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Risk and behavior analysis rice farmers in Southern Lampung district

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ABSTRACT

This study aims to: (1) analyze the risk of production, price, and income of technical irrigated rice fields and rainfed rice field in South Lampung regency, 2) to analyze farmer behavior against rice farming risk on the technical irrigated rice field and rainfed rice field. The research was conducted in August - September 2016 in Kecamatan Palas, rice production center in South Lampung. The sample of farmers consist of 23 technical irrigated rice field farmers, and 37 rainfed rice field farmers, taken proportionally by random sampling method .Data were analyzed quantitatively including Coefficient of variation analysis, Bernoulli Theory, and Neuman Morgenstern The results show: (1) the risk of production, price, and income faced by rice farmers on technical irrigated rice field is lower than from rainfed; (2) most rice farmers behave neutrally to the risk, on technical irrigated rice fieldvalued78,26 percent and in rainfed rice field valued 81.08 percent. No farmers were found to be brave at risk either on technical irrigated rice fields or on the rain fed rice field.

Introduction

Rice is a staple food for more than 95% of Indonesia's population. Increased rice production continues to be driven by the Government through the Special Program for Rice, Corn, and Soybean (Pajale) since 2016 until now (Bappenas 2015 and Ministry of RI, 2016). Through the program, various efforts have been made to increase production and productivity of rice in order to achieve food sovereignty and to increase the income and welfare of farmers. Lampung Province is Indonesia's fifth largest rice production center in 2015 with 3,64 million tons of dried paddy production or about 4,85% of national production (BPS, 2015).South Lampung regency is one of the largest rice production centers in Lampung Province, which in 2016 its production reached 448,079 tons of dried paddy with its productivity 5.5-6.3 tons of dried paddy/ha. Increased rice production must be accompanied by risk control. The risk of uncertainty describes a situation that allows for the existence of various types of business results or various kinds of consequences of certain businesses. Failure to achieve the expected income is caused by a variety of risks that cannot be resolved (Kadarsan 1995). Uncertainty situations always occur in agriculture, which results in uncertain outcomes. Fluctuations in agricultural output (production) and price fluctuations are sources of uncertainty in the agricultural sector (Ningsih, 2013).

Farming risks that are often encountered by rice farmers are the risks of production and price risk. Production risks are caused by extreme climatic conditions (dry season or flooding) which can lead to crop failure, as for price risk, both output and input prices are influenced by the market structure and the production level produced. When the production is abundant, the output selling price will decrease, and when the planting season arrives, the production facility price will increase. This condition has an impact on the income level of farmers. Farmer's behavior against risk is influenced by income level and socio-economic condition of farmers.

The risks faced by farmers are basically related to the ability of farmer management (Kurniati, 2015). This ability can help farmers in making decisions for their farming. The decision is usually related to the number of inputs that will be used, so as to prevent the

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occurrence of risks that may occur during the cultivation process. The decision taken by the farmer will also affect the decision making for the next business. In connection with the existing conditions, this study aims to determine the behavior of farmers towards the risk of rice farming.

Literature Review

Risk-Behavior Farmers Theory

The term risk is intended for the possibility of a loss whose chance of occurrence has been known in advance, whereas uncertainty is something that cannot be predicted beforehand and hence the chance of a loss has not been known in advance. Websters Third News International Dictionary (1963) in Soekartawi (1993). According to Debertin (1986), one of the problems in dealing with risk and uncertainty is the variety of attitudes and behavior of individuals to take risky decisions.

