon et al., 2005).

Despite growing market opportunities, there is a danger that smallholder farmers will be pressurized, even though they have some competitive advantages over larger producers, particularly in their low costs in accessing family labour and intensive indigenous knowledge (Poulton et al., 2005). The disadvantages they encounter are high unit transaction costs in almost all non-labour transactions (Poulton et al., 2005). Furthermore, over the last decades structural adjustment programmes have led to a decline in state-funded agricultural support, with the result that many farmers find it difficult to access inputs, extension, and training.

Much of the literature on market access highlights the widely imperfections of markets in the developing world (De Janvry et al., 1991). Lack of information on prices and technologies, shortage of connections to established market actors, distortions or absence of input and fish markets, and credit constraints often make it difficult for small farmers to take advantage of market opportunities. High transaction costs, faced by smallholders, due to their small scale exacerbate these challenges, typically in quality-conscious and niche markets such as organic, hygiene-safety or fair trade (Poulton et al., 2005). Access to these markets often requires expensive third party certification, which in turn may be a major barrier to small-holder participation (Barrett et al., 2001).

The extensive literature on factors that are likely to affect marketing arrangements, particularly in natural resource management, offers lessons for collective action in marketing (Agrawal, 2001;

Baland and Platteau, 1996; Rasmussen and Meinzen-Dick, 1995; Ostrom, 1990). This literature identifies three broad categories of factors as important: characteristics of the resource, characteristics of the user groups, and institutional arrangements, plus the external environment. The latter two categories have principles that are also relevant for linkages and cooperation in marketing of agricultural products. For marketing, instead of resource characteristics, it is useful to consider the types of products and types of markets.

Small groups often have higher internal cohesion because it is easier to know and monitor other members (Coulter et al., 1999). But larger groups can achieve economies of scale, a particular advantage in marketing (Stringfellow et al., 1997).

Factors affecting the output market access of aquaculture farmers in Haiduong

Access to output markets, ranging from small village-level markets to sophisticated export processors, is the key for small farmers to earn more from the sale of their produces. Poor farmers in rural areas appear to have limited access to output markets for their products. However, by assessing transport costs and focusing on multiple high-value storable crops, opportunities emerge to create output market linkages with a rate of return that is very attractive to poor families (International Development Enter-prises, 2008).

According to Heinemann (2002), rural people in developing countries, especially the poor, often say that one reason they can not improve their living standards is because they face difficulties of accessing markets where they can obtain agricultural inputs and consumer goods and sell the produce that they grow. A major reason why even those farmers who can produce a surplus remain trapped in the poverty cycle is lack of access to profitable markets. All too often farmers are forced to sell to the buyer of convenience at whatever price that buyer dictates (IITA, 2001).

In addition, most of the literature related to smallholder agricultural marketing, e.g. Dorward et al. (1998), Freeman and Silim (2001), IFAD (2003), Jayne et al. (2002), Kherallah and Kirsten (2002) and Killick et al. (2000), reiterates that the problem of market access is linked to the following constraints: price risk and uncertainty, difficulties of contract enforcement, insufficient numbers of middlemen, cost of putting small dispersed quantities of produce together and the inability to meet standards. Other problems related to physical market access like physical infrastructure include roads, market facilities, power and electricity. In rural areas, for example, small holders are often geographically dispersed, roads and communications are poor and the volumes of business are insufficient to encourage private sector service provision.

According to IITA (2001), to overcome these problems, farming communities have formed cooperatives, collec-tive marketing associations, and other mutual alliances to increase their buying and selling power in the market place. Larger commercial farmers have also been active, forming mutually beneficial alliances with farmers supply-ing marketable products at agreed

prices. Clearly, it is only by such means that most developing country far-mers can move from a poverty cycle to an income cycle, and begin to make a real contribution to overall economic development.

One of the major constraints to the growth of small holder agriculture in developing countries is high transaction costs (Machethe, 2004), largely attributable to poor infrastructure. This situation is no exception in Vietnam. A large proportion of rural households continue to lack access to basic services.

Access to road transportation determines households' demand for production and consumption goods and services. If agricultural inputs and output markets are more accessible rural households will tend to use these services more, leading to improved productivity. Deficiencies in rural infrastructure services result in poorly functioning domestic markets with little spatial and temporal integration, low price transmission, and weak international competitiveness (Pinstrup-Anderson and Shimokawa, 2006). Economic activities in most rural areas tend to be concentrated around areas where there are banks, postal services, retail outlets and suppliers of inputs.

