CLIMATE CHANGES AND RISK ANALYSIS OF RED ONION (*Allium Ascolanicum*) FARMING: A CASE FROM NAGARI SANING BAKA, SOLOK, WEST SUMATERA PROVINCE, INDONESIA

Laily Fitriana, Rudi Febriamansyah, M. Refdinal, and Hasnah

Andalas University, Padang-INDONESIA
rudifeb@yahoo.com

ABSTRACT

Red Onion (Allium Ascolanicum) is a non-substituted commodity for Indonesian consumer. It is a well-known situation in Indonesia, where the fluctuation supply of some agriculture products like rice and also red onion may causes the economic inflation in one region. It is even often happening in the long Moslem Holiday since Ramadhan fasting month up to Idul Fitri Holiday where the demand of food products significantly higher than its supplies. Nagari Saning Baka is a well-known village in Solok Regency as a center of red onion production in West Sumatera Province. However, since around 1980s, secondary data from local government showed significant decreased of production area of this crop. Local farmers mentioned factor of climate, especially the uncertainty of rainfall season in this region has caused the uncertainty to produce better harvest of this red onion. Since 2000, averagely, maximum yields of red onion from this area only around 8 Ton/Ha, much lower compare to average maximum yields in Solok Regency for about 10 Ton/Ha. This study have tried to identified factors that influence the production risk of red onion in this region by using regression analysis to test some hypothetical input factors, like numbers of seed, fertilizer, volume of pesticides, frequency of pesticides applied, labor, and variety of red onion itself. The production risk as dependent variable is identified by calculating the variance of production for each farmer. This study uses cross section data by collecting information from 70 farmers as sample. As a result, the risk analysis showed that red onion farmers are facing high risk in their farm, and higher risk in hot season compare to rainy season. The expected production of red onion is only 3.2 Ton/Ha per planting season. The result for regression analysis showed that only three input factors have showed high significance in influencing the production risk of red onion, are; the use of single fertilizer, leaf fertilizer and the uses of pesticides.

Keyword: *red onion, production risk analysis, climate changes*

Introduction

Red onion is a leading commodity that had become a hot issue in the economy and business in Indonesia due to its high contribution to inflation rate along with red chili in 2013. At that time, the market price of red onion reached the fantastic figure of Rp 80,000 ,- per Kg. The shortage of red onion in the market was the main cause of sharp increase in its price in 2013, while it is always needed on a daily basis, and does not have right substitute in cooking. Bad wet season caused crop failures that pushed domestic supply of red onion to drop.

Therefore, import was required to meet domestic demand. However, port services did not run well that led to the breakdown of the distribution of red onion. Cartel practices at importer level worsened the condition that made onions pile up at the port.

The strong position of red onion in the market should be opportunity for farmer to produce more. However, farmers face some production risks whole year around. In wet season, excess water occurs that encourages diseases. In dry season, it tends to have greater pest attack. As a result, the use of production inputs is not effective.

The situation is experienced by onion farmers in Junjung Sirih Sub district, Solok Regency. They even faced dried up in 1999 due to drought and disease caused by fungus (*Cescospora duddiae*). This condition caused low yield of red onion in this area and discouraged farmers to produce red onion. Central Statistic Board of Solok (CSB Solok) reports that the yield of red onion in Junjung Sirih in 2010-2014 was volatile and lower than national and regional yield. The production of red onion in this sub district was 7 Tonne per hectare in 2009, then decreased dramatically to 2.68 tonne per hectare in 2010, and reached 8.03. The fluctuation of production indicates that red onion farmers face production risk. In order to scale up red onion farmers, factors contributing to the risk production of red onion need to be investigated. In this paper, we figured out the level of risk production in red onion farming in wet and dry seasons and identified factors affecting risk production of red onion farming. The result of this study would be valuable for the government in making policies to develop red onion farming system. This study could be as a reference for agribusiness entrepreneurs in developing their business.

Literature Review

According to Kountur (2006) the uncertainty may produce the risk of management in form of economic uncertainty, natural condition and humanity. In term of economic uncertainty, it may includes the uncertainty of consumer and producer behaviour, input and output prices, market uncertainty and others. In term of natural condition it may includes natural disaster, fire accident, and also climatic changes. While in terms of humanity uncertainty, it may includes war, crime, leadership and etc. Muslich (2007) have tried to distinguised the production risk based on three catagories, first is based on its character, second is based on its possibility to be managed, and third is based on its sources.

