

FACTORS AFFECTING FARMERS' ACCEPTABILITY TOWARD AGRICULTURAL INSURANCE PROGRAM IN MALANG, EAST JAVA, INDONESIA

Sujarwo^{1*}, Nuhfil Hanani¹, Syafrial¹, and Wahib Muhaimin¹

¹Lecturer at Agricultural Socio-Economics/Agribusiness Department, University of Brawijaya, Indonesia

*corresponding author: sujarwo@ub.ac.id

Abstract: Farmers face high risk and uncertainty in their production. There are farmers that are able to manage the risk; however, most of them fail to adapt the risk and uncertainty. If catastrophic losses happen then the farmers will suffer and come to the poverty. Therefore, government of Indonesia attempts to conduct agricultural insurance policy to prevent that case happening specially for small-scale farming. This study contributes in understanding what factors will endorse the acceptance of agricultural insurance for small-scale farming. The data analysis employed is binomial logistic regression in finding factors that negatively or positively affect the agricultural insurance program. The data was obtained through survey conducted in January to Mei 2017. The location of this study is Malang Regency, East-Java Province, Indonesia. The results found that there was 50 percent of the farmers accepting the agricultural insurance program and the other half of farmers unwilling to support the program. Regarding factors which affect negatively to the willingness to accept agricultural insurance are age, profit, and the number sources of income. Then, the factors which affects positively to the agricultural insurance are farming size, the experience of buying insurance, and also the intensity of farmers in attending farmers' group meeting.

Keywords: *risk and uncertainty, agricultural production, agricultural insurance, small-scale farming*

INTRODUCTION

Agricultural sector inherits lack of ability to adapt the changing of environment and to manage the risk and uncertainty. Those problems tightly affect the productivity of agricultural sector especially for the countries which are dominated by small-scale farming.

Changing in environment can be interpreted as climate change that becomes an issue worldwide and it is also representing the changing in ability of social, physical, and natural surrounding the farming system. Negative effect of climate change undeniably affects farming productivity of farmers and increasing risk due to the increasing of possible losses. This situation is faced by farmers and, for small scale farmers especially, it means that farmers are more vulnerable in their livelihood. Government support is needed to intervene this situation in order to prevent the farmers from the catastrophic losses. Moreover, it is also an effort of

government for developing rural area and enhancing food security as the two big issues addressed by government agricultural policies.

Agricultural insurance which is induced by government emerges recently as one of strategy in coping the increasing risk in agricultural sector especially for them who have small scale farming as part of rural development program. This is clearly one of government support to agriculture and as alternative in strengthening food security and poverty reduction in the rural area (Oliver and Charles, 2010).

Increasing risk and vulnerability of assets in farming especially for staple food is major concern of government addressing food security and poverty reduction. Dealing with the higher risk nowadays, government of Indonesia has been promoting agricultural insurance since 2011. For this program, Indonesian government spent budget

for covering the losses of rice farming due to harvest failure.

This program is based on legal Indonesia's regulation which is Act No 12/1992 on Crop farming and pursuing with Presidential Instruction No 5/ 2011 in enforcing national rice production dealing with climate change (Pasaribu and Sudijanto, 2013).

East-Java, Indonesia, has about 38 million people and the average growth of population is about 0.7 percent. The number of labor working in agricultural sector is about 37 percent. This proportion is much higher comparing to trade and industry which is 22 percent and 14 percent, respectively (Statistics of East-Java Province, 2015). According to Statistics of East-Java Province (2015), the people who working in agricultural sector mostly only graduated from elementary school. Human resources capacity is the major factor that influence the development of agriculture and rural development as well (Shrader and Siegel 2007, Strauss and Thomas 1995). This also gives the reason why government should involve intensively in agricultural and rural development in Indonesia.

In this case, strategic reason for enhancing development of agriculture in East-Java is more related to preventing how those millions of people in East-Java could be able to leave poverty line significantly and encouraging the higher living standard in the rural area through farming income and sustainability of farming.

Besides the fact that there is relatively low human resource in agriculture, the other factors should be identified in order to anticipate the failure of the agricultural insurance program. This study attempts to get more information regarding the acceptance of rice farmers regarding agricultural insurance program in East-Java Province, specifically more focus in Malang regency.

