THE IMPACT OF ENSO ON FARMERS HOUSEHOLD INCOME IN THE IMPENSO AREA OF CENTRAL SULAWESI PROVINCE

Arifuddin Lamusa[1], Hadayani[1], Abdul Syakur[1] and Ramal Yusuf[1]

[1]Lecturer at Faculty of Agriculture University of Tadulako (UNTAD) Palu, (Email: lamusa.arif@yahoo.com)

ABSTRACT

The research objective was to identify the impact of enso towards households' farmer income in *impenso* region. Data were collected from 250 farmer households which were randomly selected in ten villages at six subdistricts of Donggala Regency. All the farmers were interviewed with an aid of questionnaire. Data collected were tabulated and analysed using a multiple regresion model. Dummy variable was applied to identify the impact of enso towards households' farmer income. The analysis showed that R^2 was 60.9% with an F-value of 139, indicating that there was the impact of enso on households' farmer income. The households' farmer income in the year without enso was shown to be higher than that in the year with enso.

Keyword: Enso, Impenso, Income, Households' farmer, Year of enso.

INTRODUCTION

Agriculture is not just about effort for farm households, but it is more about their way of life (Gasson, 1993). This is particularly true in rural areas where market access is generally very limited, so that the orientation of farming is more subsistence (Soeharjo and Dahlan Patong, 1983; Nakajima 1969). Subsistence farming is characterized by low input and low productivity, due to business orientation of more than 50 percent (%) only for household consumption (Nakajima 1969), the remainder for socio-cultural needs, customary ceremonies and religious-related obligations. This fact has caused farm households to rely heavily on farming on the one hand, on the other hand is very sensitive to climate change, "(Naylor, 2007) .Economically, countries in the Asia Pacific region generally include Indonesia Climate change characterized by rising temperatures due to the enso (Lamusa, 2013).

Enso or El-Nino southern oscilation is a global climate anomaly phenomenon that causes drought in the area it passes. Anomalies occur due to rising sea surface temperatures in the East and Central to the tropical Pacific Ocean that has occurred for centuries. Although the pattern of occurrence is not always the same, but usually enso appears every 2 - 7 years. Meaning; The fastest every 2 years and no later than every 7 years. According to the NOAA (2004) record, which is shown in the form of SOI (Index enso) that, since the last 25 years have been more than 5 times happened to the different periods of 3, 5 and 7 years from 1982/83, 1986/87, 1991/92, 1993, 1994, 1997/98 and 2003, 2006 and 2013 (in Central Sulawesi). The phenomenon of the enso occurs in the Pacific Ocean region and has an important impact on the global weather conditions around the region. Impacts that arise include increased rainfall in the United States, Peru, and several other South American regions, causing flooding. Conversely, in the western Pacific region such as Indonesia, Malaysia, and Australia there is drought as one of the causes of forest fires in the area. According to Mulyana (2002) in the Indonesian territory, the enso incident caused a large drop in rainfall in September, October and November. Indonesia's worst affected area

is the southern part of Sumatra, Java, Kalimantan and Sulawesi. The phenomenon of the enso is an event that results from the interaction between the oceans and the atmosphere. When viewed from the side of the ocean, the enso can be known from the warming of sea surface temperatures in the Pacific ocean area near the equator or sea surface temperature anomalies in the region is positive.

Based on its intensity, the enso can be divided into 3 categories namely weak enso, medium enso and strong enso (Meorology and Geophysics Agency, 2006). Indicator of the atmospheric occurrence is the IOS (Southern Oscillation Index) or SOI (Southern Oscillation Index) .IOS is an index obtained from the price difference or the value of air pressure above sea level between Tahiti and Darwin. Negative IOS values are very high and last for 3 months in a row, indicating the occurrence of an enso.

The affected areas of the enso are called Impenso. The Impenso area is characterized by high intensity of sunlight and low rainfall over a relatively long period of time (usually 3 months), causing a decrease in irrigation water discharge and causing drought on land in the highlands. Drought has a wide impact on the environment including rice and cocoa farming areas as the dominant crops in the area.

According to Keil (2004), during the 20 years of the enso (1973-1992), the average annual rainfall is only about 67% of the average annual rainfall year, thus reducing the water supply for cropping. On the other hand, the role of water is very important and cannot be replaced by other production factors.

In plant growth, water functions are dual; As a direct need for physical growth and as a solvent and nutrient transport for plants (Anny, 1983). Therefore, the decrease of water debit also causes the decrease of rice harvest in Indonesia, including in Central Sulawesi Province.

The decrease of crop yield will have an impact on the decrease of paddy rice production income which furthermore to the household income as a whole. Keil (2004) reported that, the decrease of paddy crop yields in the impenso area is about 6% of the normal situation (without enso), thus decreasing the income of farm households concerned.

Based on the above description, the question arises; To what extent are the effects of the enso on the production and income of rice farming as well as the income of farm households in the impenso region in the year of the enso occur. To answer the question, this research is carried out.

