Available online at JDR Website: http://journal.unublitar.ac.id/jdr

Journal Of Development Research, 5 (2), November 2021, Pages 200-207

DOI: https://doi.org/10.28926/jdr.v5i2.136

Risks in Agriculture, farmers' responses and support solutions in Nghe An

Van Hoang Thi Thuy

Vinh University, Vietnam

E-mail: vanhtt@vinhuni.edu.vn

Received: 17 April 2021; Revised: 18 June 2021; Accepted: 20 June 2021

Abstract

This study focuses on analyzing the risks that affect in agricultural production and response of farmers. Research data was collected in Nghe An, Vietnam with 200 samples, audited by Binary Logistic Model. The research results show that the main risks affecting agriculture in Nghe An are mainly weather risks, pest risks and economic risks. And to cope with those risks, farmers have chosen a number of response measures, based on the support of the government, that have yielded clear results. The study provides empirical evidence on the current situation of risk identification and how to choose to respond to risks in agriculture, offering solutions to help improve the agricultural risk management framework in Nghe An, Vietnam.

Keywords: Risk in Agriculture ; Farmers' Responses; Support Solution

Introduction

Agriculture is an risky industry, not only in the production process, but also in the processing and consumption process (Bryant et al. 2000; Deressa et al. 2011), especially agriculture in developing and underdeveloped countries due to outdated technological level, poor investment capacity, low level of farmers and businesses' awareness. Shocks from weather changes, global climate change, pests, diseases and adverse movements in agricultural production and input prices not only affect farmers (Gbetibouo, 2009; Grothmann and Reusswig, 2006; Maddux and Rogers, 1983; Rogers, 1975) but also pose challenges to local government (Nguyen Tuan Kiet and Nguyen Tan Phat, 2019). Many studies have been conducted to private evaluate factors affects to households under climate changes (Dang et al, 2014). People's income mainly comes from crops, livestock and aquaculture (77.3%) and other off-farm activities (21.2%) (Dang et al, 2014). And when the risk occurs, their sustainability in income would be affected. The outstanding sample is the stagnated export such as Vietnamese lychee, dragon fruit, oranges, and onion during Covid-19 period posed income challenge to farmers and ask the government the solutions to cope with. These solutions have to put in a range, build up a framework to help farmers and agri-businesses dynamic and quick response to the risks. To solve this problem in Central Vietnam, the article uses experimental survey results in Nghe An, proposes solutions to help people be proactive and active in choosing risk response solutions, and function of the main policy for the main permissions and and main cover in built, perfecting the policy framework to respond to risks in agriculture.

Materials and Method

Vietnam is a sea country, with a coastline of more than 3,200 km. In recent years, Vietnam is a country heavily affected by extreme weather events and climate change such as droughts, floods, saline intrusion, sea level rise... Consequently, productivity and quality of agricultural products is severely affected, leading to the affected farmers' livelihoods, the local socio-economic development plans are threatened (Le

Quang Tri, 2016).

There have been many studies done to point out the impact of climate change on agricultural production in Vietnam as well as some other Southeast Asian countries, showing that people in these areas are still dependent on nature; 98% farmers are damaged while the risks occurred. So most of them are afraid of risks and 41% farmers are passive in coping with risks (Nguyễn Tuấn Kiệt and Nguyễn Tấn Phát, 2019). Especially, studies have shown that farmers' attitudes and decisions to choose risk response options are affected by demographic factors such as education level, age of household head, number of people in each households... (Nguyen Tuan Kiet, Nguyen Tan Phat, 2019).

Nghe An is a poor province, but the potential for agricultural development is quite large. Nghe An is located in the North Central region of Vietnam, with topography including coastal, plains and hills. Currently the total area of agricultural cultivation is 298,642 ha, equivalent to 18.12% of the whole province's land area (Nghe An Statistic office, 2020), with great potential of land, mainly basalt red soil, high biodiversity, suitable for large-scale agricultural development. However, in recent years, Nghe An agricultural production has faced many risks due to fluctuating weather conditions such as floods, droughts, disease outbreaks, soil degradation, and deep saltwater intrusion, rapid urbanization… significantly reduces the cultivated area. With the main crops of rice, cassava, tea, peanuts, vegetables, fruits and other fruit trees..., but mostly served for domestic demand, the export is done through quota, directly affected by the fluctuation of supply and demand in the global agricultural market, posing a challenge for the provincial government to transform the agricultural structure towards commodity, high technology application orientation. This study focuses on analyzing the situation of responding to risks in agriculture and how farmers are responding as well as the actions of authorities in assisting farmers to cope with risks. From that point out the factors affecting how the farmers to choose the solution to cope with the risks, contributing to provide scientific evidence to propose necessary policies to support farmers to cope with risks and improve production efficiency.