Several previous researches have been conducted regarding agricultural insurance, such as Margarita et al (2009) using multinomial probit for corn and soybean farmers in Illinois, Indiana, and Iowa found that the factors affecting the agricultural insurance were land owned and off-farm income more than \$50,000, which were negatively and significantly affecting access to agricultural insurance. However, age, education, and farm size are not statistically significant in accessing agricultural insurance.

Garrido and Zilberman (2008) using probit models for insuring and noninsuring farmers of

more than 41 thousand farmers and 12 years of data found that the major factor affected the adoption of agricultural insurance was premium subsidies. This finding confirm the fundamental roles of government in supporting agriculture sector.

Hazell (1992) asserted that agricultural insurance was the alternative should be considered in reducing and coping risk in agriculture production. Noticed as well, that there existed the mechanism governed locally and traditionally in combating vulnerability in farming production losses.

Hazell (1992) also mentioned about two different strategies regarding risk in agricultural production in developing countries. There are risk-reducing strategies and risk-coping strategies. In attempt of reducing risk, the farmers' strategies include crop diversification and other diversification source of income from owned resources. Moreover, farmers endeavor for coping the risk traditionally with selling the cumulative asset earned in previous production and/or accessing credit. However, this strategies are also costly and threaten the sustainability of farming production especially for small-scale farming production.

This study and the previous one tried to explore which one is the better risk coping mechanism for small-scale farming. The big questions then emerge is that whether the agricultural insurance really bringing the higher benefit for farmers or it just as alternative in which the cost is as high as traditional risk management. Before coming to that stage, this study will expose at the first step about the farmers' perception toward agricultural insurance implementation in Indonesia.

RESEARCH METHODS

Study Area and Data Collected

This study was conducted in Kepanjen Sub-District, Malang Regency, East-Java Province, Indonesia. The data was collected on January up to Mei 2017. The total population in Kepanjen Sub-District is about 101,816 people. There are 18 villages and the survey is conducted in 7 villages. Total respondents are 354 respondents distributed as follows.

Table 1. The distribution of sample in Kepanjen Subdistrict, Malang Regency, East-Java, Indonesia

No	Village	Sample size
1	Jatirejoyoso	61
2	Kedungpedaringan	54
3	Mangunrejo	65
4	Sengguruh	41
5	Jenggolo	59
6	Ngadilangkung	50
7	Kemiri	24
Total		354

Source: Survey, 2017

Logit Model and the Specification

The farmers' acceptability as represented by dummy variable which is 1 for accepting the program and 0 for not accepting the program. Accepting the program means that the farmers willing to pay the premium as offered by government program, which is IDR 36,000 per hectare for total coverage as much as IDR 6,000,000 per hectare. Finding the factors of affecting the farmers' acceptance toward agricultural insurance means that regression of limited dependent variable is applied. Logistic regression model is fit this type of this case.

The logistic regression analysis then specified as:

$$(1) \quad \frac{P_i}{1 - P_i} = e^Z$$

Where

Table 2. Variables considered in the logit model

No	Variable	Type of Data	Measurement	Expected Sign
1	Farmer's Age	Ratio	This is the age of the head of family. The unit of age variable is year.	±
2	Family members	Ratio	This measure the family size of the farmer. The unit is the number of persons in the same house.	+
3	Farmers with their source of income	Ratio	The farmers' diversification of income for their family. The type incomes can be from agriculture or non-agriculture sectors.	±
4	Land	Ratio	The land used for rice production. The unit is hectare.	+
5	Having experience of insurance	Nominal	The farmer who has experience and actively buying insurance has value 1 and the other is 0	+
6	The years in school	Ratio	The years of getting education in formal school. It is measured in year unit.	+
7	Profit of rice farming	Ratio	The gross profit from rice farming production. It is measured in IDR.	+
8	Actively attend in farmers' group meetings	Nominal	The farmer who attends more than 3 times a year is 1 and the other criterion is 0.	+

$$Z = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + \varepsilon_i$$

P_i = probability of the occurrence happening

β_i = the coefficient of variable-i

ε_i = stochastic error

Rearrange the equation (1), the new formulation can be noted as follows:

$$(2) \quad P_i = \frac{e^Z}{1 + e^Z}$$

$$(3) \quad (1 - P_i) = \frac{1}{1 + e^Z}$$

The odds ratio is given by $\left(\frac{P_i}{1 - P_i}\right)$.