Poor road conditions, high transport costs and distant markets have been identified as factors that hinder improved market access for aquaculture farmers in Vietnam, and also contribute towards failing input markets. Factors that determine access to input and output markets include distance to the markets, the state of the roads, the cost of transportation and the frequency of visits to these markets.

In Haiduong, a central province of Red River Delta in northern Vietnam, rice cultivation is still the traditional activity and the principal source of income for farmers. Alternative land use and livelihood options such as aquaculture, fruit production and livestock (Hanh, H. Q et al. 2013) are integrated components in a farm and created more cash income, food and foodstuff to meet subsistence needs (Lebailly, P., et al. 2015). The province targeted to develop the freshwater aquaculture from large lowland area of rice fields which were low productive and inefficient utilizations due to not unstably harvesting a crop during the flooding season. Statistical data and records indicated that aquaculture has expanded rapidly: by 2014 the aquaculture land increased 64% from 5,668 ha in 1996 (Haiduong Statistics Office, 1996, 2014). These changes are strongly supported by the policy of the government. Since 1999, the local and Vietnamese government has promoted the restructuring and diversification of its agricultural sector, with the goal to reduce the share of rice to the total agricultural output value while increasing the contribution of aquaculture to economic growth. This policy resulted in a growing importance of aquaculture as is reflected in the following figures: in 1996 aquaculture production contributed approximately 2.7 % and in 2014, 12% to the total gross production of agriculture in Haiduong. Between 1997

and 2014, annual aquaculture growth rates were 13% for production and 3.9% for culture area (Haiduong Statistics Office, 1999, 2014).

In recent years, the food production system in Haiduong has been changed significantly. In spite of playing a principal farming activity, cereals production showed a downward trend in output before increasing to 823.456 tons in 2000. In contrast, vegetable and fruit crops, livestock production and fish production presented a positive growth in their annual gross outputs. These outcomes were results from strong movement of developing the VAC systems' components in the province. Along to the process, the traditional VAC system (model) has been modified and improved into other "hybrid" aquaculture systems in which fish pond, livestock and orchards have moved from the residence areas to the rice field areas and more commercial orientation under impacts of urbanization and socio-economic changes.

II.   METHODOLOGY

As qualitative and quantitative methods were used in this study, the secondary data were gathered from the local statistical offices and annual records at survey sites. In addition, primary data and information (group discussion and household interview) on house hold aquaculture data and information such as: general characteristics of households, their aquaculture systems, integrated farming activities, and on-farm income sources related to the fish farming were applied for the research analysis. The data collection and analysis were implemented as follows:

Data collection

Site selection and sampling design

Centrally located in the Red River Delta (see Fig. 1), Haiduong province's fishery has, recently and quickly, been developed in both area and output. Because this province is situated entirely inland (with no surrounding coastal lines) where freshwater aquaculture and the VAC system can be found and was developed early in the northern Vietnam – the Red River Delta, its freshwater aquaculture tends to be unique and quite pure.

