

Risk and Social Economic Factor as a Management Risk Revealing (Vegetables Farmer Decision Making Study in Pujon Sub District Malang Regency)

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Abstract: *The aim of this research is to analyze farmer risk preferences and to examine the effect of risk and social-economic factors on the risk management strategy applied by the farmer. The data was collected by interviewing 137 sample farmer-respondents located in Pujon sub-district Malang regency. The findings of the research are as follow: First, it is found that small land farmer which cultivated land 0.69 ha on average, has a risk avert preference. It is also found that the larger the land cultivated the greater the certainty equivalent. If the farmer grows other crops in addition to cabbage and potatoes, then the farmer's income will be smaller. The price risk and yield risk are overcome by production contract, marketing contract, and crop insurance if the last scheme was implemented. It is also found that market information is mostly accessed by larger land cultivated farmers. Secondly, larger land farmer, which cultivated land 1.9 ha on average, has a risk-taker preference. The larger the land cultivated; the bigger the family number; and the higher the farm income the higher the certainty equivalent value will be. This group of farmers overcame the price risk by both production and marketing contracts. It is also found here that the longer farm experience will increase access to market information. The higher farm income will increase farmer participation in crop insurance programs if it was implemented. Third, in general, it was found that the average farmer which cultivated land 1.44 ha, has a risk-neutral preference. The higher the land cultivated and number of family, the higher the value of certainty equivalent will be. If the farmer grows other crops in addition to cabbage and potatoes, then the farmer's income will be smaller. It is also found here that the longer farm experience will increase access to market information.*

Keywords: risk, risk management, farmer, social economic

1. Introduction

1.1. Research Background

Farming is a risky occupation. Every time farmers face the possibility of price changes, productivity uncertainties and others that affect farmers' incomes. The consequences of decisions or events that are often not known with certainty, can lead to better or worse results than expected (Harwood et al., 1999). The fact shows that nature has a big influence on agriculture so that it will influence the decisions taken by farmers (Semaon, 1992).

Horticulture, especially vegetables, is a product perishable. What about the vegetable policy in Indonesia? The development of vegetable commodities in Indonesia is directed, among others, to achieve the following objectives: (1) meet domestic market demand and in order to improve community nutrition; (2) reduce sharp price fluctuations in order to maintain economic stability; (3) reducing imports and increasing exports; and (4) expanding employment opportunities and increasing farmers' incomes. Implementation, it seems there is no policy related to vegetables that protect the interests of farmers. Therefore there needs to be a policy, especially for vegetable farmers to protect vegetable farmers from various risks. What is the policy model that can protect farmers from various risks? We can see the policy model adopted by Japan as follows:

Japan is a country that is determined to protect the interests of its farmers from various risks. According to Ito and Dyck (2002), Japanese policies in the vegetable sector support

farmers' incomes, by maintaining market stability. If the market price falls below the historical average price, farmers receive compensation for most of the falling prices. Farmers are not expected to plant more than the target planting area. Price stabilization is the main goal for the Japanese vegetable sector. Farmers and the government are afraid of falling prices which can cause a sharp decline in farmers' main sources of income.

Price fluctuation events include uncertainty (Ellis, 1989). Events in the world can be classified into two extreme situations, namely (1) events containing risks with the probability of the result being known, and (2) uncertain events with the probability of an unknown result. Attempted to change the uncertainty event into an event that contains risks (Semaon, 1992). The probability of the final result can be obtained in two ways, namely: (a) Objective probabilities are interpretations of probabilities in the form of numerical numbers. This view is based on the fact that if an event is repeated continuously, a frequency ratio will be obtained that will approach a certain value (b) Subjective probabilities are statements of confidence in estimating each output probability. This probability is not determined by the results of the experiment but is determined solely by decision-makers (Semaon, 1992; Mangkusubroto and Trisnadi, 1987).

Efforts to reduce risk can be done with crop insurance and diversification (Nicholson, 1990). Farmers can manage risk by diversification, production contracts, marketing contracts and crop insurance (Harwood, et al., 1999). Uncertainty can be reduced by increasing market integration with

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information and communication access (Ellis, 1989). Providing more and better information for market services and other methods of providing information that can directly reduce risk (Eidman and Olson, 2000; Patrick, 2001). In general, the majority of farmers tend to pay attention to productivity risks and price risks (USDA, 1999; Coble, et al., 2000). Access to market information aims to enable farmers to find out price information, product information, see trends price and productivity, and make decisions for their farming activities (Eidman and Olson, 2000; Patrick, 2001).

Management of productivity risk and price risk is carried out by diversification, production contracts, marketing contracts, crop insurance, and market information access. Diversification, in this case, is diversification of commodities in farming. By carrying out various business fields or diversifying commodities, the losses incurred in one commodity may be compensated with gains in other commodities. Diversification can be used as a way to overcome income variability. Production contracts are risk management by taking over control of production and in determining seedlings, other inputs, and management practices. As a result of management takeovers, the risk of decreasing farmer income can be reduced and access to capital guaranteed. A marketing contract is risk management with a takeover of marketing controls and commodity prices (Harwood, et al., 2000). Crop insurance is risk management by protecting farmers from large economic losses due to risky events. An event is called risky if the actual yield of farming is much lower than what farmers expected (Somwaru, 2001).

Farmers' attitudes and abilities differ in dealing with risky situations. Risk management cannot be described using the "one fits all" approach. Risk management by farmers has different implications for different people, depending on the attitude of the farmer towards risk, financial situation and available opportunities. To find out farmers' preferences towards risk, farmers are grouped into two categories, namely, farmers who control land up to one hectare are called smallholder farmers and farmers who control more than one hectare of land are called large land farmers (Soehardjo et al., 1985).

1.2. Problem Formulation

Identification of the research problem formulation is: "Whether the risk and social-economic factors of farmers can reveal risk management". In detail the formulation of the problem is described as follows:

- 1) What are the preferences of small land farmers, large land farmers and all farmers towards risk.
- 2) What social economic factors influence Certainty Equivalent for smallholders, large holders, and all farmers.
- 3) What risks and social-economic factors of farmers influence the selection of risk management for smallholders, large holders, and all farmers.

All farmers in the research location carried out diversification, namely planting more than one commodity in several growing seasons alternately on agricultural land

for a certain period. Because all farmers diversify, diversification in this study is a condition for determining commodities and determining respondent farmers, namely farmers who always grow potato and cabbage commodities each year, besides planting other commodities.

1.3. Research Objectives

The aim of this research is to analyze and test the effect of risk and social-economic factors of farmers on the application of risk management namely diversification, production contracts, marketing contracts, access to market information, and crop insurance. In detail the research objectives are as follows:

- 1) Knowing the preferences of farmers to risk, namely whether risk-averse, risk-neutral or risk-takers for smallholder farmers, large land farmers, and all farmers.
- 2) Knowing what social-economic factors that influence the Certainty Equivalent for smallholders, large holders, and all farmers.
- 3) Knowing the risks and social-economic factors of farmers that influence the selection of risk management for smallholders, large farmers, and all farmers.

