Food Security and Welfare of Red Rice Farmers on Dry Land in Ponjong District, Gunungkidul Regency

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Abstract. Cultivating red rice in Gunungkidul Regency's dry lands is seen as a promising means to alleviate poverty, primarily due to its higher market value, which can fulfill the basic needs of farming households, ensure food security, and enhance their overall well-being. This study specifically evaluates the food security and welfare of dryland red rice farmers in the Ponjong District of Gunungkidul Regency. A sample of 200 farmers was selected using Systematic Random Sampling, with a specific emphasis on the Share of Food Expenditure and the Sajogyo Indicator for analysis. The results reveal significant food security disparities; the southern zone has slightly higher food insecurity (HFES 50.6%). To enhance well-being, policy efforts should prioritize boosting red rice income, strengthening food security, and reducing welfare disparities in all zones, as indicated by various analyses, including GSR (Good Service Ratio), FER (Exchange Rate Analysis of Farmer Income), and the Sajogyo indicator. While none of the zones are categorized as prosperous by GSR, FER designates the southern and northern zones as prosperous, and the Sajogyo indicator classifies all zones as moderately viable, with the central zone showing the most potential for improvement.

1 Introduction

Household food security can be described as the capacity of households to readily satisfy their food requirements and secure income sources with ease [1]. One of the food crops that the people of Indonesia widely consume is the rice plant. That way, rice plants become the basic needs of most households in Indonesia, so rice becomes an essential factor in household food security. Nevertheless, the expansion of industrial and residential developments poses a threat to rice cultivation, as it leads to the conversion of rice fields into non-agricultural areas, which can endanger national food security [2][3]. Rice plants are generally produced in rice fields, for they need to be expanded by using dry land that has the potential as a farming medium that can play a role in helping to increase rice food

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crop production [4][5]. Gunungkidul Regency, within the Special Region of Yogyakarta Province, boasts the largest expanse of dry land, covering 117,332 hectares (Central Statistics Agency, 2017). Yogyakarta Province showcases a rich diversity of five distinct local red rice varieties. Among these, Gunungkidul Regency serves as the native habitat for two of these five varieties, specifically the Segreng (Gunungkidul) and Mandel (Gunungkidul) varieties. These red rice strains serve as the genetic foundation of Gunungkidul Regency, offering genetic advantages and resistance to specific pests and diseases, thereby cementing their status as local rice varieties [6]

Red rice plants can grow on dry land using an irrigation system from rainwater; however, when the intensity of irregular rainfall will be at risk of dryness. However, with low rainfall, dry land has the advantage of being rich in nutrients, due to low rainfall so it does not experience soil leachin [7] . Red rice varieties are a priority in developing rice in dry land because it has a shorter life than rice in general. Red rice is ready to be harvested after more than 3 months of age [8] [9]. Besides being able to be consumed directly, red rice is also used as the primary raw material for products in the industry, such as red rice tea, red rice flour, and other processed food products. This type of rice contains carbohydrates, fats, fibre, minerals, proteins, and anthocyanins that prevent liver disease, stroke, and diabetes. [10][11][12]

Red rice production in dry land and improving food security also increase sources of income to reduce poverty in Gunungkidul, which has a poverty percentage of 15.86 % in 2022. The largest upland rice harvest area in Gunungkidul Regency is in Ponjong District. but in 2019 it experienced a decline due to a long dry season which resulted in crop failure (Figure 1)