Some previous studies have shown that demographic and socio-economic factors, perceptions of climate change impacts, existing sources of information and assets affect the choice of farmers in response to the risks (Jianjun et al., 2014). Research by Jianjun et al. point out that women tend to be more risk-averse than men. The attitude of fear and risk avoidance is also studied in the study of Le Thi Phuong Mai et al. (2015) and Liu (2013), influence to the attitudes toward choosing solutions to respond to risks, concerns about adopting new varieties, or abusing plant protection drugs.

In many countries around the world, surveys showed that many farmers were reported as their awareness of changing weather characteristics (Ozor et al, 2012), for example perceptions of instability at the time of capture at the beginning of the season, extreme weather phenomena such as floods, droughts, pests, diseases, weeds, and land degradation are increasing. In this study, the author uses the Regression Model with the following form of equations:

In equation (1), the independent variables in the Binary Logistic regression model include:

⇒ Education level (calculated by the number of years of schooling)

$$Y_i = \alpha + \beta_i \sum_{i=1}^{n} X_i + \varepsilon_i \ (1)$$

⇒ Average income per household (calculated by 1,000 VND / year)

⇒ Level of cultivation (calculated by the number of years involved in agricultural production)

⇒ Irrigation (takes value of 1 if the answer is that the irrigation system do affect to productivity; 0 if the other answer)

⇒ Extension (receive value 1 if participating in regular extension activities, 0 otherwise)

⇒ Agricultural planning (takes value 1 if the production is processed according to the local planning, 0 if the other)

⇒ Area of production land (calculated by 1,000 m2)

In which, the variable Y_i is a binary dependent variable with 2 values (Y = 1 means there is a risk response; and Y = 0 is the other case). Y gets value 1 when the farmer has chosen one of the risk response strategies listed in Table 1.

The variable Xi is the independent variable. α is the intercept, βi is the regression coefficient, Ɛi is the error.

Table 1: Farmers' response strategy to cope with risks

Response strategy	The values of the variable
New variety	1 = replacing new variety with high adaptability; 0 = other
Farming techniques	1 = applying techniques to production; 0 = other
Diversification	1 = crop diversification; 0 = other
Irrigation upgrade	1 = irrigation upgrade; 0 = other

The multivariate regression method is used to analyze the factors affects to farmers when they choose a response strategy actively and positively compared to non-selective households. The multivariate regression model is presented in equation 2.

$$Y = \beta_0 + \beta_i \sum_{i=1}^{n} X_i + u_i \quad (2)$$

Of which: Y: is the dependent variable (income is calculated for 1000 m2 of productive land).

The variable Xi is the explanatory variable.

β0 is the intercept, βi is the regression coefficient.

u is the error, i is the i observation.

The measurement variables include:

- Education level (measured by the number of years of schooling of the household head)
- Number of household members (measured by the number of people)
- Production experience (measured by the number of years involved in agricultural production)
- Area of agricultural land (measured by 1,000m^2)
- Response attitude (value 1 if positive, means that there is a choice of risk response solutions; 0 if the other answer)
- Income from agriculture (measured by 1,000 VND / 1,000 m^2)

Methods of data collection

Primary data was collected through direct interviews with farmers based on planned questionnaires. Study samples were selected by random method at the locations where the main crops of the province are concentrated, including: Nghia Dan (Cane), Thanh Chuong (tea), Nghi Loc (Peanut), Quy Hop (Orange)). Each locality has 50 surveyers.

Analytical Method

First, descriptive statistical methods are used to make perceptions of farmers on risk and choose to respond to risks in agricultural production. The study uses the mean, standard deviation, minimum, maximum, frequency and frequency for analysis and description.

Second, the Binary Logistics regression method through the application of regression for (1) and (2) to determine the factors that influence the decision to choose the risk response solution of Nghe An farmers.

Results And Discussion

Identifying Agricultural Risks Of Farmers in Nghe An

According to statistical reports of the Department of Agriculture and Rural Development of Nghe An as well as interviews with farmers, the number of risks encountered by households in 2020 is from 1-3 risks, accounting for 23%, the number of households meeting 4 - 6 risks accounted for 69.5%, from 7-10 risks accounted for 5% and the number of households without risk accounted for 2.5%. On average, Nghe An farmers face 4.2 risks in 2020, the majority of households face 5 risks in 2020. Showed in Table 2.