This research attempts to create a complete framework for risk, by adopting risk thinking, the function of income utilities and its measurement from Scandizzo and Dillon (1977); thinking about risk, the function of utility wealth and its measurement from Roumasset, et al. (1979), research and measurement of productivity risk and price risk from Coble, et al. (1999; 2000; 2001; 2002); Harwood, et al. (2000); Patrick (2001), research on managing risk of production contracts, marketing contracts and crop insurance from Harwood et al. (2000); Somwaru (2001); Patrick (2001) and research on managing market information access risk from Eidman and Olson (2000); Patrick (2001).

The study was conducted to obtain information about: (1) Vegetable farmers' understanding of risk, namely productivity risk, price risk, and farmer risk preference. (2) The utility of wealth, because the risk is related to the utility function. While wealth is related to farmers' social-economic factors. Therefore, it will be calculated the social-economic factors of farmers that affect the utility of wealth. utilities Wealth in conditions of uncertainty are approached with CE values; and (3) Selection of risk management by farmers based on risk and social-economic factors of farmers.

1.4. Benefits of Research

- 1) Contribution of thought to management science, specifically risk management which includes a complete explanation of (a) risk by calculating risk with price and productivity variability using coefficient of variation and Likert scale; (b) the function of income utilities and calculation of farmers' preferences towards risk using the Scandizzo and Dillon models, which are alternative models other than the Neumann-Morgestern model; (c) an explanation of risk management carried out by farmers which is a combination of several risk management strategies and; (d) strategies are taken by farmers in managing risk.

- 2) Contribution of ideas for the government in making policies that can increase farmers' income in regulating the transaction mechanism between farmers as producers and traders so that there is a balance such as a spot and forward contract system and support for the use of agribusiness information systems to find out the information network of producer centers and producer centers.

Contribution of thoughts for future researchers, namely as a basis for farm risk management. It is hoped that further research will be carried out on price risk management, namely commodity futures contracts and further research on crop insurance to model and apply for crop insurance following field conditions.

2. Framework and Research Methods

2.1. Framework for Thinking

In theory, uncertainty is the situation of the mind when a person thinks of the possible results of an action. Risk, on the other hand, is related to the degree of uncertainty in certain situations.

The definition of risk in this study is in accordance with the conference Agricultural Development Council (Roumasset, et al., 1979) namely: (1) risk is a measure of the dispersion of income that might be achieved, for example, variety; (2) risk is the probability of revenue falling as a result of a decision, below the critical level of loss; (3) risk cannot be measured separately from the utility function itself; (4) Risk is the value a person is able to pay to avoid loss.

The definition of risk management is an effort to minimize uncertainty so that the losses incurred can be eliminated or at least minimized. Risk management can be done in various ways and the management of various ways of risk management is called risk management or risk management (Djojosoedarso, 1999). Risk management includes the tasks of identifying risks faced, measuring and determining the magnitude of those risks, then developing strategies to minimize or manage risks.

The definition of risk management is an effort to minimize uncertainty so that the losses incurred can be eliminated or minimized by identifying the risks faced, measuring and determining the magnitude of those risks, and developing strategies to minimize or manage risks. The strategies used to manage risk are diversification, production contracts, marketing contracts, access to market information and crop insurance. The definition of reducing risk is reducing the possibility of income falling below a certain level of loss. Farmer income is calculated based on production and commodity prices. Productivity variability and price variability are often measured by indicators of the coefficient of variance (CV) comparison of standard deviations with mean values.

2.2. Limits and Assumptions

Farmers are a group of people who have a marginal position in the economic world (Ellis, 1989). Farmers cannot fully

integrate with the market and cannot be free from negative effects, because farmers stand with one foot in the market area and the other foot in the subsistence area. Farmers are not fully integrated with markets, which because of the nature of subsistence production causes partial integration with markets. This is what distinguishes between peasant farming and commercial farming in industrial countries that are truly integrated with the market. The lack of understanding of these aspects often results in the emergence of rural development policies that implicitly suggest to haste to transform farmers into commercial farming.

Ellis (1989) formulated the definition of farmers as follows: Peasants are farm households, with access to their means of livelihood inland, utilizing mainly family labor in farm production, always located in a larger economic system but fundamentally characterized by partial engagement in markets which tend to function with a high degree of imperfection.

Three problems need to be noted that relate to the above definition. First, farmers must be seen as having economic rationality. In analyzing the economy, farmers are concerned with efforts to realize their goals for their personal or family interests as well as other economic institutions. The only caution that must be considered is modification with greater social forces. Second, the definition contains ambiguity in traditional, subsistence and small terms. The traditional term partly implies production techniques and partly psychological factors.

Since many farming activities reflect wise adaptation to survive in a difficult environment, there is no need to contradict traditional or modern. The term subsistence describes only one partial aspect of farm family farming and not a large difference in economic analysis. Whereas the term small land farmer has more connotations with emotive nature and is not supported by established theory. Third, farmers will lose their peasant character if they have fully integrated into integrated markets so that they can be categorized as family farm businesses.

Concerning agricultural development, three criteria groups are important in discussing farmers' involvement with the outside world, namely economic criteria, social cultural criteria and development criteria. Which includes the first criterion is the ratio of farm sales. According to this criterion, subsistence farmers are farmers who consume a portion of their farming products. Decisions regarding consumption and production are a unity, and the level of dependence of farmers on their farming causes consumption considerations to dominate commercial considerations, thus affecting their decision making and economic behavior. Second is the ratio of labor paid to the purchase of production facilities. These two factors are very important indexes in assessing farmer involvement and integration with the broader economy. The third is concerning the level of technology used, which subsistence farmers have not shown because they tend to use traditional and simple ones. Fourth, income and level of life of farmers. Subsistence farmers are usually classified as poor. To assess it, it is necessary to use a size that varies depending on the general

economic situation, although based on minimum income standards. Fifth, freedom in decision making. Subsistence farmers are usually seen as people who have very limited choices, the level of freedom both in farming and in the family is very limited. As the main limitation is economic institutions besides the opportunity to vote is also limited.

Economics can be defined as a whole of economic organization and economic activity carried out in a particular region. Economics is one part of the institutional framework of a society that deals with the material needs of goods and services. According to Hasibuan (1993) the situation of Indonesian farmers in rural areas is often trapped in monopsony or oligopsonistic structures, which makes it difficult to increase farmers' incomes.

Most farmers peasant around the world now live in an open village environment, that is, in villages where (1) the community has individual responsibility for paying taxes, (2) the boundary is blurred between villages and the outside world, (3) ownership the land is almost without limits, (4) village citizenship is blurred and (5) the ownership of individual land ownership is recognized (Arief, 1990).

Trade crops can provide higher income expectations than subsistence crops, but trade crops can cause losses to cross the bottom line.