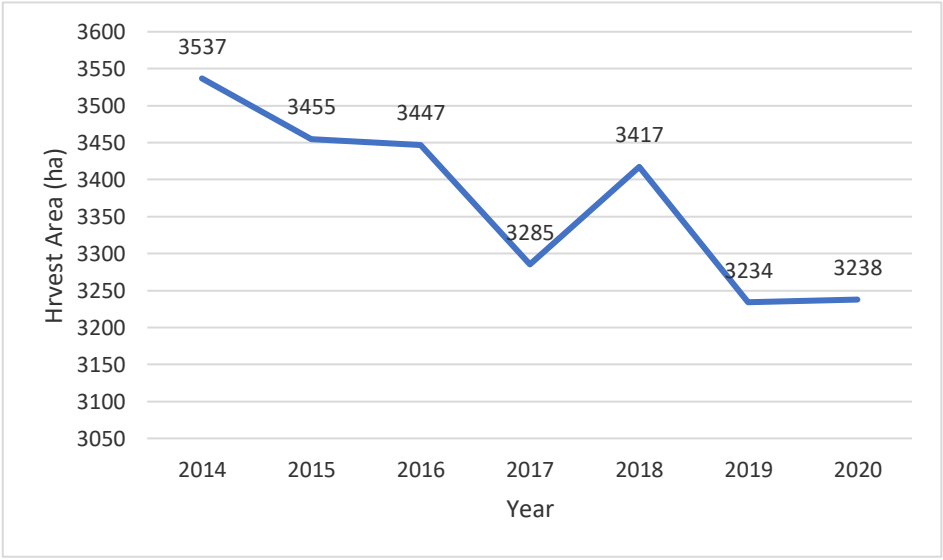

Fig. 1. The upland rice harvest area in Ponjong District, Gunungkidul Regency.

Considering the overall distribution characteristics in the area, Ponjong District is divided into three distinct zones: the northern zone, the southern zone, and the central zone. Most residents in Ponjong District work in the agricultural sector, accounting for 41.04% of the population. In addition to agriculture, farmers also derive income from trading, civil service employment, skilled and manual labor, private sector employment, and various other occupations. Agriculture is the primary income for most residents in

Ponjong District. However, the productivity of dryland rice is still low from that of rice in rice fields, which reaches 61.22 kw/ha (Agriculture, 2018). However, red rice has a higher price than white rice, which reaches IDR 15,000 / kg. It is expected that red rice production can make a significant contribution to farmers' household income. The low productivity of dryland red rice makes some farmers not sell their products, but farmers choose to consume or exchange with white rice to meet household food needs to maintain food. Enhancing food security is anticipated to bolster the well-being of farming households; however, the red rice production has yet to reach its full potential. Based on this background, researchers are interested in researching "Food Security and Welfare of Dryland Red Rice Farmers in Ponjong District, Gunungkidul Regency." This study aims to i) Determine the contribution of household income of red rice farmers, ii) Assess the food security of red rice farmer households, and ii) Know the welfare of dryland red rice farmer households. It is hoped that the research results can be used as an evaluation of food security indicators, such as the availability, access, utilization, and stability of brown rice among farmers and their households.

2 Research Method

This research was carried out in the Ponjong District of Gunungkidul Regency, Yogyakarta. The selection of this location was purposeful, considering that Ponjong District exhibited the highest red rice productivity within Gunungkidul Regency in 2022, and the area was divided into three zones. From the three zones, three villages were taken to represent 399 farmers; calculations were made using the Slovin formula [13] [14]with an error rate of 5%, and 200 farmers were obtained as respondents. Sampling in each village was conducted within the Sedyomulyo farmer group (north zone), Tani Maju (central zone), and Sedyorukun (south zone). The samples in each farmer group were determined proportionally, resulting in 66, 56, and 78 samples, respectively, from a total of 200 samples.

The data utilized in this study comprises both primary and secondary data sources. Primary data is collected directly from the field, specifically from red rice farmers, using an interview system and supported by questionnaires. The primary data obtained include farmer profile data, farm earnings, family income, and household spending on food costs and non-food expenditure. The techniques used in primary data collection are interview techniques and questionnaires as data collection tools. Secondary data is acquired by retrieving information from the Subdistrict Office, Village Office, and the Head of Gapoktan. This data encompasses details such as the area, population, topography, geographical location, and agricultural conditions in the researcher's chosen area, along with the state of the population. This research was conducted with the assumption that all the red rice production was sold. As well as limiting the problem, namely the latest red rice production data at the time of research and household income and expenditure during the last year of red rice season.

The analysis of red rice farming data in Ponjong District employed the following equations for Farm Contribution, Share of Food Expenditure, and Welfare Analysis.

2.1. Farm Contribution

Determine the contribution of red rice farming, the following approach is employed

$$A = B/C \times 100\%$$

Information

A = Farm contribution
B = Farm income
C = Total income

Farmer contribution criteria
The contribution of income lower is 24.99% of red rice revenue, classified as very low.
The revenue contribution of 25% - 49.99% of red rice income is relatively low.
The contribution of 50% - 75.99% of total red rice revenue is high.
The contribution of income higher is 75.99% of the total revenue of red rice, classified as very high.

