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Farmer household food security in two dimensions in Lombok, Indonesia

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Abstract. Household food security is faced with two important problems, namely how to expand income sources and how to properly distribute their income for life necessities. The purpose of this study was to analyze the comparison of the distribution patterns of household income and expenditure of wetland farmers with dry land and to analyze the determinants that affect the household food security of wetland and dryland farmers in Lombok Island. The research design used a *cross-sectional study* with a survey method. The collected data will be analyzed using qualitative and quantitative data analysis methods. In general, the qualitative data analysis used is policy analysis (program evaluation), institutional analysis, potential analysis, and priority determination of community-level problems. Qualitative data analysis was carried out through the process of filtering data, categorizing, concluding, and retesting. Quantitative data analysis used a logistic regression model. The results of the study concluded that: The sources of income of farmers in wetlands are more varied than those of dryland farmers. Meanwhile, wetland farmers household expenditures are relatively the same as wetland farmers. The food security of wetland farmer households (90%) is better than farmer households in dryland (83.3%). Meanwhile, wetland farmer household food insecurity is lower than wetland farmer households. The distribution pattern of wetland farmer household income comes from rice, and maize cultivation, while in dryland areas, it is sourced from rice, corn, and soybean farming. Distribution patterns Household expenditure of wetland and dryland farmers is divided into expenditures for food and non-food. The factors that determine household food security in dry and wetland areas are farmer household income.

1. Introduction

Conversion of agricultural land to housing, factories, and mining has taken place decades ago. This change began when the government developed the industrial and housing sectors on a large scale, where which was a result of the growing population. Consciously, this land conversion does not only occur in wetlands (technical irrigated rice fields) but also occurs in drylands (rainfed land). This situation has threatened the existence of agricultural production and productivity, which has been the hope of most Indonesians and even residents of the island of Lombok.

Threats to agricultural production and productivity do not only come from land use change but can also occur from the smaller control over agricultural land by farmer households. It is estimated that control of agricultural land is getting smaller, namely less than 0.5 hectares per farmer. The relatively narrow land area coupled with the relatively large number of household members will make farmer households struggle stronger in fulfilling the economic needs of the household itself, and at the same time, this will have an impact on the resilience of farmer households. The decision of household

members to participate in farming and non-farming activities is a choice based on meeting the economic needs of the household.

The *household economic theory* assumes that the activities carried out by each member of the household are a household decision and each member of the household in allocating his time is faced with three options, namely time to work in the market; time for household activities, and time for physiological activities [1]. The reality in developing countries, including Indonesia, is that the division of labor between household members is very much determined by sex, namely, women spend more time in household activities, while men spend more time on economic activities (market) and less time for household activities. According to Mangkuprawira (1984), this is because by nature men tend to specialize more in the market sector than in the household sector, while women are the opposite [2]. In line with that, Becker (1981) also states that investment for the market (*human capital*) is more visible to men, while investment for households (*household human capital) is* more visible in women [3]. This is why the wage rate for men tends to be higher than that of women.

Meanwhile, according to several research results, it is indicated that the work distribution of men and women is influenced by many factors. The results of Halide's (1981) study in rural areas of South Sulawesi show that there are not many wives who work because they are considered a factor of *SIRIi (great shame)* when the wife earns a living to finance her household [1]. Meanwhile, according to the results of research by Koentjaraninggrat (1984) in rural Java, it shows that husband and wife are used to jointly earning a living for their family [4].

Research on the distribution pattern of the farmer household will be approached with a subjective *equilibrium theory*. This theory was first put forward by Nakajima (1969) by using the farmer household as the unit of analysis [5]. In theory, it is assumed that labor can be bought and sold, thus allowing farmers to work outside their farms. The labor market is assumed to be in a state of perfect competition. Farming is considered as a company that seeks to maximize profits; and labor is considered as a worker who tries to maximize satisfaction or *utility*. The utility is defined as a function of the amount of time the household works in a certain time and the income earned in the same period with the constraints on the income obtained from work. Subjective equilibrium is reached when the marginal product of labor in farming and the marginal labor of product outside of farming equals the level of wages.