To find out the magnitude of the risk of production analyzed using the coefficient of variation (CV). The coefficient of variation (CV) is a measure of the relative risk obtained by dividing the standard deviation by the expected value (Pappas and Hirschey, 1995). The smaller coefficient of variation value indicates that the average value variability in the distribution is low. This illustrates the risk faced to obtain this production is low. Risk production of low land rice was analyzed by the coefficient of variation, while the factors that affect the risk of rice production were analyzed with multiple linear regression analysis with multiplicative heteroskedastic method. The result showed that the risk production of rice on wet season and the land does not belong to his own status is higher than dry season and his (Suharyanto 2015). To analyze the behavior of farmers towards the risk of lowland rice farming analyzed using the quadratic utility function model approach (Soekartawi, 1993)

Relating to risky situations where a decision must be made, modern decision theorists argue that a farmer will use all available information, including past information, expert opinion, and personal experience to formulate a large probability in decision making process (Doll and Orazem, 1980). Decision-making behavior towards agricultural business risks can be explained using a rational approach to utility theory that is manifested in the form of utility functions.

To utility is a description of a person's behavior related to the choice of activities from several alternative opportunities. This behavior can be described by utility functions based on arbitrarily scales from several observations (Neumann in Soekartawi (1993).

Research and Methodology

The research method used was a survey method. Data descriptive analysis and quantitative analysis. Research has been conducted in South Lampung. The location of the study was determined based on the results of an initial survey conducted by the researcher. Based on a survey conducted, one regency was established which is the center of rice commodities in Lampung Province Indoneesia, namely South Lampung. In South Lampung Regency, Palas District was chosen, namely two villages which were distinguished by the type of irrigation, namely Bandan Hurip Village with technical irrigation land, and Mekar Mulya Village with rainfed area.

Sampling design

The sample in this study was rice farmers. Samples were taken using a simple random sampling method. Before the research is conducted, a survey is conducted first to see the general condition of the prospective respondents and make a sampling frame. The sampling frame was made to identify rice farmers in both villages that had a monoculture planting pattern, as well as farmers who planted rice during the planting season in the rainy and dry seasons.

Through the sampling frame made, it is known that the number of paddy rice farmers at the research location is technical irrigation land in Bandan Hurip Village 537, and rainfed land in Mekar Mulya Village 816 farmers. The total population of farmers is 1,353 farmers. Based Sugiarto (1993) formula, a of sample of 80 farmers was obtained, then from the number of samples obtained, the proportion allocation for each village was determined based on the Nazir (1988). From this formula, the number of technical irrigation land samples is 33 farmers from Bandan Hurip Village, and 47 farmers from rainfed land.

Data collection

The data used in this study are primary data and secondary data. Primary data obtained by direct interview with the rice farmer respondents. Secondary data obtained from the agricultural department or agency related to the purpose of the research.

Data analysis methods

Data were analyzed by using descriptive analysis and quantitative analysis. The coefficient of variation (CV) is a measure of the relative risk obtained by dividing the standard deviation by the expected value (Pappas and Hirschey, 1995).The smaller coefficient of variation value indicates that the average value variability in the distribution is low. This illustrates the risk faced to obtain this production is low. Farmer behavior against risk is analyzed by using the Bernoulli Theory. Statistically, risk measurement is done by using variance or standard deviation. This variance or standard deviation measurement is performed to determine the magnitude of deviations on actual observations around the expected average value (Kadarsan 1995). Measurements are formulated as follows:

To analyze the behavior of farmers towards the risk of lowland rice farming analyzed using the quadratic utility function model approach (Soekartawi, 1993)

(a) Production Risk: $CV = \frac{\sigma}{\check{C}}$

(b) Price Risk : $CV = \frac{\sigma}{Q}$

(c) Income Risk : $CV = \frac{\sigma}{\hat{y}}$

Information :

CV = coefficient of variation

σ = standard deviation

$\check{C}$ = average production (kg)

Q = average price (IDR)

$\bar{y}$ = average income (IDR)

The coefficient of variation value indicates the relative risks of farming. A low coefficient value indicate low variability in the average value on the characteristics. This illustrates the risks that farmers will face to obtain production, price, and average income is low. In contrast, high coefficient values indicate high variability in the average value on the characteristics. This illustrates the risks that farmers will face to obtain the production, price or average income is high.