These types of common risks include the main risks such as: Flood (30%), Storm and other natural disasters (25%); pests, diseases and diseases for plants (36%); Price fluctuation of products (20%); lack of labor (14%); lack of market information (41%); lack of technique (22%); lack of good seed (9%); lack of capital (18%); crop failure (11%); other causes (5%). In which, the most common are the flood risk; pests and diseases; price; lack of information; lack of technology and capital.

This shows that Nghe An farmers are well aware of the risks in agricultural production, contributing significantly to the selection of response measures and risk prevention in the production

Table 2: Statistics on frequency of risks in agricultural production in 2020

Number of risks encountered	**Number of households**	**Percentage (%)**
No risk	5	2.5%
From 1 - 3 risks	46	23%
From 4 - 6 risks	139	69.5%
From 7 - 10 risks	10	5%
Total	**200**	**100%**
Average		**4.2**
Standard deviation		**1.7**

Table 3: Coping measures of Nghe An farmers to encounter the risks in 2020

Risk response measure	Number of responses	Percentage (%)
Doing nothing	25	2.9%
Cut spending	135	15.8%
Ask for help from relatives and friends	36	4.2%
Material support from the government	164	19.2%
Credit support from the government	140	16.4%
Agricultural extension support from the government	155	18.1%
Use savings	52	6.1%
Going to cities to find part-time jobs	25	2.9%
Reduce scale of production	43	5.0%
Research market information	60	7.0%
Finding new varieties	21	2.5%
Total	856	100%

process.

Responding to risks - choosing solutions of farmers in Nghe An

Because in 2020, sudden natural disasters (historic storms and floods) plus unpredictable developments of the Covid-19 epidemic, Nghe An farmers face many different types of risks, farmers have to choose from many different types of solutions to response to the risks; in order to minimize losses, besides experience-based measures, also rely on financial support from the government

Through the selection of measures to prevent and minimize the impact of risks, the survey shows that only 18.2% of risks are completely overcome, 49.5% of risks are partially overcome and 32.3 % has not been fixed. The household's results of overcoming each type of risk are presented in Table 4.

Group of weather risks in 2020, mainly due to floods, storms and floods, the household's response solution is to pump against flooding and increase working time after inundation or thanks

Table 4: Results of household risk overcoming

Type of risk	**Frequency (%)**	**Level of recovery (%)**		
		Completely	**Partly**	**Not yet**
Flood	30	0	51.5	48.5
Storms and other natural disasters	25	11.5	52.5	36
Pests, diseases and diseases of plants	36	11	42	47
Out put price fluctuation	20	0	0	100
Lack of labor	14	20	50	30
Lack of market information	41	25	45	30
Lack of tech	22	33	44	23
Lack of varieties	9	13	67	20
Lack of capital	18	35	60	5
Crop failure	11	8	50	42
Others	5	25	38	32
Total		18.2	49.5	32.3

Table 5: Results of Binary Logistic regression estimation

Variable	Use new varieties	Apply new techniques	Upgrading irrigation	Diversification
Age of household	0.355	-0.101	-.0322	0.100
Production experience	-0.402	0.211	0.273	-0.051
Education level	-0.040	1.450***	0.040	0.030
Production area	-0.030	0.070	-0.005	0.192***
Household income	3.264**	-1.551	2.767***	-1.305**
Awareness	4.381**	0.408	0.197	2.340**
Irrigation	0.003	0.899	1.424	0.680
Agricultural extension	3.744**	4.274**	-0.522	-1.228
Planning	0.991	-0.599	-0.558	-2.011**
Intercept term	-17.225	3.119	-27.32	10.988
Omnibus test	0.0000	0.0000	0.0000	0.0000
Cox & Snell R^2	0.604	0.621	0.374	0.390
Nagelkerde R^2	0.844	0.827	0.501	0.517

to the support of relatives and friends. However, due to widespread inundation, the rate of not responding is quite high (48.5%).

The risks of pests and diseases are quite common among farmers, the main solution chosen is to use plant protection drugs (64%) to directly intervene, treat diseases for plants, in order to reduce crop losses. Only a few households use technical treatments and reduce the amount of fertilizers/drugs (5%). Measures such as using relatives/ friends supports, and savings are also common. For cases of heavy damage, people often choose to do nothing (20%).

Economic risks (fluctuating input/output prices, lack of labor, lack of capital, lack of technology...) are particularly serious in 2020, under the impact of the Covid-19 epidemic, putting great pressure on Farmer households because they cannot be sold by agricultural products. However, with the active support from the government, the local agricultural agencies, 10% of the farmer households co-

seek information to solve their problems. consumer market, change the method of product consumption, change production techniques, access to loans, change varieties...).