Fig1. Site selection of two districts in HaiDuong
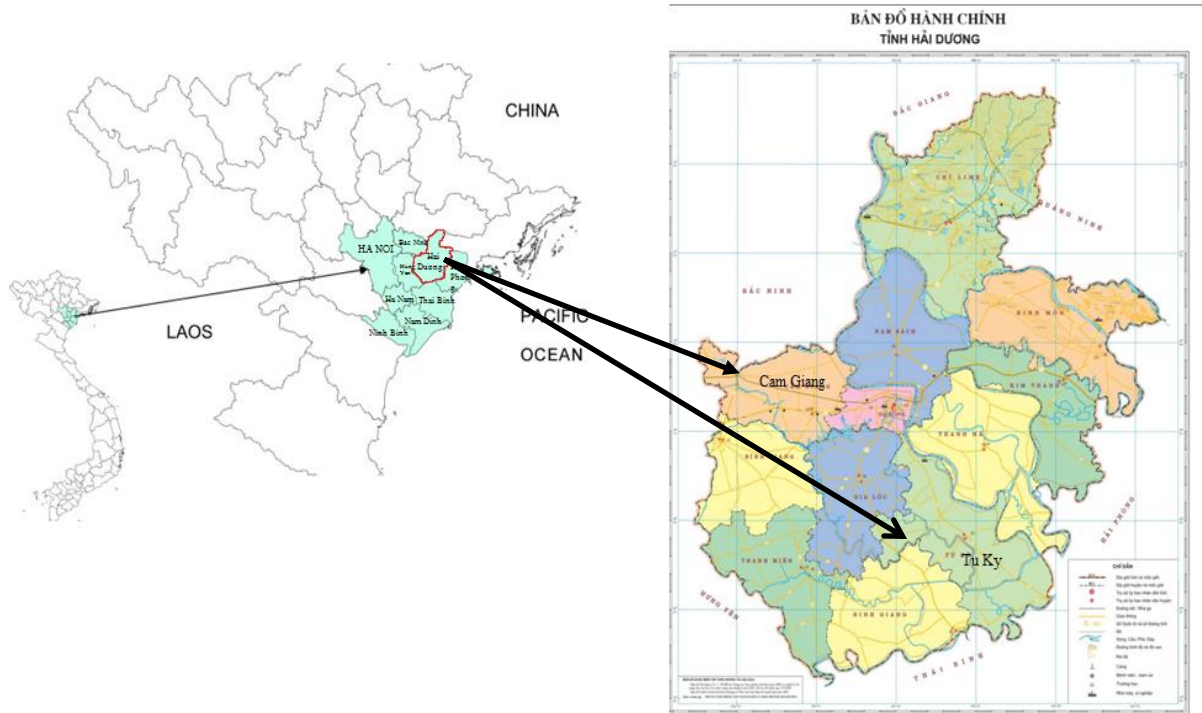
Source: Vietnam department of survey and mapping 2015

Although, over the decades, freshwater aquaculture has been projected to develop in the province, there has been limited data and information as well as studies about the freshwater production systems. It is also quite difficult to define and verify the classification, category and characteristics of the aquaculture production systems existing at the research site. Therefore, three stages were applied in order to design the samples. First of all, the two districts of Tu Ky and Cam Giang were selected in order to investigate the aquaculture households because of their strongly developed and diverse fish production systems. Secondly, two communes were defined from each district. Finally, the most prevalent fish-rearing village was chosen from each selected commune.

Table 1. Samples of fish farms selected in HaiDuong province

Location			Fish HHs	Animal/Fish HHs	VAC HHs	Total
District	*Commune*	*Village*				
Cam Giang	Cam Doai	Hoa Binh	13	13	10	36
	Cam Dong	An Lai	8	18	9	35
	Subtotal		*21*	*31*	*19*	*71*
Tu Ky	Hung Dao	Lac Duc	19	15	7	41

Tai Son	Thuong Son	11	19	9	39
Subtotal		*30*	*34*	*16*	*80*
Total		**51**	**65**	**35**	**151**

The sampling design was defined from the selected villages from which, 151 households with fish farming were randomly selected from the lists that were provided by local officials and authorities such as leaders of The People Committee, Cooperatives and/or Villages. The sampling design is described in the Table 1. The number of households was 39 from Thuong Son; 41 from Lac Duc; 36 from Hoa Binh and 35 from An Lai village.

Data analysis:

Data collected from a sample of 151 fish farmers across the two districts of Haiduong province in the year 2015 and the Marketing Surveys and Statistical Analysis (MSSA) was used in this study. From each district, fish farmers were identified first and then randomly selected. In the study fish farmers were defined as those participating in the output market. The information was collected through a structured questionnaire administered on individual head of households.

The econometric model

The econometric model used in this study is Factor Analysis (FA). According to Johnson and Wichern (1992) and Hair et al. (1995) the essential purpose of the factor analysis is to describe the covariance relationships among many variables in terms of a few underlying, but unobservable, random quantities called factors and interpreted through weights of the variable called factor loadings organized in a matrix of factor loadings. The factor analysis model is organized in such a way that all variables within each factor are highly correlated among themselves but have relatively small correlations with variables in other factors (Gorsuch, 1983) . Typically, factors used for further analysis should contain unique variables. However, such a restriction can be relaxed when the results are just intended for understanding the pattern of relationship. Factor analysis is a generally accepted method of answering the basic question of whether or not output markets are located individually or in some cluster (combinations) . The procedure is applied in this study to identify dimensions in which these services are distributed. The factor model can be expressed in matrix form as:

$$x = \wedge f + e$$

Where x is the vector of n observable variables; f is the vector of m unobservable factors; $\wedge$ is called the loading matrix of the order nfm; e is the error vector of nx1.