According to Grinol (1994) economic theory is a method of analysis with the postulation of several actors with specific goals and deductive efforts to understand how someone will act in situations that allow for choices on the assumption that they are trying to reach their goals rationally.

With rationality, each person evaluates the results that he might achieve by producing following their choices in conditions that suit their preferences and values. In this process, they compare the results they have achieved by adjusting the evaluation of each outcome according to the subjective estimates of the likelihood of achieving certain results. Finally, they make choices that they think will be able to maximize the utility of their expectations. Many people equate rationality with self-interest which is defined as only being interested in one's welfare. In reality, at some point a farmer thinks of himself, his family, his friends, and even his village.

Rationality needs to be viewed from an individual perspective because what is rational for someone can be different from what is rational for society. There is a difference between the two views on rationality, which is not impossible to contradict each other. Therefore it often happens, that the actions of a rational farmer concerning the market with the market or other aspects, do not reflect a rational society.

2.3. Hypothesis

The research hypothesis is as follows:

- 1) Smallholder farmers are more risk-averse than large-scale farmers.
- 2) Social-economic factors influence certainty equivalent of farmers.

- 3) The choice of diversification is influenced by the risk and social-economic factors of farmers.
- 4) The selection of production contracts is influenced by the risk and social-economic factors of farmers.
- 5) The selection of marketing contracts is influenced by the risk and social-economic factors of farmers.
- 6) The choice of market information access is influenced by farmers' risk and social-economic factors.
- 7) The selection of crop insurance if held is influenced by the risk and social-economic factors of farmers.

2.4. Research Methods

The type of data used is primary data and secondary data. The way to collect primary data is through interviews and answering questionnaire questions. While secondary data was obtained from farmer data inventory by the Agricultural Extension Office (BPP) of Pujon District, Pujon District Office, Malang Regency Information and Agricultural Extension Office (BIPP), Department of Agriculture, Food Crops, Department of Industry and Trade of Malang Regency and from offices in Malang Regency, East Java Province and the Ministry of Agriculture.

The unit of analysis as the object of this research is farmers who diversify by rotating potato and cabbage crops for two growing seasons each year, other planting seasons are used by farmers to grow commodities other than potatoes and cabbage in Pujon Subdistrict which are spread in 10 villages. The basis for determining commodities based on the coefficient of commodity-cabbage income (C -cabbage) of -0.03 is the most optimal. The population based on data from BPP District Pujon in 1998 amounted to approximately 280 farmers (N). For analysis in this study, sampling was conducted with a minimum number of respondents of 100 people (Hair, et al, 1992). Based on the data above, samples of 137 farmers who fulfilled the requirements were carried out, namely farmers who diversified by rotation of potato and cabbage plants by 137 farmers (n).

The duration of the study was conducted for approximately 8 months. Researchers conducted interviews with respondents repeatedly visited and continued with respondents answering questionnaires. The overall sample size requirement (n) is 10% of the total population (Gay and Diehl in Sigit, 2001). Samples were taken approximately 49% of the population, so the samples taken meet the requirements.

Some of the models used in the first study are the mean-variance (E, V) model Scandizzo and Dillon, the two logarithmic estimator function models and the three logit models.

First, analyzing farmers' preferences on risk, using the (E,V) Scandizzo and Dillon (1977) models, namely:

$$U(X) = E(X) + \phi [V(X)]^{1/2} = U(CE),$$

where:

U= Utility; ϕ = coefficient of risk choice;

X= random value of risky income

E (X) = Expectations (X); is the average random income from a risk prospect

CE = certainty equivalent is a result or farm income that is decided by the farmer in an uncertain condition where the farmer feels no difference between receiving a result that is reflected in uncertainty or receiving conditions with a certainty of yield with value certain.

$[V(X)]^{1/2}$ = standard deviation of the random value of income X whose value is fixed, we can calculate the amount ϕ , which is the difference between CE and E (X). Random income from risk prospects is calculated based on productivity and commodity prices for four years. Measurement of productivity risk and price risk using the Coefficient of Variance (CV) which is then converted on a Likert scale. Likert scale score 1 = very low, if the productivity variability that occurs between 0 to less than 20% (score 1 indicates that productivity variability less than 20% are categorized as not at risk (Harwood, et al. 1999); score 2 is categorized as risky low, i.e. if productivity variability occurs between 20% to less than 40%; score 3 is categorized as moderate risk, i.e. if productivity variability occurs between 40% to less than 60%; score 4 is categorized as high risk, i.e. if productivity variability which occurs between 60% to less than 80%, a score of 5 is categorized as very high risk if the variability of productivity that occurs between 80% to 100 %. In the same way, a measurement of price variability is carried out.

The farmers' preference for risk is obtained by comparing income expectations with value certainty equivalent, if the expected income is less than value, certainty equivalent then the risk preference is risk aversion, the expected income is equal to the value certainty equivalent is risk-neutral, while the risk-taker if the expected income is greater than the value certainty equivalent.

Second, the relationship between utility and wealth (wealth Roumasset (1979). Farmers are assumed to maximize utility following the utility function of wealth (Roumasset, 1979; Coble et al, 2000). Wealth is related to farmer's social-economic factors. Therefore, it will be counted social-economic factors affecting farmers' utilities wealth developed and enriched with social-economic factors. Social-economic factors farmers are land controlled by farmers (X_1), its size (X_2), farm income (X_3), education (X_4), farm experience (X_5).

To test the second hypothesis the exponential estimator function model is used: $U(w) = b_0 \prod X_i^{b_i} e^u$, where U (w) is a utility wealth; X_i , is a farmer's social-economic factor. utility Wealth in conditions of uncertainty is approached with a certainty equivalent (CE) value.

where:

$U(x)$ = Utility; b_0 = intercept (constant)

X = social-economic factor of farmers,

e = natural logarithm number

b_i = estimated regression coefficient;

u = error

Thus the logarithmic regression model becomes:

$$U(x) = b_0 X_1^{b_1} X_2^{b_2} X_3^{b_3} X_4^{b_4} X_5^{b_5} e^u$$

With logarithmic transformation, the above equation is converted to a multiple linear regression equation (double log), becomes:

$$\ln U(x) = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + u$$

Third, is the probability of farmers' preference for risk management efforts based on factors social-economic and farmer risk preferences (Coble et al., 2000) which are processed using the logit model. The dependent variable is (1) whether or not to diversify (Y_p), (2) whether or not to choose a production contract (Y_p), (3) whether or not to carry out a marketing contract (Y_m), (4) choose to access price information or not (Y_i), (5) choose to run crop insurance if held or not (Y_a). The independent variable (X_i) is the social-economic factors of farmers is land area (X_1), the number of families (X_2), farm income (X_3), education (X_4), farm experience (X_5), and risk is the risk of productivity (X_6) and price risk (X_7) (Coble, et al, 2000). Logit model for testing hypothesis 3; 4; 5; 6 and 7 are formulated as follows:

$$Y_p = a_0 + b_1 X_1 + b_2 X_2 + b_3 X_3 + b_4 X_4 + b_5 X_5 + b_6 X_6 + b_7 X_7 + u_i$$