The important thing in decision-making is the calculation of the lower limit of the highest results. Determination of this lower limit is done to determine the lowest amount of results at the expected level of results, the calculation formula of the lower limit is:

$L = E - 2V$

Keterangan :

L = lower limit of production, price, and income

V = standard deviation

E = average production, price, and income earned

Farmer behavior against farming risk is analyzed by using a quadratic utility function model approach. Soekartawi (1993) writes the formula for quadratic utility functions as follows :

$$U = \tau_1 + \tau_2 M + \tau_3 M^2$$

Where :

U : the utility for the expected income

σ : intercept

M : expected income at the balance point (rupiah value of certainty equivalent (CE)

τ_2 : indifference income coefficient (certainly equivalent)

τ_3 : farmers risk coefficients

Information :

$\tau_3 = 0$: Neutral to risk

$\tau_3 < 0$: Averter to risk

$\tau_3 > 0$: Lover to risk

In this study, the behavior of farmers against farming risk is tested in each individual, so that the option they choose is the value of their hopes on alternative balance point encountered. The balance point between uncertain conditions and definite conditions can be determined by the Von Neumann Morgenstern (N - M) technique. This equilibrium value is called CE (Certainty equivalent) and in this rice farming, it is the income that makes the farmer indifferent to the farm. The formation of the utility function is done by connecting the utility scale, so farmers who work on rice farming will have different CE values. Each farmer will have a different utility curve because of the difference in value to the expected amount of income

Result and Discussion

Characteristics of farmers

The results showed that the average age of rice farmers was 48 years on technical irrigated rice field and 49 years in rainfed rice field, each with an average education level of elementary school (SD) and quite experienced in rice farming. This means that farmers belong to the productive age with sufficient level of education and rice farming experience for rice farming management (Mantra, 2008).The control of farm field amounted to 0.25 - 2.5 hectares, with an average of 1.21 hectares for technical irrigated rice field and 0.67 hectares for rainfed rice field.

Risk analysis

The risks faced by farmers in the study area are mostly caused by the weather and rice pests. The existing rice pests are rats and planthopper, while in rice plants there is brown leaf spot threat. In addition, extreme weather such as continuous rain will cause flooding and rice plants submerged in water. During the long drought, the available water is not enough to meet the normal life needs of paddy rice crops. These conditions will cause rice production to decline (Soekartawi, et al, 1993).

Risks analyzed include production risk, price risk and income risk. The risks are calculated on each farmer with production and price levels for the last 5 seasons. The last planting season (m) is when farmers harvest rice crops in the rainy season from January to April 2016, while the four seasons before the last growing season (m-4, m-3, m-2 and m-1) are obtained from results of interviews to farmers about the production and prices in the previous rice planting season, so the period of planting between one farmer and other farmers is not necessarily the same.

Based on the research, production, price, and income of rice farming per hectare in the last 5 seasons have fluctuated. Fluctuations in wetland rice productivity during the last 5 seasons can be seen in Figure 1.