The aim of the factor analysis is to account for the correlation of the covariance between the responses variables in terms of a smal-ler number of factors. This study attempts to determine

the pattern of relationships among location of output market for fish farmers. Also this study uses principal component extraction method, which involves no assumptions about unique or error variance in the data. The principal component method is appropriate where the objective is to ensure maximum ability to explain variance of observed variables (Mulaik, 1972; Jackson, 1991).

To determine the number of factors that have to be retained, the study uses the Kaiser criterion of retaining Eigen values greater than one (>1), and also selects factors with high factor loadings scores ± 0.4 or greater. Table 1 shows the variables that are included in the analysis.

III. Results and Discussion

Access and use of output market

The study identified three main types of aquaculture output markets available to fish farmers and these were the local fresh fish market, the best retail fish market and the wholesale fresh fish market. Access and use of output market is categorised into the percentage of produce to the aquaculture market, distance to the aquaculture market, tarred road condition to the aquaculture market as well as gravel road condition to the aquaculture market. Table 1 below shows the descriptive statistics of the access and use of output market.

Table 1. The descriptive statistics of the access and use of fish market in Haiduong

Variable	N	Min	Max	Mean	Std. Deviation
% Of produce to local fresh fish market	151	0.00	60.00	6.19	8.672
% Of produce to the best retail fish market	151	1.00	58.00	7.53	7.033
% Of produce to local wholesale fresh fish market	151	2.60	98.64	84.16	14.304
Distance to local fresh fish market (km)	151	0.01	4.00	1.41	1.006
Distance to the best retail fish market (km)	151	0.00	50.00	7.74	6.284
Distance to local wholesale fresh fish market (km)	151	0.00	20.00	9.50	3.596
Tarred road to local fresh fish market (%)	151	0.00	100.00	88.07	22.219
Tarred road to the best retail fish market (%)	132	0.00	100.00	95.56	19.170
Tarred road to local wholesale fresh fish market (%)	150	0.00	100.00	96.61	8.456
Gravel road to local fresh fish market (%)	151	0.00	75.00	4.73	13.251
Gravel road to the best retail fish market (%)	132	0.00	16.67	0.65	2.294

Gravel road to local wholesale fresh fish market (%)	149	0.00	12.50	0.58	1.831

The results show that about 7% of the aquaculture produced by fish farmers is sold to the local fresh fish market as well as the best retail fresh fish market while more than 84% is sold to the wholsale market. Whilst some of the farmers use more than one channel of marketing, not all fish was sent to the market, but some was retained for home consumption.

The distance to the fish market is an important factor since the interaction of the farmers with the fish market is crucial in making information available. Long distances to the market can be a disincentive to farmers who want to commercialize. Compared to other output markets, the whosale fresh fish markets is located furthest to a typical fish farmer. That is, a typical fish farmer is located 9.50 km away. The best retail fish market with the closest fish farmer being located very nearby while the furthest household is located 50 km away. In contrast the local fresh fish market seems to be the closest to a typical fish farmer (1.4 km). This is not surprising as the local markets are the main output market for the farmers that are located mainly in the rural production areas.

Sometimes the distance to the agricultural market is affected by the conditions of the road to that output market. The results show that more than 90% of fish farmers use tarred road to reach all forms of output markets. The wholesale fresh fish markets are more accessible with tarred roads than the other fish markets. This may be because most of the fish farmers are located in the projected areas for aquaculture production and the fish markets such as the local fresh fish markets are located nearer. The best retail fish markets are located a little bit further in towns or/and cities which are normally accessed via tarred roads.

Patterns of access and utilization of fish markets

The principal component extraction method was used to analyse the patterns of the access and use of fish market. Table 2 shows the rotated factor patterns for the fish market variables. Four factors were suggested by the criterion of Eigen values previously discussed. These factors were the true factors as they explained 73% of the variance in the 12 fish market components. The four factors referred to are; Road condition to output market, Percentage of produce to the output market, distance to local output market and road condition to the best retail market, and distance to wholesale output market.

