Determinant Of Household Food Security Status In Relation With Farming System In South Sumatra (The Case Of Rural Community Nearby An Industrial Forest Company)

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Abstract**—** The purpose of this study is to analyze the socio-economic factors associated specifically with different farming systems which will determine the security status of the household. Location is determined by considering the method of purposive commodity farmers grow more diverse. Thus, the determination of the samples taken by simple random sampling method to select a number of farmers according to the criteria in this study. Data were collected in April 2010. Data were processed using SPSS 13.0 statistical software through the discriminant function. The results showed that the factors that affect the safety of the household is market access, expenditures for food, and the type of farming system with a canonical correlation of 77.95%.

Keywords**—**Discriminant Analisys, Food Security, Farming System, Household.

I. Introduction

FOOD security exists when all people at all times have access to safe nutritious food to maintain a healthy and active life [4]. The main goal of food security is for individuals to be able to obtain adequate food needed at all times, and to be able to utilize the food to meet the body's needs.

Food security can be expressed at the different levels of socioeconomic life. Those are at the microeconomic level (household, village), at the macroeconomic level (nation) and at the regional level. Household Food Security (HFS) can be defined as a household having assured sets of entitlements – food availability, food accessibility, and food utility – such that in times of need they will be able to maintain sufficient nutritional intake for physical well-being [4].

South Sumatra has vast agriculture land, which is around 60 percents of its population are farmers. Its land area is 8,701,742 ha, while 4,416,837 ha are forest area [1]. Forest area is dominated by industrial forest plantation about 70 percent or 2,941,898 ha. PT Musi Hutan Persada (PT. MHP) is the biggest company that has license to manage this industrial forest plantation. They cultivate *acacia mangnium*.

Managing Forest with Community and People Forest Management are the PT. MHP programs to manage industrial forest plantation. Those programs are beneficial to increase natural resources quality (unproductive land) along with encourage people who live around PT. MHP concession area. They have to take part in managing forest plantation in order to have mutual benefit.

Resources availability especially water were insufficient for them to plant acacia and other perennial crops. Limited transportation and bad road conditions are some of problems. These conditions causing the lack of society enthusiasm to plant the food crop for their daily life. The problem rises when community around forest area is realize that they only can receive their income in long period of time while they need income for daily requirement. Therefore, access to food is become crucial problem because of limited food production, lack of transportation, and bad road condition.

National Food and Nutrition Surveillance System Team's in 2006 finding about food security status in South Sumatra. Analysis of food and nutrition situation in South Sumatra indicated that there are eight districts which are in moderate level of vulnerability on food and nutrition. Table 1 show the condition of two districts which are including in PT. MHP area [5].

TABLE I
MACROECONOMIC INDICATORS IN SOUTH SUMATRA

Macroeconomic Indicators	Muara Enim	East OKU	South Sumatra
1. Ratio Production and Rice Requirements (%)	1.1	1.5	2.34
2. Average expenditure per capita per month (Rp)	414,279	405,675	458,477
3. Income > Rp.500,000 /capita/month (%)	19.48	18.44	28.19
4. Level of vulnerability on food and nutrition	Low Risk	Moderate Risk	Moderate Risk
5. Number of poor household (%)	24.15	40.96	19.15

Source : Badan Pusat Statistik South Sumatra Province, 2008.

Most of indicators of both districts are still below the average condition in South Sumatra. It is susceptible to the vulnerability of food condition. Those problems are diverse in

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nature as a result of diversity in their accessibility to resources, their choice of activities, and the entire structure of their lives [3]. Therefore, farming systems approach offers a framework for understanding the needs of families within a system and the relative importance of strategies for development and food security [2].

This study focuses on basic classification of farming systems which are related to the subject of study: food security. The two classified farming systems are polyculture farming systems and perennial farming systems. The former specializes in the cultivation of acacia, along with some food crops as complements, while the latter cultivates combine acacia with other perennial crops. This classification is intended to analyze the factors affecting HFS status base on different farming system.

II. Research Methodology

This research had conducted in two Districts in South Sumatra. The districts are purposively chosen. The farmer samples are those who produce both food crops and non-food crops. Those samples are the participant of Society Forestry Management Program in Muara Enim and East Oku District.

The collect of research data had been done in the region I Subanjeriji, in units I and III. Respondents who are in Subanjeriji village (Muara Enim District) are in unit I, while in Unit III, respondents who are in Banumas village (East OKU District) for 3 months. The 40 Respondents had been selected randomly. A pre-tested structured questionnaire was done to understand the farmer's socioeconomic characteristics and his food crops farming and perennial crops farming performance.

A. Theoretical Framework

As mentioned before, farming system in this research is divided into two, polyculture farming system and perennial farming system. These farming system are related to the yield they produce, so that it is needed to analyze HFS. Besides farming system types, other factors included in HFS are food availability, food accessibility, and food utilization.

