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Network and its impact on product quality/performance: The case of pangasius farmer in the Mekong River Delta, Vietnam

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ABSTRACT

The paper is going to find out impacts of pangasius farmer's network linkages on its farming, particularly for product quality. Pangasius is fresh fish and has a significant distribution to the government's budget and rural employment generation. A qualified sample of 200 pangasius farmers is employed. There are three farmer groups considered, including individual farmers, farmers being members of the fishery association, and farmers being members of the company's fish club. Based on statistical methods, the study finds empirical evidence of significant relationships between the farmer's harvested fish and its network linkages. Evidence also confirmed that the farmer produces high quality of pangasius once it uses network linkages with farming technique system. Also, using network linkages of contract farming system and market information, the farmer gets the higher product quality. More interestingly, the farmers belong to the fishery association, and the fish club of the company, they have more advantages to approach network linkages to increase their product quality. Findings as mentioned are positive contributions to policy decision makers to strengthen network linkages of the farmer toward quality improvements of pangasius.

Key words: Pangasius farmer, networks, performance, Vietnam.

1. Introduction

As argued by Borgatti (1987), a network is a group of actors or social entities connected by a set of linkages through which they are going to exchange information or resources or both. According to Provan and Kenis (2007), network is typically institute to coordinate and promote network operation and share many characteristics with other governance devices. In recent years, the network literatures are paid more attention by researchers (Oerlemans & Assouline, 2004). Although the term of networking is not always used, a number of studies have found that owners-managers conduct environmental scanning regularly. According to Borgatti & Foster (2003), the network literature has exploded as researchers have come to appreciate the importance of relational and contextual understandings of social and economic life. Decades of research on rural community viability on agricultural sector highlighted the significant relationship between farm and rural communities (Oerlemans and Assouline, 2004).

For developed countries, network is a real advantage and contributes to the firm performance (Borgatti & Foster, 2003). However, it is skeptic and not concerned much in underdeveloped countries. There are two types of networks, which interorganizational networks offer networks of alliance partners, and channel members, while intraorganizational networks

present connected business units and individual managers within a single business unit (Bond, et al. 2004).

As argued by Hartwich & Scheidegger (2010), farmers in developing countries are in need of innovation, due to contemporaneous challenges, in which in terms of networking linkages are taken into account of. This is one of reasons that impels pangasius farmers interested in developing their networks toward communication, such as with local government organizations for agricultural extension, with fingerling/hatcheries, with financial organizations for rural credit demand, with input material suppliers (feed, aquatic drug, fingerling), with fishery export processing company. A prominent point of which is considered after the trade dispute between the USA and Vietnam in 2002. Accordingly, players doing business in the market, such buyers and sellers of agricultural inputs, farmer association, community group, providers of financial services, leading producers, pay more attention to the networking expansion, and think of that indispensable.

As being a player in the market, the pangasius farmer is much interested in improving the quality of fish product to remain stable output market and able to compete with not only domestic markets but also international markets. As argued by Binh & Ky (2012), more than 90% of pangasius are exported to the world, in which the European Union (EU) is the leading market, the USA as next.

Although Vietnam's economy has been developing, particularly after the USA and Vietnam bilateral trade agreement verified in December 2001, the development of each sector has specific characteristics to involve its networking. Pangasius industry in the Mekong Delta (MD) of Vietnam is a case, its rapid growth stimulates changes in farmers' view to access community organizations, e.g. fishery associations, company's fish clubs. As well-known, pangasius is a kind of freshwater fish with two species, Tra and Basa fish as named catfish, popularly developing in Vietnam. Its fast growth has been a positive contribution to the poverty reduction of people in the MD, to the increasing of the government's budget and has become a strategic product of the country.