2.2. The household food expenditure share (HFES)

Analysis of the level of food security of farmer households according to the household food expenditure share (HFES) equation according to[15] [16], written using the following equation.
HFES = HFE/THE X 100%
HFES = Household food expenditure share (%)
HFE = Household Food expenditure (IDR/year)
THE = Total Household expenditure (food and non-food) (IDR/year)
HFES < 60% of total expenditure, meaning that households are categorized as food insecure.
HFES ≥ 60% of total expenditure, meaning that households are categorized as food insecure.

2.3. Well-being Analysis

Analysis of the welfare of farmer households is carried out using the method, namely the method Good Service Ratio, Farmer Household Income Exchange Rate (and Indicators. Measurement of the welfare level of farmer households red rice By Good Service Ratio (GSR) according to [17] [18], can be formulated as follows:
GSR = food expenditure / (non-food expenditure)
Information
GSR > 1, then the household economy is less prosperous.
GSR = 1 then the household economy is prosperous
GSR < 1 then the household economy is more prosperous.
This welfare study was analysed by using the Rice Farmer Exchange Rate (FER) and Food Expenditure Share (FES) indicator. FER is a measure of the ability to exchange the agricultural product with the goods or services needed by consumption and the cost to produce agricultural products [18][19], formulated as:

FER = Y/E; Y = YP + YNP and E = EP + EK

Where:

Y = Index of prices received by farmers
YP = Total farm income
YNP = Total non-farm income
E = Index of prices paid by farmers
EP = Total farm expenditure
EK = Total non-farm expenditure

Analysis of the welfare level of farmer households based on FER criteria as follows:

FER < 1 Not Prosperous, FER = 1 Prosperous and FER > 1 More Prosperous

The following welfare indicator uses calculations according to with the following equation:

Expenditure per capita/year (IDR) = Household Expenditures Per Year (IDR))/ (Total Family Dependents

Expenditure per capita/year rice equivalent (kg) = (Expenditure Per Capita/Year (IDR))/ (Rice Price (IDR/Kg))

Information based on classification according to [6], poverty criteria can be divided into six types, including:

a. The poorest if the expenditure per family member is <180.99 kg equivalent to rice/year.
b. Abysmal if the expenditure per family member is 181-240.99 kg, equivalent to rice/year.
c. Poor, if the expenditure per family member is 241-320.99 kg, equivalent to rice/year.
d. Almost poor, if the expenditure per family member is 321-480.99 kg, equivalent to rice/year.
e. Enough, if the expenditure per family member is 481-960.99 kg equivalent to rice/year.
f. Living decently if the expenditure per family member is >960.99 kg equivalent to rice/per year.

3. Results and discussion

3.1 Farm Contribution

The contribution of farm income is a number or amount of value in the form of a percentage that shows how much contribution red rice farming is given to meet the income needs of farmer households in one year. Total farm income can be derived from *on-farm, off-farm,* and *non-farm income*. The following details the contribution of household income of red rice farmers in Ponjong District. Farmers in Ponjong District are primarily old, and the location of settlements varies significantly in terms of differences in soil types and hilly conditions, there are some steep ones. This is related to the income from red rice farming, which causes differences in nutrients with lowland soils that are good for rice farming.

Table 1. Contribution of Red Rice Farming

Description	South Zone		Central Zone		North Zone	
	(IDR)	(%)	(IDR)	(%)	(IDR)	(%)
Red Rice farm	2,388,561	11.9	120,889	0.6	225,826	1.2
On farm	4,051,495	20.2	9,424,841	49.8	6,221,651	34.0
Off farm	2,866,154	14.3	2,399,661	12.7	3,016,364	16.5
Non-farm	10,797,949	53.7	6,970,714	36.9	8,824,242	48.3
Household Revenue (IDR)	20,104,159	100.0	18,916,105	100.0	18,288,083	100
Annual per capita income (IDR)	7,477,156		6,765,124		6,788,237	

Based on Table 2, red rice farming income is smaller than other household incomes, especially farm income other than rice which has a high value, this occurs because the land used is dry. However, farmers use this well to do other crop farming, causing intercropping patterns. It aims to take advantage of the suitability of land for other commodities that can increase farmers' household incomes, even though some residents there prefer not to cultivate red rice and replace it with crops such as corn and peanuts.