B. Analytical Tools

The collected data from sample edited and classified in tabulation and described descriptively. The objective was answered by statistical and econometric models. The processing data used is SPSS 13.0 statistical software.

Obamiro have proved several significant variables that influence in determining the HFS [6]. The next generation, Maxwell finding is also reinforcing Obamiro finding by determination several variables that affect HFS [4]. Based on these two studies, it was determined several variables which are assumed influence HFS in this research location. The discriminant function is shown in equation 1.

$$D = a + b_{1.}FS + b_{2.}FF + b_{3.}FN + b_{4.}P + b_{5.}C + b_{6.}H + b_{7.}M + b_{8.}EF + b_{9.}EN + b_{10.}EH + b_{11.}WA + b_{12.}WH + b_{13.}E + b_{14}.A + e$$

Where:

D = discriminant score (1 for food secure, 2 for food insecure)
a = intercept
b_i = coefficients (i = 1, 2, 3, …, 4)
FS = farming system type (1 = perennial farming system, 2 = polyculture farming system)
FF = farm size for food crops (ha)
FN = farm size for non-food crops (ha)
P = staple food (rice) production (kg/year)
C = staple food (rice) consumption (kg/capita/year)
H = household member (person)
M = market access (0 = not easily accessible, 1 = easily accessible)
EF = expenditure for food (Rp/household/year)
EN = expenditure for non-food (Rp/household/year)
EH = expenditure for healthy (Rp/household/year)
WA = water accessibility (0 = not easily accessible, 1 = easily accessible)
WH = man working day (HOK/year)
E = educational level (average educational level in household)
A = age (0 = 56<unproductive age<15, 1 = 15<productive age<65)

There are several criteria classifying sample in food secure group or food insecure group as shown in Table 2. Total score calculation will classifying those samples. The sample is in food secure group if total D value equal to one while D for food insecure group is above one [5].

TABLE II
MACROECONOMIC INDICATORS IN SOUTH SUMATRA

No	Indicators	D value
1	Ratio of rice production and rice consumption (R)	(0) if $R < 1$ (1) if $R \geq 1$
2	Net Revenue (X)	(0) if $X < X_{\text{average income}}$ (1) if $X \geq X_{\text{average income}}$
3	Expenditure for food per capita per year (E)	(0) if $E < E_{\text{average expenditure for food}}$ (1) if $E \geq E_{\text{average expenditure for food}}$

III. Result And Discussion

A. D Value

D value indicates the used value for classifying the sample into food security and food insecurity groups. Measurement of this value is based on HFS indicators, namely R, X and E value. These three values are measured using scores 1 and 0. Farmers who meet these criteria will be given score of one while the farmers who do not meet these criteria are given score of zero. The highest total score is three and the lowest score is zero. If the total score is less than or equal to one, the farmer is categorized in a food insecurity group. Meanwhile, if the score is more than one, the farmer enters into a food security group. Clustering results can be seen in Table 3.

TABLE III
R, X, AND E VALUE.

Items	Farmer's Score			
	1	(%)	0	(%)
R	12	30.0	28	70.0
X	33	82.5	7	17.5
E	18	45.0	22	55.0

R value is the ratio between production and consumption. There are 12 farmers who have a score of 1; this means that only 30% percent farmers are able to fulfill their food requirements, while the other 70 percent are not.

X value is the net expenditure, obtained from the reduction of revenues and expenditures. From the calculation, there are 33 farmers (82.5%) whose income has been able to meet the daily needs of household, while the rest still could not meet their needs.

The value of E is the ratio between expenditure for food/capita/year in household with the average expenditure for food. There are 55 percent farmers that have expenditure below the standard even though 45 percent of farmers are able to meet their food needs. Moreover, R, X and E value show that there are 17 farmers who enter into the category of household food insecurity.

B. HFS Variables

As described in the previous chapter, the agricultural system in this study was classified into two groups. In the Subanjeriji village, most of farmers plant the acacia which combined with other perennial crops (rubber, oil palm, coffee and teak). Meanwhile, in Banumas villages, farmers are planting acacia crops combined with food crops and horticulture. The result showed that 22 farmers (55%) conduct poly-culture farming systems while 18 farmers (45%) conduct perennial farming systems. Variables were selected on the consideration that farmers who use different systems of cropping pattern, will have a different HFS conditions. Poly-culture farming systems are considered to ensure the availability and accessibility factors in HFS.

Associated with farming system groupings, farmers also have a different portion of land for each type of plant. In average, the land area cultivated food crops is 0.403 hectare, while for non-food crops is 6.765 hectare in average. The land area for perennial crops is much larger than the land for food crops. Farmers prefer to use land for perennial crops because of their minimum risk of failure, easy in maintenance and use less labor required. This variable was chosen since farmers can ensure their food needs will be fulfilled through land used for food crops is only in small quantities. It is also related to the availability and accessibility factors in HFS.