Where:

Y_p = problem in managing risk or not

$Y_p = 1$; if doing risk management

$Y_p = 0$; if you don't manage risk

3. Results and Discussion

3.1. Overview of Farmers' Risk Management

3.1.1. Diversification

Estimation of the level of diversification is measured by a diversification index with the following formula (Kurosaki, 2002):

$$D = 1 - H; H \text{ adalah index Hirschman-Herfindahl}; H = \sum (A_{hit}/A_{hjt})^2; A = \text{luas lahan}; i = \text{jenis tanaman}; h = \text{areal}; t = \text{tahun}$$

The level of diversification level is divided into two, namely high diversification if the diversification index is more than 0.5. While the diversification category is low if the diversification index is less than 0.5. Diversification is low if a large portion of farmer's land is planted with potatoes and cabbage. Whereas diversification is high if in addition to planting potatoes and cabbage farmers grow other commodities.

Table 1: Level of Farmer Diversification

Strata	Level Diversification		Farmer
	Low	High	Total
Small Land	23	29	52
Large Land	39	46	85
All Farmers	62	75	135

Sources: Primary data, processed 2003

3.1.2. Production Contract

From Table 2, it is known that most smallholders do contract bonded type production is equal to 27.9% of all farmers who make production contracts. Whereas, most large-scale farmers engaged in production contracts with the supply of production materials with agro-industry at 32.6% of all farmers who carried out production contracts that carried out production contracts. The provision of production materials by agro-industry is included in the marketing of farmers'

products. So both the small land farmers and large land farmers who carry out production contracts aim to also market their products to the contractor.

Table 2: Distribution of Farmers Conducting Production Contracts in Pujon District Malang Regency, 2003.

	Types of Production Contracts						Total	
	Market Results: Ijon		Production Management: Seeds		Suppliers Production Provision: Agro-industry			
	n	%	n	%	n	%	N	%
Small	12	28	4	9	0	0	16	37
Large	0	0	13	30	14	33	27	63
Total	12	28	17	39	14	33	43	100

Sources: Primary data, processed 2003

3.1.3. Marketing Contracts

Based on Table 3 it is known that the most widely performed marketing contract is a marketing contract with a down payment system with traders by 82.1%. The second-largest marketing contract of 15.5% is a forward contract with price-fixing. This type of contract is usually done between farmers and buyers who already know each other. A third marketing contract is a forward contract with a price and quality determination of 2.4%. The high number of sample farmers conducting marketing contracts is because farmers need to market their products as quickly as possible, to avoid price risk.

Table 3: Distribution of Farmers Conducting Marketing Contracts in Pujon District Malang Regency, 2003.

	Types of Contract Marketing						Total	
	Down Payment		Forward Contract : Price		Forward Contract :Price & Quality			
	n	%	n	%	n	%	N	%
Small	25	30	3	4	0	0	28	33
Larges	44	52	10	12	2	2	56	67
Total	69	82	13	16	2	2	84	100

Sources: Primary data, processed 2003

Most down payment marketing contracts are carried out by farmers. Farmers receive advance payments from traders about two to three weeks before harvest, the rest of the payment is paid at harvest. Usually, traders buy farmers' harvests by slashing or contracting. By purchasing a slash system on the ground, then the harvest and transportation costs will be borne by the buyer.

3.1.4. Access to Market Information

Information needed by farmers is price and information related to production, namely land information and planting information. The findings in the field show that farmers who do farming using market information as many as 112 people or 81.8%, while those who do not use market information as many as 25 people or 18.2%. The price information is useful for farmers to see commodity price trends in several consumer centers.

3.1.5. Crop Insurance

To minimize adverse effects on productivity risks and price risks, farmers have made anticipatory efforts that can be classified as informal insurance or self-insurance. These efforts include undertaking production contracts and

marketing contracts. In Indonesia, formal crop insurance as in developed countries does not yet exist, but that does not mean that farmers do not need formal insurance. Farmers' assessment of crop insurance depends on the choice of farmers' strategies for dealing with risks. The main purpose of formal crop insurance is to protect farmers from large economic losses due to a risky event. An event is called risky if the actual yield of the farm is much lower than the farmers expected.

The results of the survey are that farmers who want productivity insurance are 32% and income insurance is 68%. Farmers choose to participate in the crop insurance program if it is held including the ability to pay premiums as an obligation to take part in insurance, because of the high price variability and productivity.

3.1.6. Farmers' Preference for Risk

Table 4 shows productivity risk, price risk measured by CV. Farmers' preference for risk, namely risk-averse, risk-neutral and risk-takers, is measured based on research and Scandizzo and Dillon (E, V) models.

Table 4: Farmers' Preference for Risk

Preference for risk	Farmer small land		Farmer large land		Total	Total %
	n	%	n	%		
risk-averse	41	30	33	24	74	54
risk-neutral	1	0.7	1	0.7	2	2
risk-takers	52	38	85	62	137	100
Risk Options Coeff (ö)	-0.08		0.05		0.00	
Productivity Risk	0.39		0.44		0.42	
Price Risk	0.61		0.63		0.62	

Sources: Primary data, processed 2003

The risk of productivity of smallholder farmers is 0.39, large area farmers are 0.44, all farmers are 0.42. Price risk, 0.61 for smallholder farmers; 0.63 for large land farmers and 0.62 for all farmers. The risk of productivity of smallholder farmers is lower than that of large holders and all farmers. Price risks of smallholder farmers, large area farmers, and all farmers are almost the same.

The risk preference coefficient (ϕ) of small land farmers - 0.08 means that the behavior of small land farmers is risk-averse. The risk preference coefficient (ϕ) of farmers' large area is 0.05 means that the behavior of large area farmers is a risk-taker. The risk preference coefficient (ϕ) for all farmers is 0.00 means that the farmer's behavior is risk-neutral.

The results of this study are supported by Scandizzo and Dillon (1976) in their study of small farmers in Brazil found behavior similar to the above, risk-averse and Widyastuti's research (1996), revealed that the behavior of large land potato farmers in Batu was risk-takers.

3.1.7. Social Economic Factors Affecting CE

Based on Table 5 Table 6 and Table 7 with the F test, the regression model can be used to predict CE. Or it could be said social economic factors are controlled farmer's land area (X_1), the number of families (X_2), farm income (X_3), education (X_4), farm experience (X_5), jointly affect the CE good for smallholders, large estates and all farmers. Thus

hypothesis 2, social economic factors affecting certainty equivalent farmers are tested.