RESEARCH METHODS

This study was conducted from July to September 2013, in Donggala District, Central Sulawesi Province. The determination of the location of the area is done purposively, as it has been randomly assigned by STORMA researchers as ENSO areas; A research institute in collaboration between Goettingen-based Goettingen and Kassel University (Germany) and IPB-UNTAD (Indonesia) governments. So that the location of this study is considered representative in assessing the impact caused by enso events.

Unit Sample This study is a household whose main source of income is paddyfarming, and work as a farm labourer. Therefore, the respondents of this research are the heads or members of the farm households that represent them. The number of samples is determined by purposive sampling of 100 heads of farm households performing activities in different year ie the year of the enso incident in 2012/2013 and the year of enso does not happen in year 2013/2014 with the assumption that, farmers have a record or still remember the results of current farming Ensuing events in those years. Sampling is done by simple random sampling technique, so the objectivity of this research can be guaranteed.

Table 1. Result of Regression Analysis Difference Farmer Household Income In the Impenso Region of Central Sulawesi Province, 2009.

Variable	Regression Coefficient	T-count Value	F-count Value
Konstanta		0.1389	
P_m	-0. 25285***	-3.863	
P_a	0.74556^{ns}	1.575	
W	0.14269**	2.246	139***
Dummy	180.92***	2.884	
R^2	60,9%		

Source: Primary Data Processed, 2009.

The data collected in this study includes the primary data obtained from the respondents through direct interviews with the help of quesionery and field notes that have been prepared. Furthermore, the data is tabulated, edited and analyzed in accordance with the objectives that have been formulated. While the secondary data obtained from the results of research, various literature, internet and documents from related agencies are relevant and support this research.

Data analyze whether the enso had an effect on the same household income between the years of enso incident and the year did not occur, the dummy variable was used. In this case, the primary data in the two different years (2012/2013 + 2013/2014) are combined into one. The merging procedure was performed in a way, the primary data of the year of the 50-plus enso incident combined with the 50 primary data in the year did not occur in the enso, resulting in a total sample being 100 farm households. Subsequently, one dummy variable was included in the multiple regression model to indicate whether or not there was a difference in household income in the two different years that could be formulated as follows (Singh et al., 1986).

$$Y = A + {}_1P_m + {}_2P_a + {}_3W + d_iD_i + u$$
.... (1)

Y = income of Farm Household (RT)
A = intersept
$_i$ = price/wage coefficient
D = dummy variabel for years enso does not happen d = 1, and for the year enso occur d = 0

d = dummy coefficient showing the difference of income of RT Between years enso occured with no year of enso.
u = *error term*

As the equation model equation (1), the following equation (2) model is used.

$$Ý* = + b_1P_m + b_2P_a + b_2W + {}_iD_i + ,$$
…………………....... (2)

Ý* is the predictor Y, predictorA, b_i estimator $_i$, predictedd, dan predicted u.

Furthermore, to get the values of the coefficient above, then performed data analysis with the help one of the analysis tools known as the program Shazam.

RESULTS AND DISCUSSION

The results of the analysis of the effect of the enso occurrence in the impenso region of the Central Sulawesi Province are described in Table 1. This table illustrates that of the three variables used to estimate the effect of the enso occurrence on farmer household income in the impenso area, there are two variables that have a very significant effect, such as commodity market price variables that are not produced by households (Pm) and labour wages in the labour market (w). While the commodity market price variable which self-produced farm household (Pa) is non significant.

In the table it appears that, Pm is significantly with negative sign (-) at a 99% reliability level. Although this is contrary to the theory, but very rational because the

higher the price of goods that are not produced alone (Pm), household income reduced. Meaning that more Pm items are purchased at a high unit price, greater spending and reduced household income compared to the low unit price per unit of Pm.

The wage rate (w) significant at the 95% confidence standard means that the higher the wage rate in the labour market will encourage the head of household as manager to supply the labour in the household to fill the existing employment. The more labour supplied with available working hours, the more increasing household income.

In the year of the enso occur, household income sourced from agriculture as its main source decreased due to crop failure, so Pa was non significant. To meet the needs of household consumption, must buy goods of basic needs with relatively expensive price, so Pm negative (-). To cover the decrease in household income due to crop failure and an increase in the price of goods which is not produced by themselves (Pm), the household utilizes income from the wages of household members, so w is positive sign (+).

In Table 1 it also appears that *Dummy* variables are highly significant at 99% confidence standards. Meaning that household income in the year of the enso occur is different from the year without enso. In this case the household income in the year of the enso occur is lower than the income in the year without enso.

CONCLUSIONS AND SUGGESTIONS

Enso negatively affects the income of farmer households in impenso areas. In this case, the income of farmer households in the year of the enso occured decreased, thus lower than the income of farmer households in the impenso area when there was no enso. This is indicated by significant *dummy* variables at 99% level of confidence with 60.9% determination coefficient (R^2) and also very high F count (Table 1).

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