The contribution of red rice income calculated for one year; the largest contribution was in the southern zone with a percentage of 11.9%. The amount of contribution obtained is because farmers tend to apply a monoculture planting pattern focusing more on red rice plants. This is driven by the existence of boreholes that are used to help the irrigation system for red rice plants, the application of irrigation systems in farming

significantly influences household income [20]. The northern and central zones utilize dry land by using an intercropping planting system so that less land is used, and there is nutrient competition due to other crops planted simultaneously. So overall the contribution made by farmers to household income is meagre because the contribution given < 24.99% is categorized as very low. The largest annual per capita income is in the southern zone of IDR. 7.477.156, followed by the northern zone of IDR. 6.788.237, and the smallest income is in the middle zone of IDR. 6.765.124.

This is inversely proportional to the research [21], whose research results explained that the contribution given by rice plants was more significant at 48.2% than other crops with the contribution of corn plants by 8.9%, peanut plants 30.4%, cocoa plants 4.1%, yield from copra coconut 8.4%. The amount of this contribution shows that farmers there tend to cultivate rice and the size of the land area, and the amount of rice production given is more significant, so it makes an enormous contribution.

Although farmers in Ponjong District prioritize farming of red rice plants. However, in one-year farmers only farm red rice once so that the income obtained is very small, in contrast to other commodities that can be cultivated up to 2 times. In addition, the use of dry land with rainfed irrigation systems has an influence on the amount of production produced, even though they both use intercropping planting patterns. This can be seen from the difference in the irrigation system in the southern zone that uses drilled wells. Although it incurs more significant farming costs for irrigation, it can positively impact red rice.

3.2. Food Security

Food security is analysed using the Share of Food Expenditure (HFES), which determines how much food security farmers have by dividing expenditure by total household expenditure and multiplying by 100%. According to [15]. The Share of food expenditure should be used as a food security analysis because it relates to household consumption and income. In addition, the Share of food expenditure can be calculated more straightforwardly. Details of food security based on the Share of farmers' food expenditure at the research location are as follows:

Table 2. Share of Food Expenditure (HFES)

Description	South Zone	Central Zone	North Zone	Average
Food Expenditure	8,523,359	8,554,554	8,771,379	8,613,940
Total Expenses	16,847,160	16,140,546	15,558,415	16,224,022
HFES %	50.6	53.0	56.4	53.1

The Share of food expenditure (HFES) used to measure the food security of farmer households is inversely proportional to the level of food security. The greater the expenditure on food needs, the more vulnerable food security will be (food insecurity), and vice versa; the more minor food expenditure, the higher the food security of farmer households. Food security can be interpreted as the need to meet the quality and quantity of food consumed. To meet food security, the role of education of the head of the family to generate more significant income is needed [22][23]. Farmer households are considered food secure when the HFES value is below 60%, and food insecure households are large or equal to 60%.

Farmers in the study location had a more significant total food expenditure than non-food expenditure. However, calculations using HFES show that most farmers in Ponjong District have a relatively good level of food security (food security), with a percentage of 53.1%. The value of HFES is close to food insecurity; farmers only focus on spending to

meet food needs, so that needs considered not so important are not a top priority for farmers. Southern zone farmers have the highest average food security rate of 50.6% because the household income generated is large enough that farmers there pay attention to other needs that must be met besides food needs, such as the need for children's education.

Farmers who live in rural areas are more focused on income from their agricultural products. The harvest of the farm that is run gives excellent hope to farmers, because it can be used to meet food needs. The harvest from some cultivated plants can meet needs other than food, so not all crops are consumed but sold in exchange for money [24]. In addition, household income positively influences food security and vice versa; household expenditure negatively influences food security[23]

This study's results align with research [25] which shows that the level of food security in Suruh District has a relatively good level of food security. The food security level is in the category with a percentage of 75.70% of respondents. This is because the non-food expenditure of farmer households is greater than the expenditure on food needs. The most significant expenditure was on education costs, with a percentage of 35.30%, the same as southern zone farmers who incurred the highest costs on education.