As a result, this paper is going to find how effects of communication and cooperation between farmers, government, and other stakeholders contribute to the farmer's performance. As documented by Binh (2009), the farmer has got more chances for recent years to communicate with the network of input material procurement, agricultural extension system as farming technique, contract farming system, market information system, and rural credit. Although findings confirm that social networks are a positive support to farmers (Brodt, et al. 2006), evidence of the farmer's networking linkages impacting on product quality is limited. This is a main reason this paper is taken into account of investigating how relationships between the networking linkages of the farmer and the quality of pangasius harvested. In addition, differences in accessing network linkages of individual farmers, farmers in fishery association, and farmers in company's fish club are tested.

In sum, network linkages are a sharply helpful instrument, but not so popular for rural regions in Vietnam, particularly for farmers. Although Vietnamese government offers various activities as policies to link farmers to partners, as model of four partners linked, such as banks, scientists, government units, enterprises, etc., those actions aren't seemly conceptualized formally by some papers published. As a result, this study will be a contribution to either literature review or the farming system with network ties in Vietnam.

Relevant information to the sector

Pangasius farmers in the study are clustered into three groups, individual fish farmers, club of the company, and fishery association. Firstly, fish club of the company is belong to the export processing company (EPC). Members enrolled in the club is decided by EPC. Benefits of those farmers are supported by EPC for the input and output markets. In sum, the fish club of the company pays more attention to output quality and commitment of members. Which its performance is expected to reach the product traceability, as the EPC wants to have a stable input of raw material (raw fish). Secondly, the fishery association is a representative organization of farmers, and play as the stakeholder. Farmers' participation is based on voluntariness. In sum, the fishery association provides services to its members, such as information on how to produce pangasius, advice for disease treatment, financial services, and market information. Thirdly, pangasius farmers as individuals are independent, are controlled by neither the EPCs nor the fisher association. Normally, these individual farmers are disadvantages of the contract farming (due to small size, traditional farming technique).

2. Theoretical framework

Based on a study on small and medium size enterprise (SME) internalization process in Malaysia, Zizah et al. (2011) debated that networking of SMEs is a linkage with institutions, business associates and personal relations, in which business associate and personal relations are main networks, due to a strong link. The institutes mean the supporting government agencies. Personal relations consist of previous employment contract, colleagues, friends and relatives. Business associates are other owners, managers of both large local firm, foreign companies.

Normally, the farming decision of farmer is influenced by adoption rate in the surrounding area, in which his or her individual decision is screened by the social network available, e.g. relatives, friends, neighbors. It provides positive impacts of networking on profit, growth in an individual farm. More broadly, Chittithaworn (2011) found that the business success of SME is significantly depended on the way of doing business and cooperation, the firm's characteristics, customer and market, resources and finance, and external environment. The firm performance is distributed by the way of doing business and cooperation, meaning an existed network in business, in which cooperation is an evidence. Therefore, as argued by Soh (2003), once a firm pays attention to linkages with other firms in the industry network, its new product performance is improved. The development of new products does depend on linkages of appropriate resources. Therefore, potential information is helpful to develop a new product and improve the product quality.

According to Khoi (2011), input materials, such feed, fingerling and aquatic drug, are main criteria to contribute the quality improvement of pangasius. This is consistent with findings of , the feed cost accounts for the highest proportion of 73.8% of total production cost, next as fingerling and aquatic drug occupying 15.3% (in which fingerling is 11.8%).

Fishery association is a legal organization and eligible, its purposes is to address advanced farming technologies, to gather, and to share international market information within members. These contribute into promoting members of the association to communicate credit organizations, in which bank of policy and rural development, bank of agriculture and rural development, commercial bank, fund organizations are mainly supported sources, as a formal credit organization.

As argued by Sanh & Binh (2011), technology transfer, aquaculture extension, capacity building, market information, credit support and contract farming are results of the linkages between fish farmers and their social network. It means that information diffusion is dynamic once the networking among partners available.