Nakajima's subjective equilibrium model above was further developed by other experts, such as Yotopoulus and Lau (1974), Kuroda and Yotoupoulus (1980) by separating the production side from the consumption side [6]. From the production side, efforts to maximize profits reduce the supply of output and the demand for labor. Both are a function of the wage rate, the price of agricultural goods, capital, and land. From the consumption side, efforts to maximize utility reduce the supply of labor which is a function of the wage level, output price, profit, the number of family members working, the total number of family members, and income from outside the outpouring of labor.

Reynold (1978) argues that the allocation of working time is influenced by many factors, including (a) lifestyle; (b) ownership of productive assets; (c) socio-economic conditions; (d) wage rates; and (e) characteristics inherent in each individual [7]. The pattern of life contains a very broad meaning and is formed by various inherent conditions, such as factors of ethnicity, religion, and neighboring life. The characteristics inherent in each individual can be seen from age, level of education, or expertise.

According to Evenson et al. (1980) allocation of working time for household members is influenced by the level of wages, the price of raw materials purchased in the market, the prices of production factors in the household, such as skills, household capital, and technology and income from outside the outpouring of labor [8]. According to Sudibyo (1995), production or productivity is a function of labor, capital, and skills. For poor households, the only capital owned by workers is that it is difficult to expect to be able to compete with households that master capital and skills [9]. Therefore, the existence of activities outside of farming can have an effect on income and work experience for farmer households. Based on the results of the above research, it means that the division of labor between men and women is influenced by many factors, including the value system developed in an area, the type of main household work, and the socio-economic conditions of the household concerned.

What is relevant for further study is whether the existence of activities outside of farming will affect the activities of farmers, what is the distribution pattern of household income and expenditure with activities outside of farming, and how does income affect household food security? To answer this problem, a subjective will be approached *equilibrium theory*, namely how to balance the household economy with activities outside of its farming. For this reason, the problems studied are (1) distribution patterns and allocation of working time, as well as production patterns and household consumption patterns, (2) determinants that affect household food security.

2. Method
This study uses a descriptive method which is designed in the form of survey research. The data was collected *using triangulation techniques*, namely by marrying the three research techniques together, namely: (1) interview techniques (*interviews)* with respondents; (2) field observations (*field observation*); and (3) *desk study*.

The determination of the research area was carried out by purposive sampling with the consideration that the research area includes dry land and wetland areas. For the dry land area, 2 villages were determined in Pujut District, Central Lombok Regency, namely Rembitan Village and Tanak Awu Village which had the largest dry land area. For wetlands, 2 villages were selected in Gerung Subdistrict, namely Jagaraga village and North Gerung village which have technical irrigation or paddy fields.

The farmer households who were the sample of the study were selected *randomly by sampling* and as many as 30 households in each area of dry land and wetland so that the number of respondents was 60 farmer households. The main variables in this study are related to three aspects, namely: (1) the pattern of production or household income, (2) the pattern of consumption and household expenditures, and (3) the independent variables that determine household food security.

Data have been collected and then classified further analysis:
 (1) To determine the pattern of production (income) and pattern of consumption (expenditure) of the household were analyzed descriptively.
 (2) To estimate the effect of independent variables on farmer household food security, it is analyzed by logit regression.

Quantitative data analysis was carried out descriptively through cross tabulation. The addition, because the dependent variable is dichotomous data, namely food resistance, and food insecurity, and is a binomial distribution, not a normal distribution, to analyze the effect of several independent variables on the dependent variable a logistic regression model is used [10]. The logistic regression model is as follows:

$$Y = \log\frac{F}{1-F} = \beta 0 + \beta 1 X1 + \beta 2 X2 + \beta 3 X3 + \varepsilon \tag{1}$$

Information:
F   = cumulative function (household status is food resistant or food insecure)
X1   = farmer household income
X2   = number of dependents
X3   = education of the head of the household
ε   = error

3. Discussion
3.1. Distribution of farmer's household income
Household income is determined by the time spent working for the household in question, especially households that do not have capital and skills other than skills as a farmer. Income that comes from the outpouring of working time in this study is called *labor income*. The addition, household income is determined by which is referred to as *non-labor income* such as transfers from other parties, asset leasing, including capital interest.