Table 3. Number of Food Insecure and Food Insecure Farmers

Description	**South Zone**		**Central Zone**		**North Zone**		**Total**	
	∑	**%**	∑	**%**	∑	**%**	∑	**%**
Food Security	51	65,4	37	66,1	41	62,1	129	64,5
Food Insecurity	27	34,6	19	33,9	25	37,9	71	35,5
Sum	78	100	56	100	66	100	200	100

Farmer households in the study location are known to have a food security rate of 64.5%. The resilience of farmer households in Ponjong District is classified as rice-resistant households. The most significant percentage is in the middle zone of 66.1% while the smallest is in the northern zone of 62.1%. Most farmers in the middle zone do farming other than red rice which can increase the household income and meet other needs. While farmers in the northern zone do the same planting pattern, the income from red rice farming is minimal, even though it is covered with other crops. This causes farmers to look for jobs other than farming such as farm laborers, thus making farmers pay attention to every expenditure that is not so important, especially needs other than food. Farmers in the southern zone have the highest average income of the other two zones. However, if calculated in the form of individuals, the level of food insecurity is still relatively large because there are still farmers who have not prioritized needs other than food. As many as 35.5% of farmers are in food insecure conditions, especially in the northern zone which has the highest level of food insecurity of 37.9% which requires other sources of income that can be obtained from outside farming and in farming.

Household food security shows that individuals and family members have adequate access to meet food needs. However, this is inseparable from the lifestyle of farmers in managing household expenses to meet all their needs. Based on research done as many as 53 out of 70 people are in the food security category, and several factors can affect food security, namely nutritional knowledge, income, education of housewives, and family dependents [25].

3.3. Well-being Analysis

Welfare analysis is used to determine how much the welfare level of farmer households in Ponjong District is analysed using the Good Service Ratio, Farmer Household Income Exchange Rate, and Indicators, according to Sajogyo.

3.3.1 Good Service Ratio Analysis

Good Service Ratio *analysis* is one of the tools to measure the level of household welfare by comparing food expenditure with non-food expenditure. A household is said to be prosperous if food needs are lower than those spent on non-food needs. That way it can be concluded that in meeting household needs, farmers do not only focus on food needs but can meet non-food needs. Details of welfare analysis using GSR can be seen in the following Table 4

Table 4. Well-being Analysis based on *Good Service Ratio*

Types of Expenses	South Zone	Central Zone	North Zone	Average
Food Expenditure	8,523,359	8,554,554	8,771,379	8,613,940
Non-Food Expenditure	8,323,801	7,585,992	6,787,036	7,610,082
GSR value > 1	1.02	1.13	1.29	1.13

Farmer households in the research location based on Good Service Ratio analysis are classified as not prosperous. The category in the Good Service Ratio analysis of farmer households is said to be prosperous if the GSR value is <1. The average GSR value in the overall research location is 1.13 so it can be said that farmers in Ponjong District are included in the unprosperous category. This shows that household food expenditure is more significant than household non-food expenditure. This means that the income obtained by farmers from farming and outside farming is relatively small, so farmers cannot meet non-food needs. The southern zone is a zone that has a GSR value close to 1 or equal to 1, which is 1.02; this is by household income that is greater than the other two zones so that farmers begin to think about other needs besides food. While the other two zones have slightly lower incomes than the southern zone, so the GSR value is more significant which causes farmers to focus more on food expenditure.

This research is inversely proportional to the results of the study [26] which shows based on well-being analysis using *Good Service Ratio* that palm sugar artisan households are included in the category of prosperous households with a GSR value of 0.49 or GSR < 1. This means that the smaller the GSR value, the higher the ability of households to meet their non-food needs. So, the more significant the income level of farmer households, the higher the ability to meet non-food needs such as children's education, service services, health, recreation, etc.

Research results [26][17] mention that welfare can be searched using a comparative calculation between household income and spenders. In research [17]uses *the Good Service Ratio* as a measure of well-being. If the GSR value < 1 means more prosperous, and vice versa, if the GSR value > 1 then less prosperous. However, if the GSR value shows = 1, it can be interpreted as prosperous. The study's results based on analysis using GSR stated that sugarcane farmers are more prosperous with a GSR value of < 1 of 97%, which means that as many as 97% of farmer households live more prosperously.

