Research Paper

Factors Affecting the Linkage Risk of Rice Contract Farming: The Case of Large Field Models in Hau Giang Province

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ABSTRACT

The study aims to identify factors affecting the linkage risk of rice production and consumption contracts in Hau Giang Province (the case of large field models). Study data were collected from 125 farmers participating in rice-farming contracts. By applying the binary logistic regression, the study has pointed out factors affecting the link age risk of rice contract farming of farmers participating in large field models. They are Production experience, Land area, Quality verification, Technical support, and Rice spread. In which, "Rice spread" most strongly influences the risk of rice-farming contracts towards large field models in Hau Giang Province

Keywords: Linkage risk, large field model, farmer, enterprise.

1. PROBLEM STATEMENT

Contract farming helps farmers overcome production risks due to financial, technical, or output market restrictions (Barrett et al., 2012). In Vietnam, the government is concerned aboutthe consumption of farmers' agricultural products through production and consumption contracts. The application of linkage contracts in producing and consuming agricultural products under Decision 80/2002/QD-TTg is still limited (M4P, 2007). Many implementation models have been failed (Roberts and Khiem, 2005). Agricultural consumption contracts show the low legality and the lack of clarity between sellers and buyers. The state does not have specific sanctions, so it is hard to handle if contract breaches occur. Therefore, over the past time, some enterprises and farmers break contracts when there exist fluctuations in prices and consumption markets. The large field model has promoted the linkage among farmers, has formedthe link between farmer groups and enterprises, moreover between enterprises and enterprises. This helpspromote the application of scientific and technical advances in rice production and rice consumption. According to the Department of Agriculture and Rural Development of Hau Giang Province (2019), the number of households participating in large-field models of Hau Giang Province in the Winter-spring crop of 2018-2019 was 3,377 with a total area of 3,538 hectares. However, the rice production and rice consumption contracts for large field models face many obstacles such as (i) The link between enterprises and farmers in rice consumption contracts still has problems; (ii) Due to difficulties in transportation in some areas, enterprises do not come to buy products; (iii) Some enterprises sell rice varieties at high prices without quality guarantee which harms their trust with farmers. From the above issues, the study "Factors affecting the linkage risk of rice contract farming: the case of large field models in Hau Giang Province" is necessary.

2. THEORETICAL FRAMEWORK AND RESEARCH HYPOTHESES

2.1 Risk definition

According to Knight (1921), "Risk is measurable uncertainty".Willet (1951) confirmed that "Risk is uncertainty related to the probability of unwanted events". Pfeffer (1956) defined risk as "a combination of hazards and is measured by probability ". Van et al. (2013) concluded that "Risk is a measurable uncertainty.

If risk management is conducted well, it will bring opportunities, on the contrary, enterprises will have to accept losses." Thus, risk is a common concept, almost anyone understands this definition. However, there is no unified view of risk. Different schools and different authors give variousexplanations of risk. Although the above perspectives are more or less different, they all mention two issues, (i) Uncertainty and (ii) A possibility: an unexpected event or loss.

2.2 Research model

Through the process of documenting, many factors are affecting the linkage risk of agricultural production and consumption. Within the scope of research, the study proposes factors that go in line with the actual situation of the research area.

2.2.1 Relationship between the price spread and the linkage risk

The price of rice purchased by an enterprise is usually the fixed price under the contract after considering factors of production costs and support activities from the enterprise (fertilizers, drugs, techniques, etc.). If farmers are satisfied with the price, they will sign on the contract to cooperate with buyers (Barry et al., 2008). However, the price in the contract which is determined by the price in the free market causes some disadvantages for farmers (Nhan and Hoang, 2013). Rice is a seasonal product, so if its price increases, farmers "do not need" enterprises, while if its price drops, enterprises "turn their back" upon farmers (Khiem, 2005). Research by Thanh and Nghi (2019) has shown that the price spread between the market and the contract is positively correlated with the linkage risk. Therefore, hypothesis H1 was proposed as follows: *H1: The price spread is positively correlated with the linkage risk.*

2.2.2 Relationship between input support services and the linkage risk

Support services reflect the buyer's help for the farmer to produce better products (Ulaga and Eggert, 2006). On the other hand, the enterprise's input support for farmers is an important content of the contract, whereby the enterprise provides materials for farmers' production needs. Then, the enterprise will deduct debts by buying back rice from farmers (Hau, 2012). However, enterprises may take advantage of their monopoly position to make the price pinch. Farmers then will be at risk of debt because risks in rice farming are very common (Eaton and Shepherd, 2001). In contrast, farmers can take advantage of the enterprises' support for other purposes, which affects productivity and product quality (Eaton and Shepherd, 2001). In a contract, the more an enterprise supports farmers, the lower the linkage risk in producing and consuming rice (Thanh and Nghi, 2019). Hence, the proposed hypothesis H2 is as follows: *H2: The input support is negatively correlated with the linkage risk.*