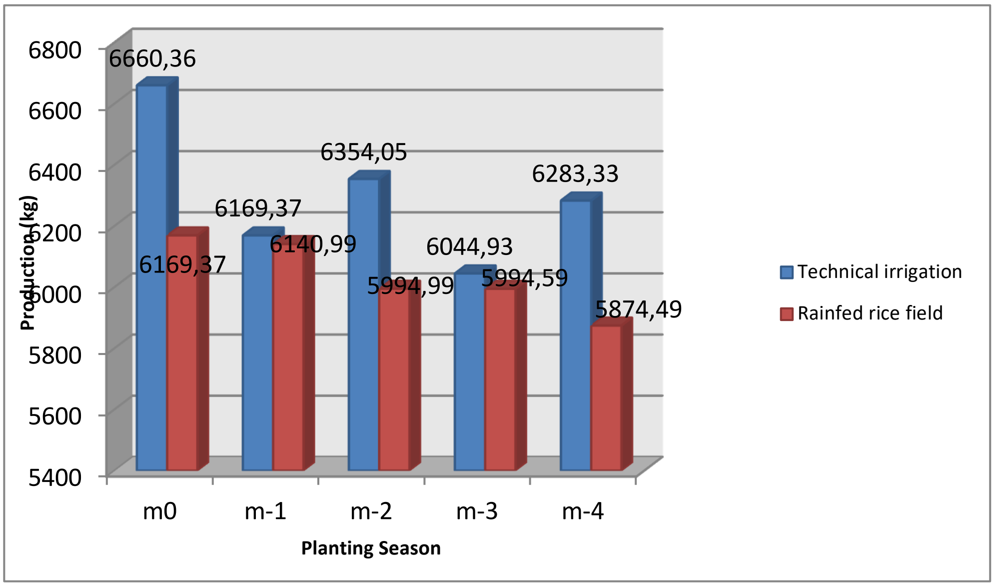

Figure 1: Fluctuations in paddy rice production per hectare of the rainy season during the last 5 seasons on technical irrigated rice field and rainfed rice field (kg/ha)

Figure 1 shows that the average production of paddy rice planting season 5 on technical irrigated rice field greater than in rainfed field, but they fluctuate. The increase or decrease in production that occurred on both rice field depends on the weather, drought, floods, and pests when planting paddy rice. When bad weather or wetland rice is attacked by pests, droughts or floods, rice production levels will be low even crop failures. Most farmers have experienced crop failures ranging from crop losses of 10 percent to no harvest at all or 100 percent failing.

The condition of harvest (harvest festival or famine) will affect the price received by farmers. At harvest time, rice production is abundant, rice price will decrease, and vice versa during the famine (crop failure), rice price will increase. Fluctuations in wetland rice prices during the rainy season in the last 5 seasons can be seen in Figure 2.

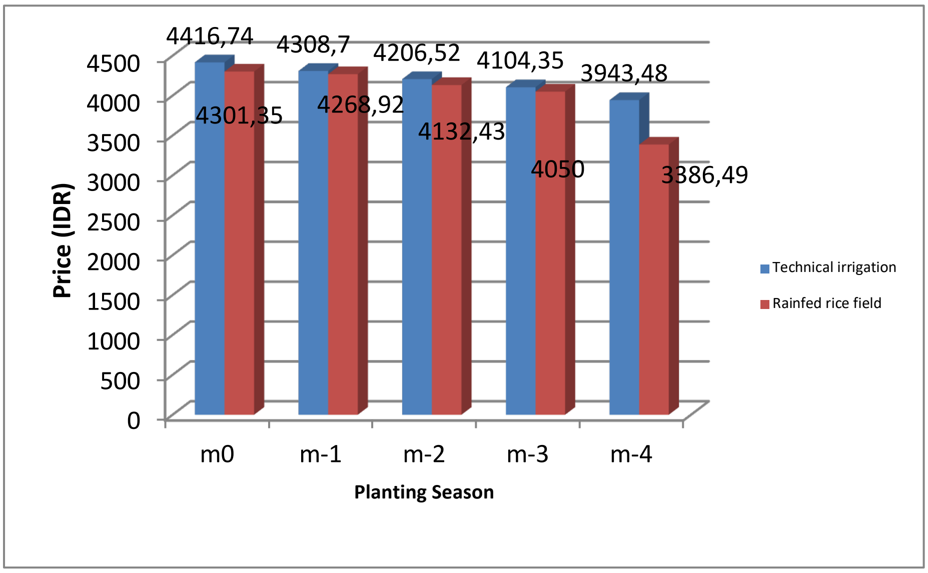

Figure 2: The price of rice received by farmers during the rainy season for the last 5 seasons on technical irrigated rice field and rainfed rice field (IDR/kg)

Figure 2 shows the average price for the last 5 seasons. The highest average price received by farmers is IDR 4,416.74, that is wetland paddy farmers on technical irrigated rice field in 1 planting season before the last planting season (m-4), whereas the lowest average price is IDR 3886.49, namely rainfed rice farmers on 4 planting seasons before the last planting season (m-4). The results of production and price will determine the income that will be received by farmers, as shown in Figure 3.