3.1.8. Small Land Farmers

Based Adjusted R², CE can be explained by 26.6% by the fifth independent variable, namely the land area (X₁), the number of families (X₂), farm income (X₃), education (X₄), farm experience (X₅). Research in social science generally produces a low coefficient of determination, as in Binswanger's (1980) study which tries to link individual characteristics with risk-averse in India, only producing a coefficient of determination of 0.09. Even Arief's research (1990), which revealed the relationship between social-economic factors of rice farmers on the northern coast of Java with the principle of security was not significant.

Table 5: Social Economic Factors of Small Land Farmers Affecting CE

Variable	Regression coefficient	
	Coefficient	Sig.
Land area	.194*	.042
Number of Family	-.108	.118
Farming Income	.039	.659
Education	.004	.962
Experience	.044	.197
Constant	14.602*	.000
F-test	4.703*	.001
Adjusted R ²	0.266	

* significant at p-value <.05.

Source: Primary data, processed in 2003.

T-test results with a significance of p <.05, indicating that the area of land significantly affected the CE value. A larger land area of 1% will result in an increase in CE values by an average of 19.4%.

Family size, farm income, education, and farm experience have no significant effect on CE scores. Increasing the number of families by 1% will result in a decrease in CE values by an average of 11%. Increasing farm income by 1% will result in an increase in CE values by an average of 0.4%. Higher education by 1% will result in an increase in CE values by an average of 0.4%. The longer farm experience by 1% will lead to an increase in the CE value of 4.4%.

3.1.9. Large Land Farmers

Based on the adjusted R², CE can be explained by 35.4% by the five independent variables are land area (X₁), the number of families (X₂), farm income (X₃), education (X₄), farm experience (X₅).

Table 6: Social Economic Factors of Large Land Farmers Affecting CE.

Variable	Regression coefficient	
	Coefficient.	Sig.
Land area	.007*	.027
Number of Family	.118*	.022
Farm Income	.006*	.049
Education	-.016*	.001
Experience	-.114*	.000
Constant	14,737*	.000
F-test	14.737*	.000
Adjusted R ²	0.354	

* significant at p-value <.05.

Source: Primary data, processed in 2003.

-test results with a significance of p <.05, land area, number of families, farm income, education, and farm experience significantly influence CE. A larger land area of 1% will result in an increase in CE value by an average of 0.7%. The greater the number of families by 1% will result in an increase in CE values by an average of 12%. A greater farm income of 1% will result in an increase in CE values by an average of 0.6%. Greater education of 1% will result in a decrease in CE values by an average of 1.6%. More farm experience by 1% resulted in a decrease in the CE value of 11.4%.

The higher education and the longer farmer experience, the lower the CE value. This is due to the high education and the long experience of large land farmers, making them diversify their businesses by raising dairy cows, so they are less focused on farming. This is why the productivity of large land farmers is lower than that of small land farmers. The business of raising dairy cows is done because it turns out that for now to maintain a single cow is still more profitable than cultivating the land.

3.1.10. All Farmer

Based Adjusted R², CE of 28.1% can be explained by the five independent variables are land area (X₁), the number of families (X₂), farm income (X₃), education (X₄), farm experience (X₅).

Table 7: Social economic Factors Affecting Farmers entire CE

Variable	Regression coefficient	
	Coefficient.	Sig.
Land area	.072*	.001
Number of Family	.038*	.034
Farm Income	.049	.134
Education	-.113*	.008
Experience	-.007*	.000
Constant	14.781*	.000
F-test	12.467*	.000
Adjusted R ²	0.281	

* significant at p-value <.05.

Source: Primary data, processed in 2003.

T-test results with a significance of p <.05, indicating that the area of land, number of families, education and farm experience significantly influences the CE value. A larger land area of 1% will lead to an increase in the average CE value of 7.2%. The greater the number of families by 1% will result in an increase in CE values by an average of 3.8%. Higher education by 1% will result in a decrease in CE values by an average of 11.3%. A greater farm experience of 1% will result in a decline in CE values by an average of 0.7%.

3.2. Risks and Social Economic Factors of Farmers as Reveals of Risk Management

Based on Table 8, Table 9 and Table 10, the probability value of the classification table without the influence of variables and with the effect of variables of smallholders, large areas and all farmers is greater than the *cut value* of 0.5 shows the dichotomy classification of the dependent variable is correct. The Hosmer and Leme show test is a model of the *Goodness of fit test* for smallholder farmers, large tracts of

land and all farmers greater than 0.05 indicating that the logit model is appropriate for each risk management namely diversification, production contract, marketing contract, access to market information and crop insurance if held. Thus hypothesis 3, namely the selection of diversification by farmers is influenced by risk and the social-economic factors of farmers are tested. Hypothesis 4, the selection of production contracts by farmers is influenced by risk and the social-economic factors of farmers are tested. Hypothesis 5, the selection of marketing contracts by farmers is influenced by risk and the social-economic factors of farmers are tested. Hypothesis 6, namely the choice of market information access by farmers is influenced by risk and the social-economic factors of farmers are tested. Hypothesis 7, namely the selection of crop insurance if held by farmers is influenced by the risk and tested social-economic factors of farmers.

3.2.1. Small Land Farmers

Based on Wald tests as listed in Table 8, if the land area is getting bigger, small land farmers will reduce diversification, from planting potatoes, cabbage and other commodities to planting potatoes and cabbage. If smallholder farmers diversify by planting potatoes, cabbage, and other commodities, the farm income will decrease. Productivity risk and price risk do not affect diversification. Education, farm experience and number of families also have no effect on diversification.

Table 8: Risk and Social-Economic Factors of Smallholder Farms That Affect Risk Management.

Variable	Coef Div	Coef. KProd	Coef KPsr	Coef AInfo	Coef AsPert
Land area	-6.96 *	-4.44	.67	12.95 *	-5.98
Number of families	.15	.037	.20	-.39	-1.29
Farm income	.00	0.00	.00	.00	.00
Education	.16	-.13	-.06	.32	3.53
Experience	-.02	-.17	-.02	.09	.01
Productivity risk	.81	-0.3	1.38 *	-.53	-1.83
Price risk	-.34	0.71 *	.32	-1.02 *	1.17 *
Constants	-.65	-2.64	-3.9	.31	-9.54
Hosmer Lemeshow Tests	.50 **	0.62 **	.56 **	.44 **	.80 **

* significant at p-value <.05

** significant at p-value >.05

Source: Primary data, processed in 2003.

Explanation:

Div = Diversified

Kprod = Production contract

KPsr = Production contract

Infiniti =Information

AsPertAccess = Crop Insurance if held

For smallholder farmers production contracts are used to reduce price risk because the majority of smallholder farmers undertake bonded production contracts. Productivity risk does not affect the production contract, because the productivity risk of smallholder farmers is included in the low-risk category so that the production contract is carried out not because of productivity risk but because of price risk. Land area, family size, farm income, education, and also no effect on production contracts.