Table 5. Number of Prosperous and Unprosperous Farmers

Description	South Zone		Central Zone		North Zone	
	∑	(%)	∑	(%)	∑	(%)
Prosperous	30	38.5	16	28.6	13	19.7
Not Prosperous	48	61.5	40	71.4	53	80.3
Sum	78	100	56	100	66	100

Based on analysis using the Good Service Ratio, the welfare level of farmer households in Ponjong District is classified as not prosperous because the average value is more than 50%, namely with a percentage of 70.5% or equivalent to 141 less prosperous households. In this case the farmer's household income is relatively small, even though the farmer has been looking for additional work outside the farm. Low income causes farmers only to be able to meet food needs and the rest is used for basic non-food needs. Overall, farmers who fall into the prosperous category are 59 households with a percentage of 29.5%. This shows that households have been able to meet needs other than food, which means that the household income obtained can meet the needs of farmer households, both food and non-food.

3.3.2 *Exchange Rate Analysis of Farmer Income (FER)*

The exchange rate analysis of farmer household income (FER) is a welfare analysis comparing total household income and farmer household expenditure. FER is used to determine how much household income can meet the needs of life. FER is calculated annually so that income can come from farming or other than farming. Meanwhile, expenditure is calculated based on the needs of food expenditure and non-food expenditure. The following is a detailed analysis of the welfare of farmers in Ponjong District using the exchange rate analysis of farmers' household income.

Table 6. Welfare Analysis based on Farmer Household Income Exchange Rate (FER)

Description	South Zone	Central Zone	North Zone	Average
Total Revenue	20,104,159	18,916,105	18,288,083	19,172,818
Total Expenses	16,847,160	16,140,546	15,558,415	16,224,022
FER > 1	1.19	1.17	1.18	1.18

The analysis of level of household welfare can be analysed using the exchange rate of farmer household income calculated by comparison between total household income and total household expenditure. Farmers in the research location have an FER value of >1, which is 1.18. This means that farmer households are classified as prosperous, because the total household income obtained is greater than the total expenditure incurred by farmer households. This shows that the income obtained is enough to meet the needs of farmer households. Farmers in the southern zone have the highest FER value reaching 1.19, which shows that farmer household income is more significant than household expenditure even though the largest southern zone expenditure is accompanied by a sizeable total income resulting in a considerable FER value. While the northern and central zones have the same FER values of 1.18 and 1.17, more minor than the southern zone, farmers' expenditures are by farmers' incomes so that income can be used to meet the needs of farmers.

Research results in [27] show that the farmer household income exchange rate can measure welfare analysis. FER describes household economics, income and expenditure calculations that can reflect the welfare level of farmer households. Households are said

to be prosperous if FER > 1, which means that household income is greater than the needs spent by households. The results showed that each stratum of land showed different results. However, overall, rice farming households had an average FER of > 1, meaning that the ability of farmers to meet household needs was good enough so that rice farming households were classified as prosperous.[28]

In line with research [29] the exchange rate of farmer household income is a ratio between income and expenditure that can be used to measure welfare. In this case, how much income can meet household needs can be known. Based on his research, the overall FER value of > 1 is around 1.38, meaning farmers live more prosperously in the research location. The large amount of income farmers causes this situation to meet farmer households' food and non-food needs. In contrast to the results of the study by [30], which shows the results of FER research < 1 or 0.97, meaning that household expenditure is greater than the total income obtained by farmers,

Table 7. Number of Prosperous and Unprosperous Farmers

Description	South Zone		Central Zone		North Zone		Total	
	∑	(%)	∑	(%)	∑	(%)	∑	(%)
Prosperous	45	57.7	26	46.4	32	48.5	103	51.5
Not Prosperous	33	42.3	30	53.6	34	51.5	97	48.5
Sum	78	100	56	100	66	100	200	100

Table 7 shows prosperous and unprosperous households in Ponjong sub-district based on analysis using the farmer household income exchange rate as many as 51.5% of farmer households fall into the prosperous category. This shows that the total income of farmer households is sufficient to meet the needs of farmer households. Farmers can appropriately allocate income obtained from on-farm, off-farm, and non-farm to meet the needs of farmer households. However, when viewed with the number of per zona households, southern zone farmers live prosperously with a percentage of 57.7%. The middle and northern zones are not included as prosperous because farmers who live prosperously only have 46.4% and 48.5%. This means that when viewed from the income of farmer households in the middle and north zones, it is still classified as not prosperous, because the income obtained is smaller than the total expenditure of farmer households. 48.5% of farmers live unprosperous lives based on calculations using FER. This shows that the amount of costs incurred to meet the needs of farmer households is greater than the total income generated by farmers.