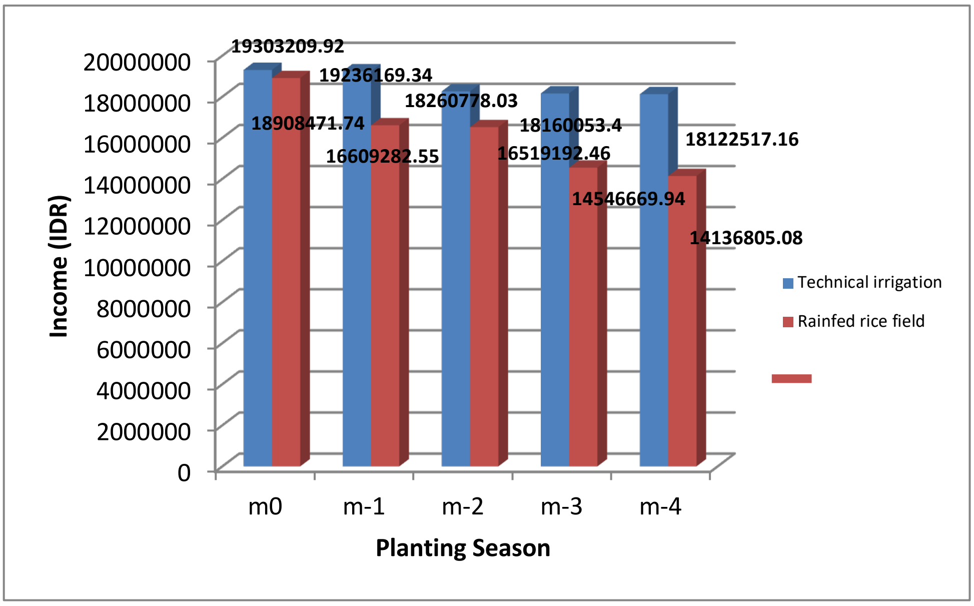

Figure 3: The level of income that wetland paddy farmers received during the rainy season for the last 5 seasons on technical

Figure 3 shows that the average income on technical irrigated rice field over the last 5 growing seasons is greater than the average income for the last 5 seasons in rainfed rice field. The difference in income is due to the availability of water, use of inputs, use of varieties of seed, and technological innovations used. On technical irrigation land, already using irrigation technology, the better the management and development of irrigation, the more productivity of paddy farming will increase. The amount of total income generated from technical irrigated land is due to the higher level of paddy production compared to rainfed land. This is in line with Ivan's (2013) research on the analysis of production and income of lowland rice farming in Purbolinggo District, East Lampung Regency that the highest average productivity and farm income is generated by respondent farmers who carry out farming activities on technical irrigation land.

Production risk

The production risk of rice farming on technical irrigated rice field and rainfed rice field in South Lampung are listed in Table 1.

Table 1: Production Risk of Rice Farming on Technical Irrigated Rice Field and Rainfed Rice Field in South Lampung Regency.

Information	Technical Irrigated Field	Rainfed Field
The middle value of rice production(kg gkp) (E)	6.026,55	6.163,87
Standard deviation (V)	522,48	663,10
Coefficient of variation (CV)	0,09	0,11
Lower limit (L)	4.981,60	4.937,67

Table 1 shows that the risk of production (CV value) in the technical irrigated rice field is lower than in the rainfed rice field. This means that rice farmers on technical irrigated rice field have a smaller chance of losing production compared to rainfed rice field. This is because on the technical irrigated rice field, the availability of water is more secure and evenly distributed among farmers than in rainfed field so the variation of production among farmers in technical irrigated rice field is smaller than in rainfed rice field because there are farmers experiencing drought resulting in crop failure. Production risks are caused by uncertain climate, pest attack, flood and drought. This is in line with Soedjana study (2007) which shows the risk of production caused by events that are difficult to predict, such as climate changes, pests, disease, and genetical mutation. In addition, low productivity can also be caused by farmer's behavior towards risk, in the form of their willingness to take risks (Ellis, 1989).