The statistical tests regarding logit model are Hosmer and Lemeshow Test for examine whether the predicted probability match with the observed one (Meyers et al, 2013). It is expected that the test will show insignificant different between the observed and the predicted probability. The individual coefficient of logit is tested using Wald test. The hyphotesis statements are

$$H_0 : \beta_i = 0$$

$$H_1 : \beta_i \neq 0$$

The test statistic is

$$(4) \quad W_i = \left(\frac{\beta_i}{SE_{\beta_i}}\right)^2$$

Where

β_i = the coefficient of variable i

SE_{β_i} = standard error of β_i

The variables used in the logit model and the expected signs are in the table below.

RESULTS AND DISCUSSION

Respondent Characteristics

The respondents' characteristic regarding the age distribution (Figure -1) shows that the rice farmers are old farmers with the age more than 60 years which is 44 percent from total 354 respondents. Furthermore, there is only about 20 percent of farmers having less than 50 years old.

Regarding the education level, the rice farmers mostly have graduated from elementary school (44 percent). There is 22 percent of the respondents having senior high school or higher.

Land use for rice farming is about 0.38 hectare. The number of farmers who use land for rice farming less than the average is 66.67 percent. Furthermore, the largest land used by farmer is 2.5 hectare and the smallest one is less than 0.05 hectare.

The lower education level and the small-scale farming is the picture of agricultural sector generally in East-Java. Those characteristics could be seen as potential barrier in agricultural development. However, the weaknesses are still possible to be transformed in strength if government intervention in developing farmers' local institutions successfully designed.

Government interventional so far operates in supply side, such as input subsidies, credit, and also developing local institutions, such as farmers group development. However, those interventions are still in process of finding the optimum design for encouraging small-scale agriculture performance and for transforming the government intervention into farmers benefit technically and economically.