In the paper, the fish quality is an indicator to measure the farmer's success, it can be characterized as the firm's ability to create acceptable outcomes and actions. However, it is a complex and multidimensional phenomenon. The fish quality is a measurement of fish quality harvested. As pointed by Khoi (2011), the criteria applied to measure pangasius quality are color, size, disease and antibiotic residues. Accordingly, an application of the pangasius quality of the farmer's harvest is based on Khoi (2011), which white is qualified as the best quality, pink and yellow are next, respectively. According to Khoi, the EU and the USA prefer white and pink meat to yellow and are willing to pay a high price, while yellow one is lower price and popularly marketed in ASEAN countries.

Moorthy, et al. (2012) also documented that the performance of the firm is affected by the use of marketing information as well as the application of information technology. Based on data on view of community member and farmer of agriculture, found the linking of farmers' efforts on how to sell products and sustainable production more explicitly, and significant engagement between farming oriented farmers and their communities.

With what previous authors found, this study is going to find out extra ideas how the relationship between the farmer's product quality and its networks. Product quality is measured by the fish quality of farmers' harvest. The networking linkages of farmer taken in to account of the paper are agricultural extension system or farming technique, input materials suppliers, contract farming, rural credit system, market information. Econometric models of logit and tobit are employed, which dependent variables is a measure of fish quality, independent variables are derived by the method of exploratory factor analysis. Additionally, the econometric model of multinomial logistic regression is applied, too, its dependent variable is a presentation of three groups: individual farmers, fishery farmer association, farmers of company's fish club.

Hypothesis: Pangasius farmers have used social networks to look for farming advice as techniques, which neighbors, friends, relatives, local agricultural extension staffs, companies in touch with the farmer are a main source. According to Binh (2009), the main channels that the farmer communicates to get aquaculture extension activities directly come from the extension system at the commune level. However, farmers under groups/clubs or cooperative farming organizations have more opportunities to communicate with aquaculture extension from the public and private units (e.g. private export processing companies). As documented by Evenson & Mwabu (2001), the agricultural extension or farming technique are critical to increase productivity, the crop quality. Accordingly, farmers have multiple sources based on their social networks to collect information that they trust and contribute to the increasing of profitability. As a result, the first hypothesis regarding the farming technique network is suggested as below

H1: Using the network linkage to farming technique of the pangasius farmer causes an increase in the farmer's fish quality harvested

Binh (2009) found that an increase in technical efficiency of pangasius farmer is caused by using input materials, in which feed, aquatic drug and fingerling are key indicators.

Consistently, Kohli & Singh (1998) confirmed that inputs play a key role in the rapid adoption of high yielding varieties. Similarly, Conley & Udry (2001) also found that an individual farmer's input material use responds to changes in information, it can increase productivity. With views of authors found, three next hypotheses are considered as follows
As discussed earlier, feed, aquatic drug, fingerling play an important role to produce pangasius, and account for the big share of total production cost, in which the feed is the highest proportion contributing to the total cost, next as fingerling, and aquatic drug. As argued by Skarstad, et al. (2007), quality production of the farmer is often associated with emergence of alternative networks, in which main channels of input material procurement are taken into account. Increasing links to input suppliers that the farmer has more chance not only to get more advice of the farming technique, but also improve its product quality (Chianu, et al., 2008). In addtion, Conley & Udry (2001) also found that an individual farmer's input material use responds to changes in information, in which knowledge of technique is considered. With views as mentioned above, three next hypotheses are taken as follows

H2: using network linkages with aquatic drug suppliers of the pangasius farmer causes an increase in the farmer's fish quality harvested

H3: Using network linkages with feed suppliers of the pangasius farmer causes an increase in the farmer's fish quality harvested

H4: Using network linkages with fingerling producers of the pangasius farmer causes an increase in the farmer's fish quality harvested