In case of agriculture production, Harwood et al. (1999) divided the agricultural risks into five catagories; production risks, price and market risks, institutional risks, financial risks and personal risks**.**

Methodology

This research was conducted in Kanagarian Paninggahan and Muaro Pingai, Junjung Sirih Subdistrict, Solok Regency, West Sumatra. The research locations were selected purposively for two reasons: (1) farmers produce red onion in this area in two seasons; (2) this area faced crop failure due to fungal attack in 1999. Data was collected using structured interviews, direct observation and desk study. The research involved 70 red onion farmers who were selected using simple

random sampling. Production factors that hipothetically affect the production risk of red onion in this study site were selected from hipothetical factors of farm management mentioned by Soekartawi (1993).

Analysis of variance and coefficient of variation proposed by Salvator (1989) were employed in data analysis using the following equations.

Variance (σ^2) = $\sum_{i=j}^{n} (Qi - q)^2 . Pi$

(1)

Variance (σ^2)= $\sum_{i=j}^{n} Vi$

(2)

Where:

Vi= Variance of onion yield per sample farmer reflecting risk facing every farmer.

σ^2 = Variance of yield

Qi = red onion yield (quintal per hectare) per farmer

q = expected yield (quintal)

Pi= probability (the value of 0.65 for dry season dan 0.35 for wet season)

Expected yield = E(q) = $\sum_{i=1}^{n} Qi . Pi$

(3)

Where:

Qi = average yield per hectare

Pi = probability (weight)

The level of risk production was analysed using equation 4.

KV = $(\sqrt{\sigma 2})$/q

(4)

Where:

$(\sqrt{(\sigma 2)})$ = Standard deviation

q = expected yield

Conclusions

Most farmers (66%) had low educational level (primary education). The experience of farmers in red onion farming was about 2 – 7 years. Most farmers (46%) had very small size of cultivated land with the average of ≤ 0.22 hectare per farmer.

Farmers applied different quantity of inputs between the two seasons. They used more seeds in dry season than in wet season because space between seed in dry season was larger than in rainy season. Framers used more insecticide in dry season, while in wet season they used more fungicide. They applied more fertilizer in rainy season compared to the dry season.

We found that farmers faced relatively high risk in both seasons. In the rainy season the level of risk faced by the farmers was 2.97 while it was 3.19 in the dry season. The size of cultivated land was the same in both seasons indicating that farmers did not consider the risk in the second season. The results of our study were different from study by Widyantara and Yasa (2013) where red onion farmers in Kintamani District were more willing to take the risk of production. In the rainy season the average of land size (0.25 ha) was smaller in the dry season

(0.29 ha) even though the level of risk was higher in the dry season.

Farm income from red onion in Kintamani was higher in the dry season counting for Rp. 62 million than in the rainy season (Rp. 11 million). Our study found that farmers got loss in Junjung Sirih in the dry season about Rp. 145.000, - while in the rainy season they got Rp. 46 million,-. This figure indicates that farmers in Kintamani District can address the risks while farmers in Junjung Sirih were unable to cope with risks.

Prior to further regression analysis, the model was tested against the classical assumptions. The tests showed that Skewness ratio was 1.393 and kurtosis ratio was -0.572. The value was between -2 to +2 that means that the data were normally distributed. A Multicolinearity test showed that all variables were free from multicollinearity. There were no auto correlation and heteroscedasticity in the model.

The regression analysis reveals that none of variables affecting production risks in the dry season (Table 1), while in rainy season production risks were influenced by the use of single fertilizer, leaf fertilizer and the use of pesticide.

Table 1 Statistical result for factors affecting production risks in dry season and wet season.