Table 1 explains that the household income of farmers comes from farming and outside farming. This means that the distribution of farmer household income in the two regions is different both in source and value. When viewed from the source of income, in detail the distribution of income that comes from farming in the wetland is less than in the dry land area. However, the income value of farmer households in wetland areas (68.38%) is much greater than those in dryland areas (36.29%). This shows that in wetlands it has advantages in soil fertility and irrigation water so that it can produce greater yields of rice and maize than in dry land.

Judging from the source of income from outside farming, the distribution of income in wetland areas is more than in dry land, but from the value of the income, the household income of dryland farmers (62.71%) is greater than that of farmers in wetlands (31.62%). This shows that farmer households in dryland have higher creativity, especially in trading and as laborers (masons, agricultural laborers), because relatively large amounts of time can be used to increase their income. If this is not the case, the farmer's household will be threatened with food insecurity.

Table 1. Average household income of farmers in Pujut Subdistrict (Dryland) and Gerung Subdistrict (Wetland).

Sources of Income	Wetland		Dryland	
	Value (IDR)	%	Value (IDR)	%
Farming:	15,323,356	68.38	8,241,666	36.29
a. Rice	12,141,784		7,988,333	
b. Corn	10,605,241		93 333	
c. Soybean	-		160,000	
External Farming:	7,086,667	31.62	14,471,200	62.71
a. Horrified Civil servants	2,720,000		3,259,200	
b. Traders	2,380,000		7,133,333	
c. Labor	1,520,000		4,038,667	
d. Chicken farm	466,667		-	
	22,410,023	100.00	22,712,866	100.00

The average income of a farmer household in wetlands in a year is IDR 22,410,023. Meanwhile, the average income of a farmer household in dry land is IDR 22,712,866. Additional income from outside the farm, such as from labor, traders, and chicken farm, is quite helpful for fulfilling the needs of daily life.

3.2. Farmer household expenditure distribution
Routine household expenditure is determined by household income and consumptive behavior of the household concerned. So, the distribution of household expenditure for farmers in both regions (wet and dry land) can be broadly divided into two, namely food expenditure and non-food expenditure.

The largest expenditure of household farmers is for food and the largest expenditure of this food is for rice. This shows that farmer households are still classified as poor, because according to Engel's law (*Engels Law*) the greater the proportion of household expenditures for foodstuffs, the poorer the household concerned. This further explains that farmer households whose livelihoods are mostly in the agricultural sector have a weak economic condition. This is largely due to more limited employment opportunities, which can be seen from limited livelihoods and low working time for household members, which leads to lower household income and expenditure.

Table 2. Average farm household expenditure in Gerung District (Wetland) and Pujut District (dryland).

Expenditure type	Wetland		Dryland	
	Value (IDR)	%	Value (IDR)	%
Food:	6,431,600	42.75	10,667,533	56.23
a. Rice	3,850,000	25.59	4,380,000	23.09
b. Side dishes	2,581,600	17.16	6,287,533	33.14
Non-food:	8,613,567	57.25	8,302,633	43.77
a. Fuel Oil	1,156,800	7.69	1,141,000	6.01
b. Electric	461,920	3.07	729,600	3.85
c. Water	428,080	2.85	404,800	2.13
d. Soap	366,800	2.44	384,000	2.02
e. Phone	904,000	6.01	442,733	2.33
f. Clothes	155,167	1.03	80,333	0.42
g. Cigarettes	5,140,800	34.17	5,120,167	26.99
Total	15,045,167	100.00	18,970,166	100.00

In the wetland area, the proportion of household expenditure for farmers is actually for non-food, namely percent of the total expenditure. The largest contribution to expenditure comes from cigarettes and spending on buying fuel for transportation purposes. The smoking habit for farmers is still a priority, because by smoking it will be easy to think about getting the desired inspiration (according to farmers). Unlike. in dry areas, the largest proportion of expenditure is for food, namely 56.23 percent. For them food is more important, because to be able to live naturally. the need to eat is a top priority, if they cannot fulfill their food, it will endanger them. However. non-food expenditure is also quite large, namely 43.77 percent. The biggest contribution came from cigarettes (26.99%) and fuel for transportation (6.01%).