Once contract farming is signed it will be a strong commitment of the pangasius farmer to get a good chance, and bringing stable psychology for farmers to expand their production. Usually commitments are based on criteria of fish quality, e.g. color of pangasius meat, size of pangasius, antibiotic residues. As found by Binh (2009), once the farmer is a member of fishery association or company's fish club, it create a good chance to sign contract farming, particularly with EPCs. However, EPCs prefer signing the contract farming with the large scale fish farmers, because of fish quality, procurement amount and transportation cost. As argued by Rindfleisch & Moorman (2003), network relationships or linkages influence a firm's new product outcome, they meets market expectation. As reviewed, the fifth hypothesis of contract farming is depicted as below

H5: Using network linkages with contract farming system of the pangasius farmer makes an increase in the farmer's fish quality harvested

The availability of credit is recognized as a key element in the agricultural production, because credit plays a pivotal role in the modernizations of agriculture (Rao & Priyadarshini, 2013). Therefore, farmers with strong financial capacity, they can have more advantage to apply the advanced farming technique, because the application of industrial farming can occur more costs. In addition, agricultural production is often affected by problems with climate and the incident of epidemic, so the crop quality is maintained if the farmer has enough capital to solve those problems. As a result, the sixth hypothesis is claimed as below

H6: Using network linkages with credit system of the pangasius farmers causes an increase in the farmer's fish quality harvested

Participation and cooperation are the heart of development process, because it causes a good convergence of partners to share and exchange information as knowledge. Farmers' networks can be effective means to gather information, in which market information is a positive contribution to the consumption oriented-farming. Once the product quality of the farmer isn't met the market demand, the farmer can face with threats to be out of business. As argued by Gill (2002), leading to networks of information and knowledge can support and sustain the firm's production. In addition, Ked et al. (2007) documented evidence to conclude a positive relationship between information utilization and firm performance. By senses pointed out, the seventh hypothesis is considered as below.

H7: Using network linkages to pick up market information of the pangasius farmer causes an increase in the farmer's fish quality harvested

3. Sample and data collection

The purpose of this study is to investigate how relationships between network linkages of the farmer and its product quality as firm performance, in which the performance is measured by fish quality criteria. Also differences in the network built among individual farmers, farmers belong fishery association, farmers belong company's fish club, are taken into account. To do this before conducting a survey, the questionnaires is developed, in which some observed variables measured by five point scales are enclosed, then translated to Vietnamese language and checked by a pilot interviewing on some panasius farmers. The broad survey based on the final questionnaire is conducted in three provinces, e.g. An Giang, Can Tho, Dong Thap in the MD, where are the leading share of pangasius cultivation. Respondents interviewed are pangasius farmers, with a sample planned is 230 by directly interviewed. However, due to a sensitive sector that some farmers did not want to communicate and answer, so the initial sample expected isn't met. The final sample after collected and qualified is 200 questionnaires. Of which 50% of the total is individual farmers, farmers are members of the fishery association occupying 35% and farmers belong to the fish club of company accounts for 15%. According to the questionnaire designed, 25 items are enclosed and measured by five point scale with anchors ranging from 1= strongly disagree to 5= strongly agree.

As pointed out previously, the farmer's performance in the study is fish quality harvested, which is based on measure of criteria of the color of pangasius meat. When asked about the fish quality, the farmer will provide information of the total volume of harvest, with the share of white, pink and yellow meat of pangasius (this measure based on buyers' evaluation).

4. Analysis and interpretation

As depicted in table 1, the average age of pangasius farmer is around 43 years old, in which farmers being members of the company's fish club are the youngest of 38, the highest education of 12 years, and the most experience of pangasius farming of 12 years. As a result, we can infer the farmer belong the company is a dynamic group, because of its youngness, experience and education. This is offered as a strength of those farmers to lead and integrate proactive developments, e.g. using and expanding their networking. Advantages of the fish club are derived by the EPC, who only recruit farmers if they are good in education, experience and large scale. The farmers of company's fish club have a large farming scale of 40.725 square meters on average. It induces a demand of hired labor of 11.4 persons per crop on average. While the individual farmer and the fish farmer association only hire between 2-

3 persons per crop. In short, farmers in groups, e.g. fish association and fish club, have more advantages of education and experience years. The farming area is larger, it will be more advantageous for the farmer to apply advanced farming technique models to assure the quality, also get more chances to directly sign contact farming with EPCs.