Marketing contracts are used to reduce production risks because the majority of smallholder farmers undertake a marketing contract for a type of down payment with a slash purchase system that does not differentiate quality and traders estimate the amount of production per land area. Land area, family size, farm income, education, farm experience have no effect on marketing contracts.

If the area of land gets bigger, small land farmers will increasingly access to market information. Farm income, education, farm experience and number of families do not affect access to market information.

Crop insurance is used to reduce price risk because crop insurance chosen by smallholder farmers is income insurance rather than productivity insurance. Land area, farm income, education, farm experience and number of families have no effect on crop insurance if held. When price risk occurs, smallholder farmers anticipate it by carrying out risk management of production contracts rather than crop insurance if held.

3.2.2. Large Land Farmers

Based on the Wald test in Table 9, the price risk makes large land farmers reduce diversification from growing cabbage, potatoes and other commodities to planting potatoes and cabbage. Productivity risk has no effect on diversification. Land area, farm income of education, farm experience and number of families also have no effect on diversification.

Table 9: Risks and Social-Economic Factors of Farmers of Land Area Affecting Risk Management.

Variable	Coef Div	Coef. KProd	Coef KPsr	Coef AInfo	Coef AsPert
Land area	-.54	.09	-.44	.09	3.36
Number of families	-.26	.36	.08	-.23	1.06
Farm income	.00	.00	.00	.00	.00*
Education	.11	.13	-.04	.24	.20
Experiences	.03	-.02	-.02	.09*	-.00
Productivity risk	-.58	-.50	-1.31*	-.11	-.83
Price risk	.46*	.84*	1.34*	.12	1.08
Constants	-.92	-5.52*	.20	-1.23	1.11
Hosmer Lemeshow Test	339**	.40 **	0.33 **	.49 **	.99 **

* significant at p-value <.05

** significant at p-value >.05

Source: Primary data, processed in 2003.

Large land farmers reduce price risk with production contracts because the majority of farmers enter into production contracts with agro-industries related to yield markets. Productivity risk does not affect the production contract, because the productivity risk of large land farmers is included in the medium-risk category so that the production contract is carried out not because of productivity risk but because of price risk. Land area, farm income, education, farm experience and number of families also have no effect on production contracts.

In addition to production contracts, large land farmers reduce price risk with marketing contracts. Land area, farm income, education, farm experience and number of families have no effect on marketing contracts.

Farm experience makes large land farmers increase access to market information. Productivity risk and price risk do not affect access to market information. Land area, farm income, education and number of families also do not affect access to market information. Increasing farm income will increase the participation of large land farmers in the crop insurance program if held. Productivity risk and price risk do not affect crop insurance. Land area, education, farm experience and number of families also have no effect on crop insurance if held. If there is a price risk, large land farmers anticipate it by carrying out marketing contracts rather than production contracts.

3.2.3. All Farmers

Based on the Wald test as listed in Table 10, if land area increases the farmer will reduce diversification from growing potatoes, cabbage and other commodities to growing potatoes and cabbage. If farmers diversify by growing potatoes, cabbage, and other commodities, their farm income will decrease. Productivity risk and price risk do not affect diversification. Education, farm experience and number of families also have no effect on diversification.

Table 10: Risks and Social-Economic Factors of Farmers That Affect Risk Management.

Variable	Coef Div	Coef. KProd	Coef KPsr	Coef AInfo	Coef AsPert
Land area	-1.28*	.01	-.26	.26	2.75
Number of families	-.06	.36	.21	-.22	.04
Farm income	.00*	.00	.00	.00	.00
Education	.11	.09	-.03	.22	.32
Experience	.01	.02	-.01	.07*	-.02
Productivity risk	-.12	.29	-.06	-.20	-.69
Price risk	-.06	.20*	.72*	-.15	.78*
Constants	-.65	1.57*	-2.12	.69	.41
Hosmer Lemeshow Test	.09 **	.81 **	.10 **	0.8 **	.57 **

* significant at p-value <.05

** significant at p-value > .05

Source: Primary data, processed in 2003.

Farmers reduce price risk with production contracts. Production contracts run by farmers with the aim of the market for the products. Productivity risk does not affect diversification. Land area, farm income, education, farm experience and number of families also have no effect on production contracts.

In addition to production contracts, farmers reduce price risk with marketing contracts. Productivity risk does not affect marketing contracts. Land area, farm income, education, farm experience and number of families also have no effect on marketing contracts.

Farm experience makes farmers increasingly improve market information access. Productivity risk and price risk do not affect access to market information. Land area, farm income, education and number of families also do not affect access to market information.

Crop insurance is used to reduce price risk, because the farm insurance chosen by farmers is income insurance not productivity insurance. Land area, farm income, education, farm experience and number of families have no effect on crop insurance if held. When price risk occurs, farmers

anticipate it by carrying out marketing contracts rather than agricultural production and insurance contracts if held.

3.3. Research Contribution

To be able to see the contribution made by this study, it is necessary to compare with some of the previous studies in the following table:

Table 11: Comparison of Earlier Research with Sugeng Santoso's Dissertation

No	Researcher	Topic	Results
1	Scandizzo & Dillon (1979)	Measurement of risk preferences	The coefficient of risk choice and principle of security
2	Huijsman (1986)	Farmer response to risk and uncertainty of production	Differences in attitude to risk at various levels of technology adoption
3	Arief, B (1990)	Farmer rationality in diversification	Risk choice coefficient and the principle of security
4	Widyas-tuti (1996)	Taking decisions on risk conditions Risk	choice coefficient
5	Harwood et al. (1999)	Risk Management in Farming Risk	measurement with CV
6	Coble et al. (2000)	Comparison of policy preference expectations factors that influence farming	Policy preferences are influenced by price, yield and other variability
7	Eidman & Olson (2000)	Risk Management from Researchers to Farmers	Alternative risk management with information access
8	Coble et al. (2001)	Measurement of risk management of farmers with limited resources	Risk management ranking
9	Coble et al. (2002)	Measurement of risk sources and risk management for agricultural instructors workers	Extension have different perceptions from farmers about risk management
10	Sonkkila (2002)	Decision making of farmers joining the European Union	Linking risk management with entrepreneurship and the environment
11	Patrick (2003)	Managing Risk in Agriculture	Incorporating provision information as a way to reduce risk events
12	Sugeng Santoso (2004)	Risks and Social Economic Factors of Farmers as A Management Risk Revealing	coefficient of risk choice for each layer Price and productivity risk level with CV and Likert Scale Social Economic Factors affecting CE of each layer of farmers Influence of risk and social-economic factors of farmers in risk management of each farmer

When viewed from previous research, only Harwood et al. (1999) calculated productivity risk and price risk using the CV approach but was not followed by research on the effect of these risks on risk management. The Coble et al. (2000; 2001; 2002) study calculated risks using farmers' perceptions that were linked to agricultural policy preferences, but not diversified risk management, production contracts, marketing contracts and access to market information. Scandizzo and Dillon only examined risk preferences and safety principles. Only Patrick (2003); Eidman and Olson (2000) included elements of providing information as a way to reduce risk events.