3.3. Farm household food security
3.3.1. Availability. Farmers own land for rice and secondary crops farming. The habit of farmers do rice and secondary crop farming applies to both wet and dry land areas. Because in the rainy season or the first planting season, the availability of water for rice farming is sufficient. For farmers in dryland areas. The yield from rice farming is sufficient for food reserves for one year. For those who do not meet their food needs, they can get furniture from the nearest kiosk or stall. Likewise, for farmers in wetlands, the results of rice farming are also used for food reserves in the future, and if this is not sufficient, they can buy it from the nearest kiosk or shop. This is in line with the opinion of Suharjo (1989), which states that the need for food can be met through self-production [11]. So, income in the form of money is not so decisive. Food supply capacity can be enhanced by increasing the food production itself. On the other hand, the need for food depends a lot on what is bought. Then the income (purchasing power) must be able to buy food that is sufficient in both quantity and quality. Adi's research (1997) in Pasuruan Regency shows that there is a tendency that the higher the level of household food availability [12], the more food-resistant households are. The results of statistical tests show that there is a significant influence between household food availability on the incidence of food resistant households. According to Frankenberger and Maxwell (1992), potential agricultural production is a good predictor of food availability [13]. Adi (1997) states that there is a significant (strong) correlation between food production (rice) and household food availability [12]. As well as between the area of land owned by the household and the availability of food at the household level. The wider the land ownership and the higher the rice production, the greater the availability (reserves) of household food owned.

3.4. Accessibility / Availability of food
Accessibility can be measured from the method and convenience of obtaining food, namely in terms of income and distance traveled to reach foodstuffs. Judging from the per-capita income, the farmer

household is poor, because according to the criteria of World Bank. people whose income per capita per day are currently less than US\$ 2 or equivalent to IDR 26,000 (US\$ 1 equals IDR 13,300), whereas the farmers' households in the wetlands have an average per capita income of IDR 20,750 per day. Meanwhile, farmer households in dryland areas have an average income per capita per day of IDR 16,824. Judging from the distance traveled to get food. farmer households do not experience difficulties. because in every village there is a market and even in every hamlet there are *kios* or stalls that provide rice food ingredients.

3.5. Food stability

Stability can be measured from 2 things namely the frequency of meals and food reserves. The household food-frequency of farmers in the two regions (wetland and dryland) is an average of 3 times a day. This habit has been passed down from generation to generation. even though their income is low.

Judging from the food reserves of farmer households, most of the farmer households store food and a small part sell it. In wetland areas 80% of farmer households save their rice farming and 20% of farmer households sell their rice. Meanwhile in dryland areas 76.67% of farmer households store their rice as food reserves and 23.33% of farmer households sell their rice. For farmers who sell their rice first, they rely on income from farming and from outside the farm to meet their food needs. This means that farmer households in both regions have stable food stability.

Judging from the level of food insecurity, farmer households in wetlands and drylands have an average income that is greater than their average expenditure. This means that the farmer household does not have a serious problem with food or is not included in food insecurity. However, some households will be vulnerable to food insecurity.

3.6. Determinants of farmer household resilience determinants of household

Food security was analyzed through a logit regression equation model using SPSS version 10 software. The results of the first analysis were regarding the classification of food-resistant and food-insecure farmer households. In Table 3, it is explained that it is estimated that the number of farmer households in wetlands that are food resistant is 22 households (91.7%) and those who are not food resistant are 2 households (8.3%). Meanwhile, in food-insecure farmer households. it is estimated that there are five farmers who are not food resistant (83.3%) and 1 household is food resistant (16.7%). Overall, it is predicted that the number of food-resistant farmer households will be 90.0%. This means that food resistant farmer households are quite large.