Price Risk

Rice as a seasonal food commodity will definitely have price risk. At harvest time the price will fall while at the time of famine price will rise. Rice price risks on technical irrigated rice field and rainfed rice fields in South Lampung are listed in Table 2.

Table 2: Price Risk for Rice Farming on Technical Irrigated Rice Field and Rainfed Rice Field at South Lampung

Information	Technical Irrigated Field	Rainfed Field
The middle value of rice price(IDR/kg gkp) (E)	4.194,96	4.127,84
Standard deviation of rice prices (V)	190,90	174,49
Coefficient of variation (CV)	0,04	0,05
Lower limit (L)	3.813,11	3.778,85

Table 2 shows that the price risks are relatively small and equal between the price of paddy in the areas of technical irrigated rice field and in rainfed rice fields. Relatively, price risk is lower than production risk (Table 1).This is because rice prices have been regulated by the Government nationally through the Purchase Price Policy (HPP) of rice and grain. The average price of paddy rice in farmers on technical irrigated rice field is higher than the price in rainfed rice field, this is because rice farmers on technical irrigated rice field use technical irrigation (technology) thus the availability of water is more secure, so the application of rice cultivation technology package better and finally the quality of rice production is also better. According to Soekartawi et al 1993, the factors that influence price fluctuations are the speculation of intermediary traders who want to gain the maximum profits by themselves.

Income risk

Income risks for rice farming on technical irrigated rice field and rainfed rice field in South Lampung are shown in Table 3.

Table 3: Income Risk for Rice Farming on Technical Irrigated Rice Field and Rainfed Rice Field In South Lampung Regency

Information	Technical Irrigated Field	Rainfed Field
The middle income value of rice farming (IDR) (E)	18.740.052,67	16.144.084,35
Standard deviation (V)	2.279.735,41	2.942.276,91
Coefficient of variation (CV)	0,12	0,18
Lower limit (L)	1.405.707,74	1.025.953,54

Table 3 shows that the risk opportunities for paddy farming income both in technical irrigated rice field and rainfed rice fields are quite large (CV above 0.10). This is because the influence on the technical irrigated rice field in Bandan Hurip Village in the last five seasons is often flooded causing rice plants to be submerged within a few days (5 to 10 days) whereas on rainfed rice field the rice crops suffered drought for a long time. In addition, the high intensity of pests attack and plant diseases in rainfed rice field causes the variation in rice production is high enough so that the variation of income is also high even greater than the income variation of rice farming in technical irrigated rice field. If production is high, but the price still low then the income that will be received by farmers will also be low, and vice versa.

The production risk and price risk on the technical irrigated rice field are greater than the rainfed area, while the risk of rice farming in the rainfed rice field is greater than the risk of rice farming in the technical irrigated rice field. This is in line with Muzdalifah's study (2012) which shows that the income risk in technical non-irrigated rice fields is greater than in technical irrigated rice field, which indicated by high variation coefficients.

Farmer behavior against rice farming risk

Farmer’s behavior in dealing with risk is grouped into three groups, namely risk lover farmers, those who like to take risks, risk neutral farmers, those who are neutral towards risk and risk averter farmers, those who are reluctant to take risks (Darmawi, 2005). Farmer behavior against rice farming risk in South Lampung Regency 2016 listed in Table 4.