Factors affecting the strategy of choosing to cope with risks in agricultural production of farmers in Nghe An

The negative affects of climate change in recent years directly affect production activities and livelihoods of farming households. Rain, storms, floods and droughts became common. Rising temperatures help spread pests and diseases to plants and animals. Effective strategies for responding to climate change include: application of new varieties with high adaptability (42%), application of technology in production (37%), improvement of irrigation systems (67%) and diversifying crops to reduce risk (33%). These strategies are validated by Ozor et al. (2012), Jianjun et al. (2015) and based on the survey of farmer households in Nghe An province. Showed in Table 5.

For the selection of "using new varieties" the estimated results show that there are 3 significant variables, namely Farmer's income, awareness and extension. This shows that when the income of farmers tends to be high, they often choose new plant varieties with higher prices than traditional plant varieties. As results, new plant varieties are better to help farmers avoided climate change effects, contributed higher yields and greater added value, and are better suited to agricultural practices/regulations in many imported countries. Variables such as awareness and frequency of participation in agricultural extension activities also influence the selection of new plant varieties of households. The "use of new varieties" therefore, positively affects the farmers' income (positive), the quality of agricultural products are heighten. This is in line with the Conclusion of Jianjun et al (2015), which states that richer farmers are more likely to buy and plant higher-priced varieties than lower income farmers, and often build longer production plans (Deressa et al. 2009). This result is also consistent with the conclusions in the studies of Hassan and Nhemachena (2008); Le Hoa Dang et al (2014).

For the selection of the solution "Applying new techniques", the estimated results show that education level and participation in agricultural extension activities are often meaningful. It is shown that the higher the number of years of schooling of the household means the ability to choose a change strategy and apply new technologies to production is higher than others. The number of years of schooling can affects the consciousness of choosing farming methods and techniques to increase crop productivity as well as reduce pests and diseases; reduce the dependence on nature, for example using hydroponic and aeroponic farming methods in some areas specializing in producing green vegetables such as Nghia Dan, Nghi Loc, Quynh Luu... Agricultural extension activities also help farmers equipping better understanding of new agricultural techniques, increasing efficiency of distribution and farming techniques of farmers (Ozor et al, 2012), increasing people's adaptive capacity to climate change (Vo Thanh Dan, 2015). These households regularly participate in agricultural extension activities to update new knowledge on farming techniques and market information, therefore, their exposure to risks is usually lower (mainly encounter 1-3 risks/year); ability to accumulate is higher than that of other farmers (Dang et al, 2014).

For the third solution, "Upgrading Irrigation", the estimated results show that when farmers choose to upgrade their irrigation system, their income is improved (approximately 67-85 million VND/household/ year) compared with the local average (55 million VND/ household/year) (Nghe An Statistics, 2020). On the contrary, higher-income farmers will be more interested in improving the irrigation system to ensure water sources for production than lower-income farmers, which helps them avoid risks when encountering adverse weather conditions. For example, drought in the summer, when hot and dry westerly wind (from Laos to Central Vietnam)is active. This also posed the challenges that in order to reduce risks from climate change, farmers need financial support, especially the microfinance with lower barrier and mortgage.

For the solution of "Diversification", the analysis results show that the ability to choose this solution has a positive relationship with production land area and awareness; has a negative relationship with the variable income and planning. This means that only households with large production areas (over 10 hectares) often choose a variety of plants in combination to take advantage of the productive capacity of the land; at the same time, households with a high number of years of schooling also choose a variety of plants that alternate seasons to increase income. Models of growing oranges -

pink grapefruit - Thai guava, sugarcane - guava - orange - avocado in Nghia Dan; growing medicinal herbs in a chain (Solanum procumbens, Gymnema) in Con Cuong… has become an outstanding example, bringing high income to farmers. On the other hand, low-income households often do not have the resources to invest in seeds and diversify crops. On the other hand, if the quality of local agricultural production planning is not high and there is a lack of effective production models and the planning for the development of key crops and livestock in the locality is not suitable, that could lead to farmers' unsuitable production activities. This result is consistent with the results of previous studies such as Ozor et al (2012), which means that households with large production areas will have greater motivation to seek solutions to cope with risks, ensure reasonable profits.