No	Variable	Dry Season			Wet Season		
		Coef.	t. Stat.	Sig.	Coef.	t. Stat	Sig.
1	Constant	488,267	2,875	0,008	-348,115	-2,541	0,017
2	Single fertilizer	0,729	2,615	0,512	0,729	2,621*	0,014
3	Organic fertilizer	-147,215	-0,215	0,234	-148,346	-1,592	0,123
4	Leaf fertilizer	75,152	0,715	0,480	250,587	3,076*	0,005
5	Pesticide	2,422	-0,324	0,748	17,081	5,536*	0,000
6	Freq. Spraying	-2,911	0,642	0,535	1,555	0,721	0,477
7	Variety	-146,108	-1,773	0,087	-112,910	-1,084	0,288
F stat			**1,088**	**Sig: 0,394**		**10,439**	**Sig 0,000**
F Table			**2,445**			**2,445**	
R^2			**0,189**			**0,691**	

Dependent variable: Risk *) Significant

At the 90% confidence interval level in the dry season, the calculated F value test of 1,088 is lower than F table of 2.445. It means that Ho was accepted; therefore we concluded that none of the variables suspected to affect production

risk significantly. The models could not estimate the risk variables.
R^2 value in the dry season is very low. At only 18.9% of risk variables can be explained by the independent variables, the remaining 81.1% is explained by other variables outside the model. Other variables outside the model that became a source of risk in dry season could be the climate, smog and pests and plant diseases. Climate and smog are a source of risk that is not able to be solved by the farmers during the dry season. Pests and plant diseases in the dry season are also difficult to address even though the control has been carried out.

Based on the signs of regression coefficients in the dry season, it showed that the variables of a single fertilizer, leaf fertilizer, and frequency of pesticide spraying were risk-inducing factors, while organic fertilizers and varieties were risk-reducing factors. However, all these factors did not significantly affect the risk production variable. An increase or reduction of the use of these factors would not be beneficial. However, farmers could consider these results related to a reduction in production costs.
In contrast to the rainy season, the calculated F value of 10.439 was greater than F table of 2.445. The decision was rejected Ho and accepted H1.This indicates that there was at least one independent variables that influence production risk significantly. The model can estimate the risk variables in the rainy season.

The coefficient of determination (R2) in the rainy season was high counting for 0.691, meaning that 69.1% dependent variable (Y) can be explained by the independent variables, while the remaining 30.9% is explained by other variables outside the model.
In the partial test, variable single fertilizers (X1), leaf fertilizer (D2) and pesticides (X4) affect production risk significantly at the 90% confidence level. These three variables were risk-inducing factors, in which increasing the use of these factors may increase the risk.

The regression coefficient of single fertilizer was positive. It was contradictory to our expectation. The positive value is likely to occur due to saturation of the soil for chemical fertilizers that causes soil cannot increase fertility even fertilizer applied continuously.

There was a strong influence of leaf fertilizer on production risk with the positive sign. The regression coefficient of leaf fertilizer was 250.587 with t statistic of 3.076. According to Baswarsiati (2009) that fertilizer applied to leaves is usually a fertilizer containing micro elements and serves as additional fertilizer or supplement. Fertilizer Micro nutrient fertilizer needs a fairly long process before being absorbed by plants. As onions are seasonal crop, they do not need this fertilizer. Since this variable significantly influenced the production risk, the application of this type of fertilizer needs to be reduced in order to reduce production costs.

The regression result reveals that pesticide had strong influence on risk production. The regression coefficient was 11.832 and t statistic of 5.536. In our study pesticide was a risk inducing factor. The result is similar to study by Pratiwi and Murantiyadi (2011) in Citapen, Ciawi Sub District. The use of pesticides continuously with the same brand and the same formula can actually make pest increasingly resistant to pesticides. The impact is not directly visible but will happen in the next planting period, where pest growth is more rapid and resistant

(Girsang, 2009), therefore the use of additional pesticide becomes useless and it raises the risk of production.

However, research conducted by Puspitasari (2011) showed different result, in which the pesticide variable can be a risk reducing factor. The use of pesticides with proper dosage and time is able to suppress pest growth and population. Pest and disease control need to be done with accurate dosage, proper time and right target. Pest and disease control can also be done in an integrated way. This strategy could allow the use of pesticides to address the problem, and crop production increases. .

Red onion farming in Junjung Sirih need attention from relevant agencies such as agricultural extension centers through UPTD Center for agricultural training to improve farmers' knowledge in the use of production inputs such as single fertilizer, leaf fertilizer and pesticide which had strong influence on production risk. Socio-cultural approach need to be applied to the community in order to receive guidance on cultivation techniques, the correct use of production inputs and technology adoption.

Acknowledgement

The author would like to thank the PEER-USAID project at the Andalas University for its financial support for this research

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