2.2.3 Relationship between quality verification, terms of payment, and the linkage risk

According to Zhang and Hu (2011), purchase verification and terms of payment are quite important to the relationship quality between farmers and enterprises. Phuong et al. (2015) argued that if the purchase verification process is done well, itimproves the relationship quality between farmers and buyers. Research by Loc and Nghi (2018) has shown a negative correlation between quality verification, terms of payment, and the linkage risk in rice farming between enterprises and farmers. Currently, farmers still spontaneously produce rice, lacking an ideal orientation and long-term vision. As a

result, productivity and product quality are unstable, affecting the relationship quality with contract parties. From the above discussion, hypotheses H3 and H4 weresuggested.*H3: Quality verification is negatively correlated with the linkage risk; H4: Terms of payment negatively influences the linkage risk.*

2.2.4 Relationship between the technical support and the linkage risk

Support services reflect the distributor's help with the farmer to produce high-quality products (Ulaga and Eggert, 2006). Specifically, support services are shown by introducing or providing seeds and fertilizers, as well as technical guidance on planting and caring for farmers (Phuong et al., 2015). However, when farmers start to apply new technologies transferred from enterprises, they may face risks. Farmers are accustomed to traditional methods and sometimes they find it hard to apply new techniques (Rehber, 2000). According to Thanh and Nghi (2019), the more technical assistance enterprises provide to farmers, the lower the linkage risk in rice production and rice consumption. Thus, hypothesis H5 was proposed. *H5: The technical support is inversely correlated with the linkage risk.*

2.2.5 Relationship between production experience and the linkage risk

When farmers do not have access or insufficient access to new production techniques, they tend to follow traditional habits and paths. This harms the productivity and product quality required in the contract, thereby leading to the termination of the contract from the enterprise (Rehber, 2000; Minot, 1986). Research by Thanh and Nghi (2019) indicated that, when participating in a linkage contract, if the farmer is experienced in rice farming and has a long-term relationship with the enterprise, the linkage risk in producing and consuming rice will be hard to occur. Therefore, hypothesis H6 was set out.*H6: Production experience negatively impacts the linkage risk.*

2.2.6 Relationship between the production area and the linkage risk

Most farmers have a fragmented and dispersed agricultural land area, so it costs more for enterprises in transactions, management, and product collection. This reduces enterprises' motivation to cooperate (Nhan and Takeuchi, 2012). On the other hand, small-scale households find it difficult to obtain payment procedures; as a result, they do not comply with the terms of the contract (M4P, 2007). Research by Khiem (2005) showed that the majority of rice exporters do not pay attention to off take agreements, because they are still exporting rice under short-term contracts with ordinary rice types. Hence, the following hypothesis was proposed.*H7: The area of production land is inversely correlated with the linkage risk*

Based on the research hypotheses, the research model of factors affecting the linkage risk of rice contract farming for large field models in Hau Giang Province is as follows:
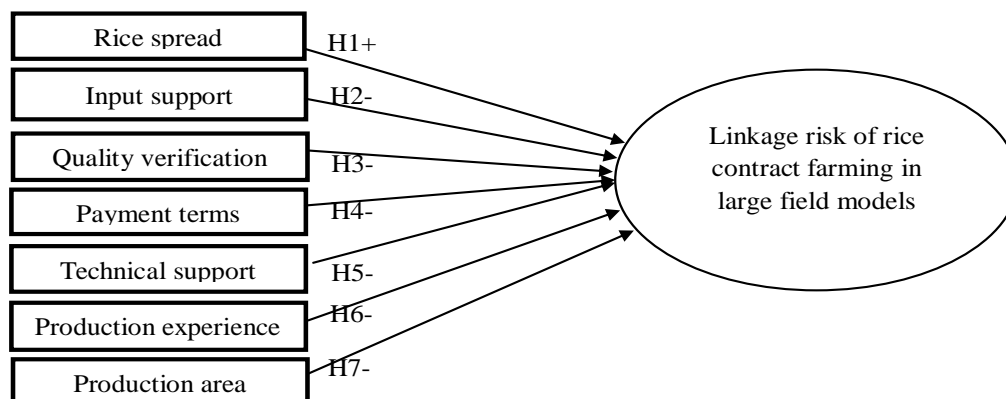

Figure 1: The proposed research model, 2020

- Dependent variable: In this study, the dependent variable linkage riskin rice production and consumption for large field models is measured by a nominal scale (receiving value 1 if there is a risk or 0 if there is no risk). Therefore, binary logistic regression is appropriate (Judge et al., 1985).