Conclusion

Through a survey of 200 farmers in Nghe An, it shows that households are aware of common risks in agricultural production. On average, in 2020, farmers in Nghe An have encountered 4.2 risks / year, and most of them have not overcome it. Faced with these risks, the choice of coping solutions to minimize the loss of household income depends on their awareness, attitudes towards climate change, financial resources and information that the farmer can gather. Positive coping measures that people use are the use of pesticides to deal with pests and diseases; seek support from relatives and friends; use their savings; irrigation upgrading; loans; look for information; using new varieties. However, the rate of completely overcoming the risk is only 18.2%. This stems from a number of main reasons: 1) Risks in 2020 are mostly natural disasters and epidemics effected on a large scale, with a wide and comprehensive impact on the entire economy. 2) The Covid-19 epidemic caused Vietnam to close to the world, and the export of agricultural products faced difficulties. 3) A decrease in domestic employment due to the "social distancing" order, a reduction in people's livelihoods, and a reduction in consumption demand. 4) To be able to maximize the risk, requires the participation of the government by applying the following policies: a) Develop and complete a risk management framework in agricultural production. b) Increase investment and improve the irrigation system. c) Promote market information, trade promotion for agricultural products. d) Strengthen agricultural extension activities, provide financial support to farmers who face difficult and urgent situations.

References

Bryant CR, Smit B, Brklacich M, Johnston TR, Smithers J, Chiotti Q, Singh B (2000) Adaptation in Canadian agriculture to climatic variability and change. Clim Change 45(1):181–201

Dang Le Hoa, Elton li, Ian Nuberg, Johan Bruwer (2014), Farmers' assessments of private adaptive measures to climate change and influential factors: A study in the Mekong Delta, Vietnam, Natural Hazards 71(1):385-401, DOI: 10.1007/s11069-013-0931-4

Deressa, T.T., Hassan, R.M., Ringler, C., Alemu, T., and Yesuf, M., 2009. Determinants of farmers' choice of adaptation methods to climate change in the Nile Basin of Ethiopia. Global Environmental Change. 19: 248 –255.

Gbetibouo GA (2009) Understanding farmers' perceptions and adaptations to climate change and variability: The case of the Limpopo Basin, South Africa. In: International Food Policy Research Institute (IFPRI), Discussion paper 00849. http://books.google.com.au/, Accessed 8 Sept 2010

Grothmann T, Reusswig F (2006) People at risk of flooding: why some residents take precautionary action while others do not. Nat Hazards 38(1):101–120

Hassan R, Nhemachena C (2008) Determinants of African farmers' strategies for adapting to climate change: multinomial choice analysis. Afr J Agric Resour Econ 2 (1):83–104

Jianjun, J., Yiwei, G., Xiaomin, W., and Nam, P. K., 2015. Farmers' risk preferences and their climate change adaptation strategies in the Yongqiao District, China. Land Use Policy. 47: 365-372.

Lê Quang Trí, 2016. Tác động của biến đổi khí hậu đối với sản xuất nông nghiệp ở đồng bằng sông Cửu Long, Truy cập ngày 03/4/2018. Địa chỉ http://bavutex.baria-vungtau.gov.vn/vi/tintuc/tac-dong-cua-bien-doi-khi-hau-doi voi-sanxuat-nong-nghiep-o-dong-bang-song-cuu-long1023.html.

Lê Thị Phương Mai, Trần Ngọc Hải, Dương Văn Ni, và Võ Nam Sơn, 2016. Đánh giá tác động của biến đổi khí hậu và giải pháp ứng phó trong mô hình tôm sú quảng canh

cải tiến ở Đồng bằng sông Cửu Long. Tạp chí Khoa học Trường Đại học Cần Thơ. 42D: 28-39.

Liu, E. M., 2013. Time to change what to sow: Risk preferences and technology adoption decisions of cotton farmers in China. Review of Economics and Statistics.95(4): 1386-1403.

Maddux JE, Rogers RW (1983) Protection motivation and self-efficacy: a revised theory of fear appeals and attitude change. J Exp Soc Psychol 19(5):469–479

Nghe An statistics office (2020), Nghe An Statistics yearbook, statistical publishing house, 6/2020, p 33

Nguyễn Tuấn Kiệt, Nguyễn Tấn Phát, 2019. Ứng phó của nông dân đối với rủi ro trong sán xuất nông nghiệp tại thành phố Cần Thơ, Tạp chí khoa học trường Đại học Cần Thơ, Tập 55, số chuyên đề: Kinh tế (2019): 135 – 147.

Ozor, N., Madukwe, M. C., Enete, A. A., 2012. A framework for agricultural adaptation to climate change in Southern Nigeria. International Journal of Agriculture Sciences. 4(5): 243-251

Rogers RW (1975) A protection motivation theory of fear appeals and attitude change. J Psychol 91(1):93–114