Based on the results of this previous study, researchers see no research that links and combines productivity risk, price risk calculated based on the coefficient of variation and Likert; farmers' preference for risk; farmer social economic factors and risk management selection. In risk management, researchers combine several strategies that were studied by previous researchers, namely the calculation of the diversification index (Kurosaki, 2002), diversification (Harwood, et al., 1999), production contracts, marketing contracts and crop insurance (Coble et al., 2000; 2001 ; 2002) and access to market information (Eidman and Olson, 2000; Patrick, 2003). Harwood, et al., Coble et al., Patrick, Eidman and Olson did not differentiate the strategies used by farmers in managing risks for each layer of farmers, and the conditions of farmers in Indonesia differed from the conditions of farmers in the research countries above.

Therefore the research contribution given in this dissertation is a complete explanation of (1) risk with risk calculation with price and productivity variability using coefficient of variation and Likert scale; (2) the function of income utilities and calculation of farmers' preferences towards risk using the Scandizzo and Dillon models, which are alternative models other than the Neumann-Morgestern model; (3) an explanation of risk management carried out by farmers which is a combination of several risk management strategies, specifically in Indonesia the risk management strategy that is often discussed is diversification; (4) strategies taken by farmers in managing risk. Farmers' strategies to manage risk for each layer of farmers and what are the implications or suggestions for improvement are not discussed in previous research.

In general, the results of the discussion showed that farmers in the research area carried out a risk management strategy for production contracts and marketing contracts with the 'lowest' level, namely ijon for production contracts and marketing contracts with an advance system. In fact, farmers do bonded labor because they are forced due to a lack of living costs and economic pressure so that farmers receive whatever price is determined by the lender. Likewise, the marketing contract system with advances, in practice buyers or middlemen whose economy is stronger can put pressure on farmers. The balance of power between farmers and traders is so different that farmers do not have the power to determine prices.

For this reason, policies are needed that can encourage farmers to make 'higher' types of contracts such as contracts with agro-industries. For the balance to occur, it is necessary

to regulate the transaction mechanism, including the system *spot* and *forward contract*. This contract system will be handled by the contract committee or the auction committee which manages the binding of the sale between the farmer and the trader. The auction committee will take care of the verification of the participant, the auction judge and will involve an arbitration body to secure the parties making the achievement of the contract agreement. It is expected that farmers participate in this auction system because it will balance the power of farmers and traders in determining prices. By following this contract system it is expected that farmers will know the commodity and quality desired by consumers. This strategy should be carried out by farmers.

The system *forward contract* needs to be supported by the use of agribusiness information systems to find out the information network of producer centers and producer centers. If the *forward contract* can be implemented, the prediction power of doing a *future contract* is horticultural quite large considering (1) horticulture contributes 6% to the Gross Domestic Product, (2) the pioneering network of information about production, supply, prices in several consumer centers so that can be known *trends* price as a reference when to buy, stock, when to plant and what commodities are needed. Coordination with PT. Indonesian Futures Clearing, Indonesian Commodity Futures Exchange Management Agency and other agencies to realize *future contracts*.

3.4. Research Limitations

- 1) Limitations of the theory and the results support previous research that examines the measurement and risk management so that the evidence of research results with supporting theories related to risk measurement and relative risk management is also limited.
- 2) The causes of risks in farming are not discussed in this study due to the broad scope of the study, for example, the causes of productivity risks due to drought, pest, natural disasters related to plants and risks caused by changes in government regulations. It is recommended in further research to discuss the causes of this risk.
- 3) The application of crop insurance in Indonesia as a risk management tool has not been implemented, so the description and application of crop insurance must be explained to respondents many times before answering questions.
- 4) The marketing contracts examined in this study are in the *spot and forward contracts*, not yet discussing futures (*futures contracts commodity*), it is recommended that future research include marketing contracts for types of the *future contract*.
- 5) This research was conducted in one area. To be able to generalize findings or reveal theoretical findings of the risk management of vegetable crop farmers, studies need to be carried out in different places.

4. Conclusions and Recommendations

4.1. Conclusion

Risk of small land farmers is risk-averse, preferences of large land farmers are risk-takers, risk preferences of all farmers are risk-neutral. While social-economic factors of land area, number of families, farm income, education and farm experience together affect the value of *certainty equivalent* (CE).

In smallholder farmers, a land area significantly influences the value of CE. The greater the land area, the greater the value of CE. In large land farmers, the five social-economic factors significantly affect the value of CE. The greater the area of land, the number of families and farm income increases the value of CE. The higher education and the longer farmer experience, the lower the CE value. The high education and the long experience make large land farmers diversify their business by raising dairy cows, so they are less focused on farming. This is why the productivity of large land farmers is lower than that of small land farmers. Until this research is completed, the results from raising one dairy cow are more profitable than cultivating one hectare of land. So in the short term, large-scale farmers rely on raising dairy cows, but in the long run, they still hope for farming. For all farmers: land area, number of families, education and farm experience significantly affect the value of CE. The greater the area of land and the number of families the greater the value of CE, while the higher the education and the longer the experience will make the CE lower.

The strategy carried out by farmers in managing risk based on social-economic factors for each layer of farmers can be stated as follows:

1) *Small Land Farmers*

a) Diversification

Of all farmers, 17% of small land farmers to diversify 'low' ie diversification by planting commodities of potatoes and cabbage, 21.5 % diversifying 'high', i.e. diversifying by growing potatoes, cabbage, and other commodities. If the area of land gets bigger, smallholder farmers will reduce diversification, from planting potatoes, cabbage and other commodities to planting potatoes and cabbage. If smallholder farmers diversify by planting potatoes, cabbage, and other commodities, the farm income will decrease. Productivity risk and price risk do not affect diversification. Education, farm experience and number of families also have no effect on diversification.

b) Production Contract.

Of all the farmers who made production contracts, 28% of smallholder farmers carried out bonded production contracts; 9% entered into a production management contract. Production contracts are used to reduce price risk because the majority of smallholder farmers undertake bonded production contracts. Productivity risk does not affect the production contract, because the productivity risk of smallholder farmers is included in the low-risk category so that the production contract is carried out not because of productivity risk but because of price risk. Land area, family size, farm income, education, and also no effect on production contracts.

c) Marketing contract

Of all the farmers who carried out marketing contracts, 30% of smallholder farmers carried out marketing contracts with advance payments for the slash purchase system, 3.6% carried out *forward contracts* with price-fixing. Marketing contracts are used to reduce productivity risks, because the majority of smallholder farmers undertake a marketing contract for a type of down payment with a slash purchase system that does not differentiate quality and traders estimate the amount of production per land area. Land area, family size, farm income, education, farm experience have no effect on marketing contracts.

d) Access to market information.

If the area of land gets bigger, smallholder farmers will increasingly increase access to market information. Farm income, education, farm experience and number of families do not affect access to market information.

e) Crop Insurance.