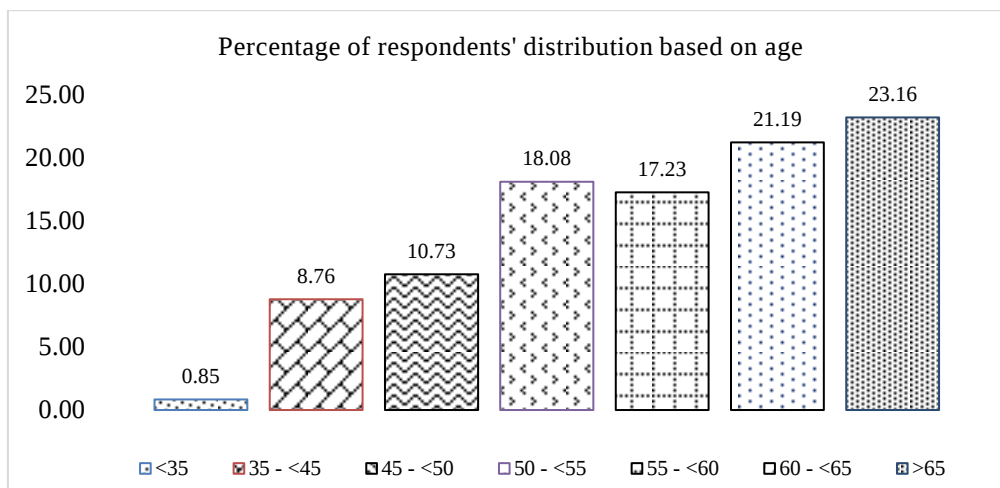


Figure 1. The percentage of respondents' distribution based on the age

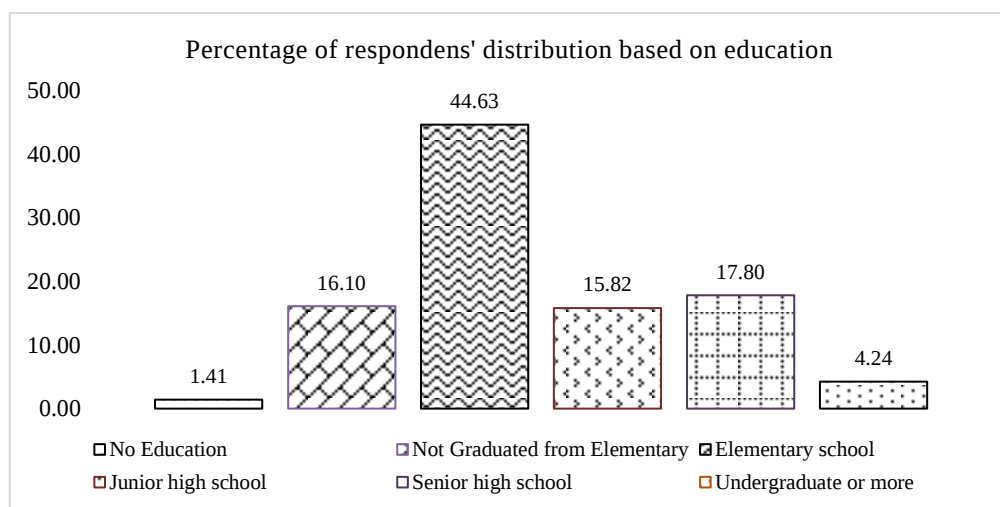


Figure 2. The percentage of respondents' distribution based on education

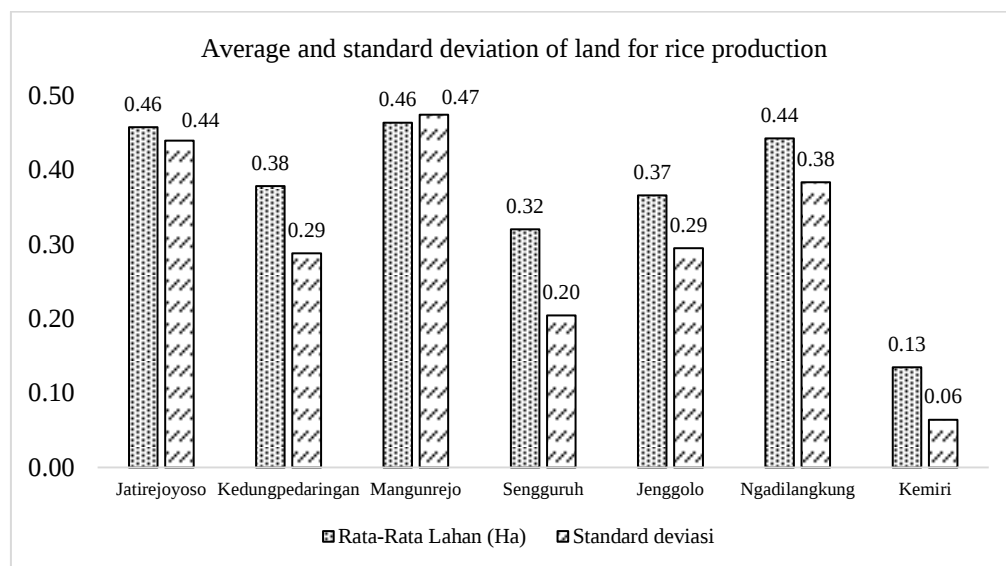


Figure 3. Average and standard deviation of land for rice production

Data Used in the Logit Model

Before representing the result of logit analysis, this study shows the data used in the analysis as represented in Table 3 below.

The proportion of farmers who are willing to accept agricultural insurance and those who are not is relatively equal. Furthermore, the age of farmers on average is 57.5 years old. As mentioned before, more than a half of respondents are graduated from elementary school or less and only about 4 percent of farmers are graduated higher than senior high school.

The other important factors considered are the family member, the farmer's source of income, land of rice production, the experience of buying insurance, the gross profit of rice farming, and the activity in farmers' group. Table 3 shows that the farmer commonly has 4 up to 6 family members.

The source of income for family mostly is coming from agriculture. It is showed in Table 3 that 94 percent of farmers rely on agriculture production. In this case, farmer is vulnerable and having such critical situation if the farmers get problem in their production and significant losses as a result. The family will come to the poverty and have hard time to operate their farming for the next season.

The unfavorable situation in agriculture in the study location is not stop there since the farming size is also not giving much advantage. On average, the land used for rice farming is only 0.27 hectare and regarding total respondents selected in this study, there is 52 percent operating land for rice

production less than 0.25 hectare. Furthermore, the rice production from the actual farming size generates less than IDR 4 millions gross profit for about 53 percent of farmers' respondent.

Assuming that there is 4 family members and the production is the only source of income, it means that there is IDR 1 million per capita during 3 months or about IDR 333 thousand per month or US \$ 24 per month per capita using IDR 13,500 per US \$. This is lower than \$ 1 per day of farmer's family.