Table 1: Sample characteristics of pangasius farmers

Variable		Individual farmer (n=100)	Fish association (n=70)	Company's fish club (n=30)	Total (N=200)
Age	Mean	42.51	46.73	38.17	43.34
	Std. Deviation	10.194	9.888	7.125	10.070
Education	Mean	8.54	6.61	12.30	8.43
	Std. Deviation	3.292	2.367	1.208	3.312
Experience year	Mean	7.08	10.13	11.03	8.74
	Std. Deviation	4.950	4.736	2.659	4.884
Home labor	Mean	1.95	1.99	2.40	2.03
	Std. Deviation	1.140	.771	.621	.966
Hired labor	Mean	2.95	2.06	11.43	3.91
	Std. Deviation	2.576	.915	5.354	4.239
Area (m2)	Mean	5484.50	9222.86	40724.90	12078.99
	Std. Deviation	3156.728	4356.444	28514.157	16686.905

Source: Own survey

As pointed previously, the fish quality measurement criteria of the pangasius farmer is based on three kinds of color. Pangasius with white meat and pink meat is targeted by the EPCs. A strict procurement of those companies to high quality standard of white and pink is to meet needs of the EU and the U.S., while yellow pangasius meat is concerned in complaisant markets, e.g. ASEAN. As shown in table 2, the high share of white pangasius is absorbed at farmers belong the company's fish club, while pangasius with pink color is converged in individual farmers and fish farmer association. This is appropriated, because farmers of fish club are a large production scale, high consciousness of conditions, and have good commitments to response with advanced farming technology usages, for example, using limit of aquatic drug with antibiotic residues. In sum, figures described in the table are consistent to actual situation of farmers in the MD. The individual farmers are limited in using technology transforms, because of their education, experience, and scale, so their performance are not as effective as that of farmers in groups. This can be influenced by their networking available. In the coming session, ambiguous ideas can be exposed by econometric models estimated.

Table 2: Share of fish quality by type of farmers

		Individual farmer (n=100)	Fish association (n=70)	Company's fish club (n=30)	Total (N=200)
Pangasius with white meat	Mean	34.50	25.94	83.33	38.83
	Std. Deviation	34.949	27.590	5.622	35.251
Pangasius	Mean	55.65	68.03	16.67	54.13

with pink meat	Std. Deviation	31.612	28.315	5.622	32.564
Pangasius meat yellow	Mean	9.85	6.03	.00	7.04
	Std. Deviation	15.819	10.529	.000	13.218

Source: Own survey

In order to evaluate channels of network linkages, pangasius farmers are asked to rate 25 items based on a five-point scale, with 1 being "strongly disagree" and 5 being "strongly agree". These 25 items developed as part of the questionnaire are based on informal meetings with local experts during doing the pilot research as informed previously, also based on researches formally published.

Based on an application of exploratory factor analysis, seven factors are extracted. Their mean scores of items are presented in table 3. Most of items evaluated by the pangasius farmers are network linkages favor to their production and consumption, because scores of rating some items are 4 and up,