Table 4: Farmer behavior against rice farming risk in South Lampung Regency, 2016

Farmer’s Behavior Against Risk	Technical Irrigated Field		Rainfed Field	
	Amount (People)	(%)	Amount (People)	(%)
Risk lover	0	0	0	0
Risk Neutral	27	81,81	47	100
Risk Averter	6	18,18	0	0
Total	33	100	47	100

Table 4 shows that most rice farmers in the technical irrigated rice field and rainfed rice field are classified as neutral to risk, some are reluctant to risk and no farmers are willing to risk. This is in line with research conducted by Heriani (2013) which states that there is no single farmer in the study area who behaved dare to risk.

Rice farmers on technical irrigated rice field and rainfed rice field tend to be neutral and avoid risk. This happened because of the amount of losses that must be borne by farmers in case of crop failure. Rice farmers on both rice fields often experience crop failures caused by weather, pest, flood, and drought. Therefore, farmers tend to be neutral and even avoid risks.

This is in line with research on technical efficiency analysis and paddy rice risk by Parsini (2010), most farmers behave neutrally to the risks because rice farming is the main tradition and livelihood of respondents. Although rice farming has a risk of loss, there is no other farming option to avoid such risks.

The absence of farmers who dare to take risks causes farmers to adopt less technology, so the level of production efficiency obtained by farmers is low. Rice farmers on technical irrigated rain field behave neutrally to risk as much as 27 farmers (81.81 percent). Neutral to risk is the behavior of farmers where farmers make decisions by being hesitant or indecisive in selecting actions on risky circumstances in wetland rice farming. This happened because some farmers have other income besides their activities as farmers, so farmers are not too concerned with risk.

The amount of farmers on technical irrigated rice field that reluctant to risk is 6 farmers (18.18 percent). This happened because the farmers perceive that the results of their rice farming have been good enough, if they use additional inputs and seeds, it will increase their expenses so the farmers do not want to use them which can lead to excessive losses. Rice farmers in rainfed farms that behaved bravely to risk as much as 0 farmers (0 percent), this happened because farmers do not want to bear losses in their farms.

Rice farmers in rainfed farms that behaved neutrally to risk as much as 47 farmers (100 percent), and There are no farmers who are reluctant to risk . This happened because farmers tend to farm based on their hereditary habits, Farmers only work to provide for their household needs, so farmers do not rely toward farming risk, if there is additional capital for farmers, it may increase inputs for higher acceptance. Reluctant to risk is the behavior of farmers, where farmers will avoid risk and willing to sacrifice greater income opportunities. This behavior occurred because most farmers do not have the courage to deal with the risks. In fact, a brave attitude to risk will provide opportunities for farmers to gain greater benefits.

Rice farmers in rainfed farms behaved reluctant to risk because they don't want to risk themselves with the new innovations, so they only deal with the amount of income they have earned. In addition, farmers are reluctant to adopt the new technologies which have the opportunity to obtain greater income. Farmers do not want to spend higher costs, because the results are uncertain. Most farmers want a definite result to cover the certain costs and certain needs. Saptana et al. (2010) explained that basically, farmer’s willingness to make decisions to choose or act on risks, depends on the innate nature and utility obtained by farmers, based on the level of production produced (output). This is in line with the research on Soybean Agribusiness in Jombang by Soekartawi (1993) which states that the existence of aversion to risk by farmers shows that morally farmers are still thinking safety first or give priority to survive. The farmer still emphasizes his judgment on the satisfaction or usefulness of the receipt obtained for the fulfillment of household needs. Thus, it can be argued that the purpose of the farmer is not always to be based on the foundation of economic thinking since commercial considerations have not been able to change the traditional properties it possesses.

Conclusions

From the results of the study it can be concluded that paddy farmers in Lampung Regency most rice farmers on technical irrigation lands and rainfed land behave neutrally toward risk. Increasing farmers' income and developing rice farming requires courage in facing risks. Making changes in attitudes and changes in behavior of farmers who were initially neutral about the risk of being brave in dealing with risks is very important. Therefore it is necessary to conduct training to farmers through counseling, providing appropriate information so that farmers can allocate production factors to the maximum, even though they will face risks, but the goal of getting optimal results can be achieved.

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