Production and consumption are seen for staple food (rice). The average rice production in this study is 1,365 kg per year while the average rice consumption is 559 kg per year. It means that farmers are in rice surplus condition. However, this condition does not get the picture of HFS farmer condition. It only took availability factor, while accessibility to the food was not clear.

The way of farmer access market to gain their needs are divided into two groups; namely easily accessible and not easily accessible. This grouping is based on several considerations. Those are the existence of markets, road distance and time. In this study, two research locations have different market conditions. In Subanjeriji village, the nearest market is only once a week or more commonly known as weekly market. The constraints of market access are bad road condition, long road distance and also limited transportation. Those constraints cause food prices in this market is more expensive than the ordinary market.

Unlike subanjeriji village, the Banumas village has more accessible market access and good road conditions than Subanjeriji village. There are 14 sample farmers (35%) who stated that they are easily access to the market. Market access is a variable that clearly represents the accessibility factor in the HFS.

Expenditure farmers grouped into three categories. The average of total expenditure of farmers is Rp.15,198,884.05/year. Expenditures are divided into expenditure for food, non-food, and health. These are Rp.8,139,409.054/year (53.6%); Rp.6,763.350/year (44.5%) and Rp.296,125/year (1.9%), respectively. Expenditure on food utilization factor represents food in general.

Water access is grouped into two categories, namely easily accessible and not easily accessible. Water is not only for household needs (drinking, bathing and washing) but also for their farms. Banumas villagers need more water than Subanjeriji villagers, because most of farmers grow food crops and horticulture which require more water. Therefore, there are 11 farmers who easy to access water. Accessibility to the water is the comparison between need and availability of water itself. Water requirements is also indirectly supporting factor in the availability and nutritional status in HFS due to the existence of water sources.

Working hour is measured with HOK. HOK is the total work hours from all labor used by farmer to manage their agricultural land. HOK is average value of the farmer discriminant model. As in the previous farmer profile descriptions, the average farmer has four family members. Age is grouped by productive age and non productive. Education levels do not vary from elementary school to university level. Education level is grouped into two; up to junior high school level and up to university level.

C. Factors Influencing HFS Status

The interpretations of discriminant function were described in absolute value and coefficient. Their absolute values will be used to series the ranking consecutively to describe relative contribution of HFS status. It is found that accessibility to the market, takes the primary contribution, followed by expenditure for food and type of farming system as shown in Table 4. These three variables have strong relationship with 3 pillars of HFS.

All coefficients of regression estimations have the positive value. Selection variables had been running with SPSS 13.0 program through stepwise analysis. Results show that 3 variables were significant of HFS status

TABLE IV
FARCTORS INFLUENCING HFS STATUS

Variables	Coef.	Sig.	Ranking of absolute values
Accessibility to the market	0.602	0.000*	1st
Expenditure for food	0.481	0.000*	2nd
Farming system type	0.393	0.000*	3rd
Wilks' Lambda	0.393		
Chi square (χ^2)	34.114		
Df	3		
Canonical Correlation	0.779		
Significance level	0.000		

*significant levels less then 0.01 are considered significant

The positive value of coefficient in this equation means that dependent variable would change along the equation changes. The coefficient for accessibility to the market bears a positive sign implying that a change in the accessibility

status of the families from readily accessible to less accessible with likely shift group membership from the food insecure group (2) to the food secure group (1). The issue of poor feeder roads that determines market accessibility in the area worst hits most of farmer who live in bad road access condition. They have limited access to food and product marketing due to high prices afford and hard to sell their product in order to get income. Therefore, development of such an infrastructure is a prerequisite for achieving their household food security.

The coefficients of expenditure for food bear positive signs. An increase in per expenditure for food will likely shift the group membership from the food insecure group (2) to the food secure group (1) therefore revealing the importance of expenditure for food in achieving HFS. The more expenditure for food means the more food variety that farmer's consumes. With the higher expenditure for food, farmers can be easier choosing food which is more nutritious for them. Thus, not only assurance in food availability, but they will also can guarantee part of food utility in HFS status.

The coefficient for farming system type bears a positive sign implying that a change in the farming system type of the families from perennial farming system to polyculture farming system will likely shift group membership from the food insecure group (2) to the food secure group (1). Self-sufficiency in household is guarantee farmers in availability of food consumption. They should more care to their needs though used land around their house to cultivated food crops in order to achieve food sufficiency in each household.

A chi-square transformation of Wilks' lambda used along with the degrees of freedom to determine significance shows that group means differ, and the function is significant at 1%. Canonical Correlation is 77.9 %, which is determines value influencing HFS by three variables

IV. Conclusion

Based on the research that has been done, it can be concluded that factors affecting the HFS are the market access, expenditure for food and farming system type with 77.9% canonical correlation. Improving market access, increasing expenditure for food, and changing farming system to poly-culture will shift farmers from food insecure group to the food secure group.

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