Table 3: Mean score for network linkages of pangasius farmers

Factor and its items	Mean	Loading values
Factor 1: Farming technique network; Cronbach's Alpha = 0.88		
Disease fish treatment based on network linkage	4.6	.867
Network linkage with extension organizations to apply advanced farming model	4.5	.855
Communicating with social network to learn how to anticipate fish disease	4.4	.841
Looking for advices from network linkage to improve productivity	4.4	.805
Participating training programs related to farming technique implemented by partners or extension programs	4.1	.592
Factor 2: Network linkages with aquatic drug suppliers ; Cronbach's Alpha = 0.82		
Built network with aquatic drug suppliers based on their experience	3.9	.811
Network linkage with aquatic drug suppliers based on their commitment	4.4	.743
Build network with aquatic drug suppliers based on truth each other	4.2	.740
Both sides of network linkage usually meet the same point	4.3	.678
I pay attention to business negotiation based on Win-Win to maintain the network	4.3	.619
I trust aquatic drug suppliers who are in my networking	4.4	.606
Built network with aquatic drug suppliers who are prestigious and consider quality	4.3	.560
Factor 3: Network linkage with feed suppliers; Cronbach's Alpha = 0.73		
Network linkage with feed suppliers give me assurance	4.1	.769
I trust feed suppliers who is in my network	4.0	.761
Factor 4: Network linkage with fingerling producers; Cronbach's Alpha = 0.75		
I consider network linkage with fingerling suppliers/hatchery station, because of quality standard	3.1	.799

Using network linkages with fingerling producers, due to traceability in future	3.8	.769
Built network linkage with fingerling/hatchery suppliers based on their commitment and business morality	3.9	.577
Factor 5: Contract farming network; Cronbach's Alpha = 0.80		
Networks with the company offer contract signed with reasonable price	3.7	.871
Networks with the company make the quick payment by the company	4.2	.857
Financial supports by the company is based on the available network linkages	4.5	.621
Factor 6: Network linkage with credit system; Cronbach's Alpha = 0.71		
Based on network linkages I can communicate credit/finance for demand of feed procurement	3.8	.849
Network linkages are advantages to increase credit amount for farming	3.3	.683
Factor 7: Network linkage with market information; Cronbach's Alpha = 0.71		
Using network linkages I collect market information serve my production and consumption.	4.0	.889
Based on network linkage I can know market situation and market price	3.8	.718
Market information collected through my networks facilitates me improve production and consumption	3.9	.589

Note: Calculation of mean score based on five-point scale, 1 = strongly disagreed, 5 = strongly agreed.

To continue in empirical analysis, two models of binary logistic and Tobit are used. These two models have the same independent variables of seven factors extracted, as mentioned in table 3 & 4. Those seven factors are estimated from the method of exploratory factor analysis. With qualification of the method, Cronbach's Alpha is used to test reliability, all seven factors as mentioned are sufficient, because their Cronbach's Alpha is over 0.7.

Dependent variables of binary logistic and Tobit models are based on the measure of fish quality. To binary logistic model, two values are defined, 1 being high percent of white and pink as high quality, 0 being low percent of yellow, as low quality. To Tobit model, the percent of white color of fish is upper limit of 60 percent of total volume harvested.

As resulted in table 4 by two models, coefficients of factor 1 of two models are significant at 10%. This means that an increase in the network linkages of the farmer to the farming technique channel causes a rise in the fish quality. Consequently, the first hypothesis is strongly supported, there is enough evidence to confirm that "using network linkages to farming technique of the pangasius farmer causes an increase in the farmer's fish quality harvested".

Because the coefficient of factor 2 is significant at 1% level of binary logistic model, and at 5% level of Tobit model, the second hypothesis is also supported. This means that there is evidence to confirm that "using network linkages with aquatic drug suppliers of the pangasius farmer causes an increase in the farmer's fish quality harvested".

Similarly, the coefficient of factor 3 is significant at any level for two models. This means that the third hypothesis is supported, an increase in the network linkage to feed suppliers of

farmers makes a rise in the fish quality. Consequently, there is obvious evidence to confirm the that "using network linkages with feed suppliers of the pangasius farmer causes an increase in the farmer's fish quality harvested"

Because the coefficient of factor 4 is significant at any level of two models, there is a positive relationship between network linkages of the farmer to feed suppliers and the fish quality harvested. As a result, the fourth hypothesis is supported, conclusion is "using network linkages to fingerling suppliers of the pangasius farmer causes an increase in the farmer's fish quality harvested"

Table 4: Result estimated of Binary Logistics and Tobit.