Table 3. Food security classification of wetland farmer households.

Observed		Predicted		
		Food Security		Percentage correct
		0	1	
Food	0	5	1	83.3
Security	1	2	22	91.7
Overall Percentage				90.0

Table 4. Dryland farmer household food security classification.

Observed		Predicted		
		Food Security		Percentage correct
		0	1	
Food	0	13	3	81.2
Security	1	2	12	85.7
Overall Percentage				83.3

In Table 4, it is explained that it is estimated that the number of farmer households in food resistant dry land is 14 households (85.7%) and 2 households (14.3%) were not food resistant. Meanwhile, food-insecure farmer households, the number of farmer households that are not food resistant is estimated at 13 households (81.2%) and 3 households (18.8%) are food resistant. Overall, it is predicted that the number of food-resistant farmer households will be 83.3%. This means that food resistant farmer households are quite large.

Table 5 and 6, explain that the factors that significantly influence household food security (the error rate of 5%) in both dry and wetlands are household income. Meanwhile, the number of household members and the level of education did not have a significant effect. The Exp (B) component or the odds ratio explains that the proportion of household food security of farmers who have an income more than the average household income will have one-time better food security than farmer households that have below-average income. This means that if there is an increase in farmer household income in the amount of one million IDR, it will increase the food security of the farmer household.

There are 10% of farmer households in wetland areas and 16.7% of households in dryland areas are classified as food insecure. So, to improve household food security it is necessary to add activities outside of farming activities to increase house hold income of farmers. Likewise, farmer households that are classified as food resistant need to increase their income through farming activities and outside farming activities.

Table 5. Results of logit regression analysis for wetland farmer household.

Variable	B	SE	Wald	df	Sig.	Exp (B)
X1 (the number of house hold)	1.005	1.652	0.408	1	0.523	2.827
X2 (Household Income)	0.000	0.000	4.057	1	0.044	1.000
Constant	-6.327	3.163	4.001	1	0.045	0.002

Table 6. Regression analysis logit for dryland farmers household.

Variable	B	SE	Wald	df	Sig.	Exp (B)
X1 (The number of members of household)	-0.474	1.458	0.106	1	0.745	0.623
X2 (Education head of household)	0.634	0.659	0.926	1	0.336	1.885
X3 (Household Income)	0.000	0.000	6.801	1	0.009	1.000
Constant	-6.952	3.489	3.972	1	0.046	0.001

4. Conclusion

The results of the study concluded that: The sources of income of farmers in wetlands are more varied than dryland farmers. Meanwhile, wetland farmer household expenditure is relatively the same as wetland. The farmer household food security of farmers in wet-land (90%) is better than farmers household in dry-land (83.3%). Meanwhile, food insecurity in wetland farmer households is lower than wet-land farmer households. The distribution pattern of farmer household income in wetland areas comes from farming and outside farming activities. Activities in farming such as rice and corn farming. Meanwhile, non-farming activities include Civil Servants, Traders, Laborers and raising livestock. The average household income of farmers for one year is IDR 22,410,023. For farmers on dry land. the income distribution pattern comes from farming and outside farming activities. Activities in farming such as rice and corn farming. Meanwhile non-farming activities include Civil Servants, Traders, and Laborers. The average income of a farmer household for one year is IDR 22,712,866. The distribution pattern of farmer household expenditure in wetland areas is divided into expenditures for food and non-food. The average expenditure of a farmer household for one year is IDR 1,045,167. The distribution pattern of farmer household expenditure in dryland areas is divided into expenditures for food and non-food. The average expenditure of a farmer household for one year is IDR 18,970,166. The determining factor for farmer household food security in wet and dryland areas is farmer household income.

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