The support for farmers' family is definitely needed in order to prevent them from falling below the poverty line if bad state happened. The picture of small-scale farmers has been known by the central and local government and many effort has been conducted; however, the vigour policy design for helping small-scale farmers is not yet found. The policy in supply side, such as fertilizer subsidy, seems to be a double-edged blade which is helping at the short-run for increasing production but it reduces the sustainability of production in the long-run.

Results from Logit Analysis

The logit analysis is using SPSS 21 for Windows. This is binary logistic model between the farmers who willing to buy agricultural insurance and the farmers who are not.

The model specified with 8 independent variables and those variables simultaneously explains about 48 percent of the acceptance of agricultural insurance. Table 4 also represents the

overall predictive accuracy of the model which is about 77 percent of the prediction is correct.

Table 3. The data used in the logit analysis

No	Description	Value
1	Percentage of farmers acceptability to agricultural insurance	
	Accept the agricultural insurance	49.55
	Not willing to accept the agricultural insurance	50.45
2	The age of farmer respondents	
	Average of the age	57.53
	Standard Deviation of the age	10.04
3	The percentage of family number at its criteria	
	<4	38.21
	4-6	59.40
	>6	2.39
4	The percentage of farmers with their source of income at its criteria	
	1	94.33
	2	3.58
	>2	2.09
5	Land used for rice production	
	<0.25 hectare	52.24
	0.25 - 0.5 hectare	26.27
	0.50 - 0.75 hectare	14.03
	> 0.75 hectare	7.46
6	Percentage of farmers having experience in buying insurance	
	Have experience of insurance	20.30
	No experience of insurance	79.70
7	The respondents' level of educations	
	Elementary school or less	61.79
	Junior or senior high school	33.73
	Higher than senior high school	4.48
8	Level of profit earned at the actual farming size	
	< IDR 2 millions	27.76
	IDR 2 millions to less than 4 millions	26.27
	IDR 4 millions to less than 6 millions	15.22
	IDR 6 millions to less than 8 millions	8.06
	IDR 8 millions to less than 10 millions	6.27
	> = IDR 10 millions	16.42
9	Actively attend to the farmers' group meetings	
	Active attending the meetings	52.54
	Not Active attending the meetings	47.46

Source: Survey, 2017

Table 4 also represents the ability of logit model specified which is having 78.7 percent correct in predicting farmers who do not accept agricultural insurance. Moreover, the model also has 75 percent correct prediction for farmers who accept the agricultural insurance program.

The analysis for estimating coefficient of the logit independent variables is presented in Table 5. Those are estimated using Maximum Likelihood estimator. As mentioned before, statistical package software used is SPSS version 21.

Table 4. The overall predictive accuracy and Nekelkerke R-Square

Observed	Predicted		
	Acceptability		Percentage Correct
	0	1	
Acceptability	0	133	36
	1	40	126
Overall Percentage			77.3
Nagelkerke R Square			0.478

Source: Survey data analyzed, 2017

The result in Table 5 shows that there are 3 factors influencing negatively and significantly to

the willingness to accept insurance. They are age, gross profit of rice farming, and number of source of income. Among those 3 factors, number of source of income to the family is the highest effect in possibility rejecting agricultural insurance. It indicates that individual in the agricultural production tend to manage their risk individually and reducing transaction cost of accessing agricultural insurance.

Gross of profit affects negatively to the acceptance of farmers toward agricultural

insurance. The higher profit of rice production tends to experience the less risk in production and therefore not considering much agricultural insurance. This is similar to the rational of number source of income variable previously discussed. The families with more income sources and less possibility having bad state in agricultural production are more resilient and their risk aversion level tend to be lower than the one who have already exposed catastrophic problems in farming or finance.

Table 5. Result of logit analysis

Variable	Coefficient	Wald	Sig.	Exp(B)
Age	-0.04	5.86	0.02	0.96
Land	7.15	57.86	0.00	1276.43
Gross profit	-0.16	12.07	0.00	0.85
Number source of income	-1.36	7.81	0.01	0.26
Education of farmer	0.00	0.01	0.94	1.00
Number of family members	0.09	0.80	0.37	1.09
Dummy – Experience of buying other insurance	1.40	15.16	0.00	4.05
Dummy – Farmer's group involvement (active or not active)	0.24	0.65	0.42	0.79
Constant	2.15	3.50	0.06	8.56

Source: Survey data analyzed, 2017

Age is the last factor which has negatively affected to the acceptance of agricultural insurance. The older of farmers tend to unwilling paying premium and face the risk individually. The older farmers have already passed through many problems previously and got many experiences in handling such losses occurred before. Therefore, it seems rational that they will have more endurance facing uncertainty along with the age. However, the more years coming the good state and bad state presumably gets wider and more harmful to the farmers. This different situation should be understood by farmers and should be anticipated by managing and coping risk and uncertainty in order to keep the food production sustainable and to strengthen not only food security in family level but also economic position of family above the poverty line.