Factor 1: Road condition to the output market

The first factor, road condition to the fish output markets, explained 28% of the total variance in the 12 fish market items. Gravel road to the output fish markets were the items that loaded heavily in this factor. They had a same sign which implies that they are positively correlated. This is to say that fish farmers using commonly the gravel roads to reach the output market. While tarred road to local fresh

fish and wholesale fresh fish markets had a negative sign which infers that fish farmers do not totally use the tarred road to the output markets.

Table 2. Rotated factor patterns for access and use of fish market infrastructure.

Variables	Factor 1	Factor 2	Factor 3	Factor 4	Communality
% Of produce to local fresh fish market	.122	**.905**	-.033	-.089	*.843*
% Of produce to the best retail fish market	.188	**.852**	.045	.047	*.765*
% Of produce to local wholesale fresh fish market	-.173	**-.973**	.009	.038	*.978*
Distance to local fresh fish market (km)	-.012	.194	**-.751**	.148	*.623*
Distance to the best retail fish market (km)	.141	-.028	**.625**	.038	*.412*
Distance to local wholesale fresh fish market (km)	.144	.024	-.052	**.926**	*.882*
Tarred road to local fresh fish market (%)	**-.610**	.106	-.161	.204	*.451*
Tarred road to the best retail fish market (%)	-.006	.190	**.776**	.243	*.697*
Tarred road to local wholesale fresh fish market (%)	**-.519**	.210	.114	-.259	*.394*
Gravel road to local fresh fish market (%)	**.913**	-.110	.042	-.066	*.852*
Gravel road to the best retail fish market (%)	**.947**	-.090	-.099	-.032	*.916*
Gravel road to local wholesale fresh fish market (%)	**.957**	-.080	-.074	-.049	*.930*
% Of total variance explained	*28.42*	*22.07*	*13.48*	*8.90*	

Source : Survey data 2015

Factor 2: Percentage of produce to the output market

The second factor, percentage of produce to the output market , explained 22% of the total variance in the 12 fish market items. The percentage of produce to the output market were also the items that loaded heavily in this factor. They had a different sign which implies that they are negatively correlated. This is to say that fish farmers not using the same percentage of fish produce to sell to the output markets. This may be the case because some wholesale output market are located near the local fresh produce market. Therefore, fish farmers tend to sell their produce at the wholesale output market.

Factor 3: Distance to local output market and road condition to the best retail output market

The third factor in the factor analysis, distance to local output market and road condition to the best retail output market, explained about 14% of the total variance in the 12 fish market items. Distance to local and best retail output markets were the items that loaded heavily in this factor. They had a different sign which implies that they are negatively correlated. This is to suppose that fish markets are not similarly accessible altogether. In addition, tarred road to the best retail fish market had a positive sign which implies that the fish farmers prefers to selling their products to this kind of output market which are accessible to them.

Factor 4: Distance to wholesale output market

The fourth factor, distance to the wholesale output market, explainned 8.9% of the total variance in the 12 fish market items. Distance to the wholesale output market, was the item that loaded heavily in this factor. It had a positive sign. This perhaps implies that fish farmers can save time and transaction costs by being able to access this type of fish markets in their production areas.

IV.   Conclusion

Markets play an important role in improving the incomes of rural farmers. However, fish markets in Haiduong are generally poorly organised and volatile, and often inaccessible to small-scale farmers and also market information that farmers need to negotiate good prices for their produce are lacking. Even such basic information as current wholesale and retail prices is rarely available. Therefore, building efficient and well-integrated input markets (through which farmers can buy supplies), and output markets (enabling farmers to sell their harvest) is key to encouraging farmers' adoption of sustainable agricultural technologies.

The study has shown that there are patterns that are observable in terms of access to output market infrastructure by fish farmers. The most commonly used output markets by fish farmers are local fresh output, the best retail output as well as the wholesale output markets. The distance to all these markets often determines whether or not fish farmers feel comfortable to sell their fish produces. The best retail output markets also provide an important market for produce by aquaculture farmers. Improving road conditions and transport services in rural areas will not only improve accessibility of external markets, but will also improve accessibility of local output markets.

The implications of this finding is that it is important for policy makers to know that fish farmers do have access to output market though there are some challenges that they are facing. Road condition to the output market is a challenge problem as most of the fish farmers use gravel roads, which tend to deteriorate under bad weather conditions and increase the cost of transportation of produce. The role of output market access will stimulate agricultural and rural development which cannot be overemphasized. Improved road between output markets and rural areas and within rural areas themselves will serve many purposes by giving farmers better

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