Crop insurance is used to reduce price risk, because crop insurance chosen by smallholder farmers is income insurance rather than productivity insurance. Land area, farm income, education, farm experience and number of families have no effect on crop insurance if held.

2) *Large Land Farmers*

a) Diversification.

Of all farmers, 29% of large land farmers diversified 'low' by diversifying by planting potato and cabbage commodities, 34% diversified 'high' by diversifying by planting potatoes, cabbage and other commodities. Price risk makes large land farmers reduce diversification, from growing cabbage, potatoes and other commodities to growing potatoes and cabbage. Productivity risk does not affect diversification. Land area, farm income of education, farm experience and number of families also have no effect on diversification.

b) Production Contract.

Of all the farmers who carry out production contracts, there are no large-scale farmers conducting bonded production contracts; 30% entered into a production management contract and 33% entered into a contract with agro-industry. Large land farmers reduce price risk with production contracts, because the majority of farmers enter into production contracts with agro-industries related to produce markets. Productivity risk does not affect the production contract, because the productivity risk of large land farmers is included in the medium risk category so that the production contract is carried out not because of productivity risk but because of price risk. Land area, farm income, education, farm experience and number of families also have no effect on production contracts.

c) Marketing contract.

Of all the farmers who carried out marketing contracts, 52% of large land farmers carried out marketing contracts with advance payments for the slash purchase system, 12% carried out *forward contracts* with pricing and 2% carried out *forward contracts* with pricing and quality. In addition to production contracts, large land farmers reduce price risk with marketing contracts. Land area, farm income, education, farm experience and

number of families have no effect on marketing contracts.

d) Access to market information.

Farm experience makes large land farmers increase access to market information. Productivity risk and price risk do not affect access to market information. Land area, farm income, education and number of families also do not affect access to market information.

e) Crop insurance

Increasing farm income will increase the participation of large land farmers in the crop insurance program if held. Productivity risk and price risk do not affect crop insurance. Land area, education, farm experience and number of families also have no effect on crop insurance if held.

3) *All Farmers*

a) Diversification

If land area increases, farmers will reduce diversification from growing potatoes, cabbage and other commodities to planting potatoes and cabbage. If farmers diversify by growing potatoes, cabbage, and other commodities, their farm income will decrease. Productivity risk and price risk do not affect diversification. Education, farm experience and number of families also have no effect on diversification.

b) Production Contract.

Farmers reduce price risk with production contracts. Production contracts run by farmers with the aim of the market for the products. Productivity risk does not affect diversification. Land area, farm income, education, farm experience and number of families also have no effect on production contracts.

c) Marketing contract.

In addition to production contracts, farmers reduce price risk with marketing contracts. Productivity risk does not affect marketing contracts. Land area, farm income, education, farm experience and number of families also have no effect on marketing contracts.

d) Access to market information.

Of all the farmers 82% use market information. Farm experience makes farmers increasingly improve market information access. Productivity risk and price risk do not affect access to market information. Land area, farm income, education and number of families also do not affect access to market information.

e) Crop insurance.

Of all farmers who want to participate in a productivity insurance program of 32% and income insurance of 68%. Crop insurance is used to reduce price risk because the farm insurance chosen by farmers is income insurance, not productivity insurance. Land area, farm income, education, farm experience and number of families have no effect on crop insurance if held.

4.2. Recommendations

1) For Farmers:

a) Small Land Farmers Are expected to diversify by planting cabbage and potatoes.

- It is expected to carry out production contracts, marketing contracts, and crop insurance if held to reduce price and productivity risks. However, for the

time being from the three strategies above the most chosen by smallholder farmers are production contracts. However, smallholder farmers should be able to increase the type of production contract from bonded labor to a contract with agro-industry.

- Smallholder farmers are expected to access to market information on land use.

b) Large Land Farmers

- Expected to carry out production contracts and marketing contracts to reduce price risk. However, for the moment of the two risk management mentioned above the most chosen by large land farmers are marketing contracts.

- Based on his experience, large land farmers are expected to access to market information in utilizing information on productivity risks and price risks in choosing risk management strategies.

c) All farmers are

- Expected to carry out diversification by growing cabbage and potatoes. Always pay attention to the latest information and developments in order to be able to add insight into running a farm to increase the certainty equivalent.

- It is expected to carry out production contracts, marketing contracts and crop insurance if held to reduce price risk. However, for the moment of the three risk management mentioned above the most chosen by farmers is a marketing contract.

- Based on his experience, farmers are expected to access to market information in (1) land use, and (2) utilization of information about productivity risks and price risks in choosing risk management.

2) Suggestions for the government

It is realized that the development of vegetable commodities has an important role in Indonesia. For the government, to maintain economic stability in an effort to reduce price fluctuations it is advisable to make policies based on the layers of farmers, including:

- a) Immediately disseminating efforts that can improve farmers' insights to manage risk, namely to reduce price risk, efforts taken are to facilitate and developing production contracts specifically contracts with agro-industries for small land farmers, and marketing contracts especially *forward contracts* for large land farmers and whole farmers. Coordinate with related agencies to prepare for implementing a *future contract*, namely with PT. Indonesian Futures Clearing, Commodity Futures Trading Regulatory Agency (Bapperbti), PT. Indonesia Futures Exchange and prepare farmer groups and cooperatives that will follow marketing contracts on types of contracts spot, *forward* and *future*.

- b) Developing market information systems that can be used by smallholder farmers, because it is necessary to hold socialization and training. Based on his experience, large land farmers and overall farmers realize the importance of access to market information. But it still needs to be socialized about the importance of the benefits of market information systems to anticipate productivity risks, price risks, and land use.

- c) Need to coordinate between relevant agencies when implementing crop insurance. Coordination with the Ministry of Agriculture needs to be done immediately considering that in 2004 it was programmed to implement crop insurance. The results of this study can be input for relevant agencies about the need for crop insurance in Malang Regency, especially Pujon District where smallholder farmers and overall farmers believe that crop insurance if held can reduce price risk, even though it is a second choice after a production contract. Large land farmers will participate in crop insurance if their income increases. The implementation of crop insurance needs to be considered for the long term.
- 3) Suggestions for further research
- a) For the development of management knowledge, especially risk management, further research is needed on risk management for commodity futures contracts. Prediction power of horticultural futures is quite large considering (1) horticulture contributes 6% to Gross Domestic Product, (2) there is a network of information about producer centers and consumer centers so that can be seen *trends* price as a reference when to buy, stock, when to plant and commodities what is needed.
- b) As an option to overcome risks, crop insurance has not been implemented in Indonesia. Empirical support of research results is expected to provide initial information for the preconditions needed to build a horticultural insurance system or other commodities that are rational for farmers and economically feasible for insurance providers and the government as a facilitator. Therefore, it is expected that further research on crop insurance can be made as an insurance model in accordance with field conditions.
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