Independent variables	Binary Logistic		Tobit model	
	Coefficient	Sig.	Coefficient	Sig.
Constant	-0.80	0.000	35.74	0.000
Factor 1: farming technique network	0.37	0.054	5.42	0.055
Factor 2: Network with aquatic drug suppliers	0.55	0.003	4.61	0.071
Factor 3: Network with feed suppliers	0.50	0.007	6.62	0.009
Factor 4: Network with fingerling producers	0.66	0.002	9.45	0.001
Factor 5: Contract farming network	0.60	0.041	11.90	0.009
Factor 6:Network linkages with credit system	0.19	0.278	3.30	0.200
Factor 7:Network linkages with market information system	0.55	0.000	7.80	0.002
R-Square	Cox & Snell R Square = 0.251		Pseudo R^2 = 0.351	

The coefficient of factor 5 is significant at 5% level for binary logistic model, but 1% level for Tobit model. As a result, the fifth hypothesis is significantly existed. This means that there is enough evidence to confirm "using network linkages to the contract farming of the pangasius farmer makes an increase in the farmer's fish quality harvested".

Unlikely, the coefficient of factor 7 is not significant at any level for both models. As a result, we don't have enough evidence to support the sixth hypothesis. It means that "using network linkages to credit system of the pangasius farmers causes an increase in the farmer's fish quality harvested" is not supported.

Because the coefficient of factor 7 is significant at any level for both models, the seventh hypothesis is not rejected. This means than an increase in network linkages to market information system causes a rise in the fish quality of the farmer. Consequently, there is an evidence to confirm "using network linkages to pick up market information causes an increase in the farmer's fish quality harvested".

To find differences in network linkages among individual farmers, fish farmer association, and company's fish club, the econometric model of multinomial logistics is considered. As resulted in table 5, the dependent variable is measured by three groups, e.g. individual farmer, farmers of fish association, farmers of company's fish club. As pointed out previously, the

group of individual accounts for 50% of total sample. The group of fish farmer association and the group of company's fish farmer club are 35% and 15% of the total samples, respectively. As shown in table 5, the value of Sig. = 0.000 less than 1%, which confirms at least one of the regression coefficients in the model is not equal to zero. Three Pseudo R-Square values are not equal to each other. Consequently, there are a wide variety of Pseudo R-squared statistics which can give contradictory conclusions.

According to the first panel of table 5, it presents the multinomial logit estimate for the group of individual farmer relative to the group of farmers in company's fish club. Accordingly, the coefficients of factor 4, factor 5, and factor 6, are significant at any level, and negative. Those factors are expected to impact on farmers of company's fish club rather than the individual farmers. As a result, there is a significant difference in using network linkages with fingerling producers (factor 4) between the individual farmer and the farmer fish club of the company. With the company's fish farmer club is addressed to use more those network linkages. Similarly, network linkages of contract farming system (F5) and network linkages with rural credit system (F6), both significantly impacting on the individual farmer and the fish farmer club of company. The company's fish farmer club pays more attention to using those two network linkages.

Table 5: Parameter estimates of multinomial logistics

Type of farming[a]		B	Std. Error	Wald	df	Sig.	Exp(B)	95% Confidence Interval for Exp(B)	
								Lower Bound	Upper Bound
Individual Famer	Intercept	2.496	.475	27.654	1	.000			
	Factor 1	.347	.354	.962	1	.327	1.415	.707	2.829
	Factor 2	-.402	.340	1.400	1	.237	.669	.344	1.302
	Factor 3	-.613	.398	2.373	1	.123	.542	.248	1.182
	Factor 4	-1.296	.421	9.482	1	.002	.274	.120	.624
	Factor 5	-1.362	.525	6.728	1	.009	.256	.091	.717
	Factor 6	-1.094	.326	11.275	1	.001	.335	.177	.634
	Factor 7	-.330	.304	1.174	1	.279	.719	.396	1.305
Fish Famer Association	Intercept	1.895	.490	14.926	1	.000			
	Factor 1	.448	.365	1.505	1	.220	1.565	.765	3.199
	Factor 2	.371	.341	1.183	1	.277	1.449	.742	2.829
	Factor 3	-1.362	.404	11.356	1	.001	.256	.116	.566
	Factor 4	-1.304	.430	9.216	1	.002	.271	.117	.630
	Factor 5	-.536	.535	1.006	1	.316	.585	.205	1.668
	Factor 6	-.615	.327	3.549	1	.060	.540	.285	1.025
	Factor 7	-1.076	.296	13.178	1	.000	.341	.191	.610
a. The reference category is: farmers of Company's fish club.									