- Independent variables: Based on the literature review and research hypotheses, the study proposes 7 independent variables that affect the linkage risk of rice contract farmingfor large field models in Hau Giang Province. Each observation has different characteristics which are explained in Table 1 below.

Table 1: Interpretation of observed variables in the research model

Observed variable	Sign	Description	Scale	Expectation	Reference resources
Linkage risk	LR	Linkage risk of rice contract farming in large field models	Nominal (1/0)		Vesel and Zabkar (2010), Rauyruen and Miller (2007), Nhan and Hoang (2013)
Price spread	PS	The price spread between market and contract	Ratio (%)	+	Nhan and Hoang (2013), Thanh and Nghi (2019)
Input support	IS	The number of seeds, fertilizers, and pesticides that the enterprise advances to the farmer under the contract	Quantitative (VND)	-	Eaton and Shepherd, (2001), Ulaga and Eggert (2006), Thanh and Nghi (2019)
Quality verification	QV	Always check product standards before purchasing	Nominal (1/0)	-	Zhang and Hu (2011), Phuong et al. (2015), Locand Nghi (2018)
Payment terms	PT	Always make payment under payment terms in the contract	Nominal (1/0)	-	Zhang and Hu (2011), Locand Nghi (2018)
Technical support	TS	The enterprise's technical support for the farmer participating in the contract	Nominal (1/0)	-	Ulaga and Eggert (2006), Phuong et al. (2015), Thanhand Nghi (2019)
Production experience	PE	Years of production experience of the farmer	Quantitative (Year)	-	Minot (1986), Rehber (2000), Thanhand Nghi (2019)
Production area	PA	The farmer's total area of rice production land at the time of the study	Quantitative ($1000m^2$)	-	Khiem (2005), Nhan and Takeuchi (2012)

Source: Author's proposal, 2020

3. RESEARCH METHODOLOGY
3.1 Data analytical method

In previous studies, the linkage riskinrice production and rice consumption was measured by a dummy variable (receiving value 1 if there is a risk or value 0 if there is no risk). In this case, the binary logistic regression (Logit or Probit) is appropriate(Chianu et al., 2007; Nkegbe et al., 2011). Based on the research model, it shows that the binary logistic regression is suitable to test research hypotheses.

3.2 Data collection method

The study applied quota sampling to analyze the data. The criteria used to classify the survey subjects are" group of farmers with linkage risk" and "group of farmers without linkage risk". According to Tabachnick and Fidell (2007), the minimum sample size in regression analysis is calculated by the formula50 + 8m (m: the number of independent variables). The research model was set up with 7 independent variables which means the minimum sample size is 106 observations. The study surveyed 125 farmers in 4 districts/ towns with the largest field areas in Hau Giang Province, including Chau Thanh A, Long My, Vi Thuy, and Phung Hiep.

4. RESEARCH RESULTS AND DISCUSSIONS
4.1 Descriptive statistics of measurement variables in the research model

Based on the statistical result in Table 2, it shows that the percentage of enterprises making payment on time is 74%.There are 72% of enterprises providing technical support to farmers and 58% of them always carry out the product inspection before purchasing. The amount of money that enterprises support for farmers when signing the contract is very small, the highest is 460,000

VND/1000m2.In some cases, farmers have no support. The research resultalso shows that each farmer has an average area of production land of 2.1 hectares, with an average number of years of experience is 23. The difference between the market price and the contractual price is quite large.The lowest is a decrease of 46% and the highest is an increase of 2% compared to the contractual price.

Table 2: Descriptive statistics of variables in the research model

Variable	Min	Max	Mean	Standard deviation
Payment terms (1: Yes, 0: No)	0	1	0.74	0.44
Technical support (1: Yes, 0: No)	0	1	0.72	0.45
Quality verification (1: Yes, 0: No)	0	1	0.58	0.49
Input support (VND/1000m^2)	0	460,000	182,320	104,063.69
Production area (1000m^2)	8	65	21.30	10.75
Production experience (year)	3	40	23.32	7.403
Price spread (%)	-0.46	0.02	-0.13	0.12
Linkage risk (1: Yes, 0: No)	0	1	0.64	0.48

Source: Survey dataof 125 farmers, 2020

4.2 Factors affecting the linkage risk of rice contract farming

This study uses the binary logistic regression to estimate the factors affecting the linkage risk of rice contract farming for large field models in Hau Giang Province. The research hypotheses testing result is displayed in Table 3.