Factors that positively and significantly at 5 percent significant level regarding acceptance of agricultural insurance are land used for rice farming, number of family members, dummy experience in buying insurance, and dummy farmers' involvement in farmers' group. Additionally, the education of farmer is positive

affecting the acceptance to agricultural insurance but it is not significant at 5 percent significant level.

Table 5 shows that farming size or land used for rice farming is the most important factor in term of significance and the magnitude of the coefficient influencing the acceptance or the willingness of farmers joining to agricultural insurance program.

This finding brings to the discussion related to the preference of farmer regarding risk of agricultural production. Farmers with larger rice production demand more of agricultural insurance in order to prevent their production losses in uncertainty condition.

When coming to the discussion regarding why the gross profit is negatively affecting the acceptance of the insurance but the land variable is positively affecting one, the plausible reason is related to the perspective of the farmers regarding the process of farming and the realization of the farming process, which is the profit. In short, farmers tend to worry more about the process of agricultural production when the size of production getting larger; therefore, they will require mechanism to reduce the disastrous losses and

accepting more agricultural insurance. It means the expected coefficient should be in positive one. On the other hand, when the farmers find that the results are good and the profit is better, then the farmers improve their belief about their capability to generate the same results in the next period. Subsequently, it should be the case that the willingness of accepting agricultural insurance will be decrease.

The positive respond of buying insurance previously also contributes positive in acceptance of agricultural insurance. The same direction for the farmer's involvement in farmers' group also has positive effect in accepting agricultural insurance.

CONCLUSION

The study location which is 7 villages in Malang Regency, East Java Province, Indonesia has relatively old farmers, lower education level, and also small-scale of farming size which is about 0.27 hectare.

Based on the logit analysis, there are factor that positively and significantly affect the acceptance of agricultural insurance which are land used for rice farming, number of family members, experience in buying insurance, and farmers' involvement in farmers' group. Moreover, the negative and significant factors in accepting agricultural insurance are age, gross profit of rice farming, and number of source of income. Education is not statistically significant in influencing acceptance of agricultural insurance.

From this finding, it seems reasonable for government to consistently use farmers' group to promote and introduce more related to risk management and risk coping strategy for farmers. The awareness of risk and uncertainty that threat financial asset of farmers and also their family income will be the window of accepting the insurance program in the study area.

REFERENCES

- Garrido, A., & Zilberman, D. (2008). Revisiting the demand for agricultural insurance: the case of Spain. *Agricultural Finance Review*, 68(1), 43-66.
- Hazell, P. B. (1992). The appropriate role of agricultural insurance in developing countries. *Journal of International Development*, 4(6), 567-581.
- Meyers, L. S., Gamst, G. C., & Guarino, A. J. (2013). *Performing data analysis using IBM SPSS*. John Wiley & Sons.
- Oliver, M., & Charles, J. (2010). *Government Support to Agricultural Insurance, Challenges and Options for Developing Countries*.
- Pasaribu, S. M., & Sudijanto, A. (2013). Rice crop insurance pilot project: An implementation review. JICA Project of Capacity Development for Climate Change Strategies in Indonesia, Jakarta, Indonesia. Retrieved January, 21, 2014.
- Shrader, R., & Siegel, D. S. (2007). Assessing the relationship between human capital and firm performance: evidence from technology-based new ventures. *Entrepreneurship Theory and Practice*, 31(6), 893-908.
- Strauss, J., & Thomas, D. (1995). Human resources: Empirical modeling of household and family decisions. *Handbook of development economics*, 3, 1883-2023.
- Velandia, M., Rejesus, R. M., Knight, T. O., & Sherrick, B. J. (2009). Factors affecting farmers' utilization of agricultural risk management tools: the case of crop insurance, forward contracting, and spreading sales. *Journal of agricultural and applied economics*, 41(1), 107-123.