Likely in the first panel of table 5, the second panel presents the multinomial logit estimate, but this result is a presentation of the group of fish farmer association relative to the group of farmers in company's fish club. Accordingly, the coefficients of factor 3, factor 4 and factor 7 are significant at any level, while the coefficient of factor 6 is significant at 10%. Note that those coefficients are negative. As a result, there is a significant difference in using network linkages between the fish farmer association and the fish farmer club of company, which network linkage with feed suppliers (factor 3), network with contract farming system (factor 4), network with credit system (factor 6), and network with market information system (factor 7) of the fish farmer club of company are addressed more using those network linkages.

5. Discussion and conclusion

Positive changes in pangasius farmers' characteristics to market integration for recent years are doubtless. Growers do participate in local marketing strategies and are eager to learn new skills, and technology transfer by applying advanced farming models. This is consistent with what Brodt, et al. (2006) found through a qualitative study.

With a sufficient sample of 200 pangasius famers, descriptive analysis results that most of pangasius farmers in the MD have a long experiences, in which farmers belong the fish club of company is absorbed more. The fish farmer association and the fish farmer club of company have more advantages of education and experience than the individual farmer. This is one of reasons that cause a dynamic action for either the famers being a member of fish association and/or the farmers being a member of the fish club of company. Additionally, the farmer being a member of association or/and fish club has a larger farming scale, this can induce contract farming signed, which EPCs lead to the case.

Based on statistical methods, we find enough evidence to confirm that there is a significant relationship between the farmer's quality fish harvested and its network linkages with input materials (e.g. drug, feed, and fingerling). Generally speaking, significant impacts of network linkages of the farmer to input materials on the farmer's agricultural practices are confirmed, which is consistent with Conley & Udry (2001) and Kohli & Singh (1998). Moreover, evidence found in this study, the farmer can produce pangasius with high quality once it uses network linkages with farming technique system. Like Moorthy, et al. (2012), this paper also find that using network linkages of contract farming system and market information influence the farmer performance. However, farmers are member of groups, e.g. the fish association, the fish club of the company have more advantages to use network linkages to increase their quality product. In sum, pangasius farmers in the MD consider changes in market, stimulated to look for helps from communities, e.g. fishery association, companies, because they want farming effectiveness.

With what found in the paper, it is a confirmation of networking contribution to the farmer's performance not rejected, particularly for the farmer's harvest quality. Findings as mentioned are useful information and significant contribution to policy makers to think strategies strengthen networking linkages of farmers. To apply this, a formal framework to build up network linkages in farming system are take care of and must be paid attention more.

5.1 Managerial Implication

The results found in the paper are not skeptic for contributions of network linkages that pangasius farmers are tracking. Therefore, supportive policies of how to build up the farmer's networks to outside stakeholders are indispensable. To do this, policies should not limit themselves to individual farm support. Additionally, findings also place a high demand of network linkages of the farmers, so important roles of network linkages with agricultural extension, with aquatic drug suppliers, with fingerling producers, with the company for contract farming, with market information organizations will be significant contributions to sustainable pangasius production. Therefore, extension agency should pay more attention to often linking with farmers, who are individuals, and farmers in groups. Shortly, the local authority should concern to link stakeholders with the farmers by various ways, because an increase in network linkages of the farmer causes a raise in its harvest quality.

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