Table 3: Factors affecting the linkage risk of rice contract farming

Variable	B	S.E.	Wald	dy/dx	Sig.	Exp (B)
Constant	5.254	1.391	14.269	1.314	0.000	191.339
X1. Price spread	3.828	2.095	3.339	0.957	0.068[*]	45.981
X2. Input support	0.000	0.000	0.209	0.000	0.648[ns]	1.000
X3. Quality verification	-0.816	0.476	2.937	-0.214	0.087[*]	0.442
X4. Payment terms	0.355	0.527	0.454	0.089	0.501[ns]	1.426
X5. Technical support	-1.173	0.559	4.408	-0.293	0.036[**]	0.309
X6. Production experience	-0.085	0.035	5.968	-0.021	0.015[**]	0.919
X7. Production area	-0.035	0.021	2.992	-0.009	0.084[*]	0.965
Sig.					0.002	
Predicted value					72.0%	

Source: Survey data of 125 farmers, 2020

According to Agresti (2007), Ho et al. (2018), when using the binary logistic regression, it is necessary to consider the following 3 test values:
1) The appropriateness of the model: The significance level of the model is Sig = 0.002 <0.05. This shows that the research model is statistically significant which means there is at least 1 factor affecting the linkage risk of rice production and consumption contracts. Therefore, the proposed research model is consistent with the actual data.
2) Model explanation: The predicted value is 72.8% which confirms that the percentage correct of the research model is 72.8%.It is an appropriate level of prediction (Trong and Ngoc, 2008).
3) Test the significance of the regression coefficients: Based on Table 3, it shows that variable X2 (Input support) and variable X4 (Payment terms) have a significance level of Sig. $\geq$ 0.1. Thus, these 2 variables are not statistically significant, meaning that they do not affect the linkage risk of rice contract farming. The remaining variables have a value of Sig. <10%, that is, they correlate with the dependent variable.

The impact levels of factors on the linkage risk of rice contract farming are ranked from high to low as Price spread; Technical support; Quality verification; Production experience; and Production area. The degree of impact of each element is explained specifically below.

Price spread: This factor is statistically significant at 5% and consistent with the initial research hypothesis (the price spread positively correlates with the linkage risk).

This proves that the larger the spread between contractual price and market price at the time of harvest, the higher the linkage risk. Since rice is a seasonal product, its price is influenced by market fluctuations at harvest time. The price agreement between farmers and enterprises is relative if the clarity of the linkage contract is low. Therefore, the higher the difference between the price under the contract and the market price, the more the linkage risk may occur. This result is similar to researches by Nhan and Hoang (2013), Hau (2012), Thanh and Nghi (2019).

Technical support: The technical support factor is negatively correlated with the linkage risk and is statistically significant at 5%. This claimed that if farmers receive more technical support from enterprises, the linkage risk of rice production and consumption contracts decreases. Thus, the technical support not only promotes the transfer of technological advances into agricultural production but also contributes to maintaining trust and commitment in contract implementation. The finding is similar to those of Rehber (2000), Ulaga and Eggert (2006), Phuong et al. (2015).

Quality verification: This factor is statistically significant at 5% and harms the linkage risk of rice contract farming in large field models. If the enterprise carries out the inspection follows product quality standards and agreements in the contract, the linkage risk may hard to occur. The result is consistent with studies of Zhang and Hu (2011), Phuong et al. (2015), Loc and Nghi (2018).

Production experience: The production experience factor is inversely correlated with the linkage risk and is statistically significant at 5%. From that point of view, the possibility of a linkage risk in rice production and consumption is low for farmers with extensive production experience. If farmers are experienced in cultivating rice, they will be proactive in controlling their fields with fewer risks, ensuring product quality. Therefore, it is easier to meet the standards in the rice-farming linkage contract. The result is similar to those of Roberts and Khiem (2005), Anh et al. (2011), Thanh and Nghi (2019).

Production area: The factor is statistically significant at 10% and has a negative influence on the linkage risk. This says that if farmers own a large cultivated area of rice, the likelihood of linkage risk will be lower. Farmers with a large production area receive more attention and support from enterprises, the relationship quality between enterprises and farmers will be closer. Since then, the level of trust among them improves the possibility of the linkage risk decreases. This study result agrees with researches by Nhan and Takeuchi (2012), Khiem (2005).

5. CONCLUSION

Overall, the studyhas identified factors affecting the linkage risk of rice contract farmingfor large field models in Hau Giang Province. The level of impact in the order from high to low arePrice spread, Technical support, Quality verification, Production experience, and Production area. The research results are an important scientific basis for the agricultural sector of Hau Giang Province to refer and develop an action plan to limit the linkage risk in rice production and rice consumption, as well as promote large field models in thearea.

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