3.3.3 Well-being with Sajogyo Indicator

Table 8. Welfare Analysis based on Sajogyo Indicator

Description	South Zone		Central Zone		North Zone		Total	
	∑	(%)	∑	(%)	∑	(%)	∑	(%)
Very poor 181-240.99	0	0.0	0	0.0	3	4.6	3	1.5
Poor 241-320.99	6	7.7	3	5.4	5	7.6	14	7.0
Near Poor321-480.99	18	23.1	14	25.0	16	24.2	48	24.0
Enough 481-960.99	46	58.9	37	66.0	39	59.0	122	61.0
Decent Living> 960.99	8	10.3	2	3.6	3	4.6	13	6.5
Total	78	100.0	56	100.0	66	100.0	200	100.0

The Sajogyo indicator in measuring the level of household welfare can be sought from per capita household expenditure per year. Household expenditure comes from food and

non-food expenditures for one year divided by the number of family dependents. After that, household expenditure per capita per year is divided by the price of rice per kilogram.

Analysis of the welfare of farmer households in Ponjong District, according to Sajogyo, the average farmer household is in the sufficient category of 481-960.99 with a percentage of 61.0% and a decent life of 6.5%. The southern zone has the most significant percentage of decent Living at 10.3%, more significant than other zones; this is due to the relatively large household income so that the fulfilment of needs can be fulfilled including other than basic needs. Farmers in the middle zone have a reasonably large percentage in the near-poor category of 25.0% greater than other zones; this shows that farmers whose living conditions are still low are relatively large. Northern zone farmers still have farmers in the poor category with a percentage of 4.6% due to low income, so the fulfilment of living needs is only focused on food needs.

The study results are like the research by [31] shows that based on the Sajogyoo indicator, farmer households producing oyster mushrooms in Metro City are included in the sufficient category with a percentage of 52.4%. Decent living criteria of 26.2% follows the next percentage. Farmers who fall into the criteria are almost poor because of the many family dependents and low income.

According to, the research that approaches this study shows that as many as 30 respondents, 62%, fall into the decent living category, and 18 respondents in the sufficient category with a percentage of 28%. This is due to the ability of households to earn household income so that it can be used to meet family needs.

The results of other consistent research show that as many as 36 participants and 37 non-participant respondents were included in the decent living category. However, 1 participant respondent and 3 non-participant respondents were included in the decent enough category. Households that fall into the sufficient category because the equivalent expenditure of rice is below 960 kg

4 Conclusion

Based on the study's results, it's clear that there are significant differences in the food security and welfare of dryland red rice farmers in Ponjong District, categorized into the south, middle, and north zones.Income Contribution: The contribution of red rice to farmer household income varies significantly across the three zones. The southern zone has the highest contribution at 11.9%, the northern zone at 1.2%, and the middle zone at 0.6%. All three zones fall into the deficient category as their contributions are below 24.99%. This suggests a need for strategies to enhance the income generated from red rice farming in all zones.

Food Security: Food security, as measured by the Food Expenditure Share (HFES), is relatively high in all three zones. However, it is important to note that the southern zone has the lowest HFES at 50.6%, indicating a slightly higher level of food insecurity compared to the other two zones. Ensuring food security for all zones remains a critical concern.

Welfare Analysis: Welfare analysis using three different techniques (Good Service Ratio, Exchange Rate of Farmer Household Income, and Sajogyo indicator) suggests variations in the prosperity of farmer households across the zones. The Good Service Ratio (GSR) values indicate that the southern zone is the least prosperous, with a value of 1.02. The northern zone has the lowest GSR value at 1.29, while the middle zone is in the middle with a value of 1.13. None of the zones are categorized as prosperous based on GSR. The Exchange Rate (FER) of farmer household income suggests that the southern zone is the most prosperous, with a FER value of 1.19, while the middle zone is the least

prosperous at 1.17. Both the southern and northern zones have FER values greater than 1, indicating a prosperous category. The Sajogyo indicator places all three zones in the moderately viable category. The middle zone has the highest Sajogyo indicator value at 69.6%, followed by the southern zone at 69.2%, and the northern zone at 63.6%. This suggests that all three zones have some level of viability, but there is room for improvement.

The study provides valuable insights into the food security and welfare of dryland red rice farmers in different zones. By addressing the specific needs and challenges of each zone, policymakers and agricultural stakeholders can work towards improving the overall well-being of these farming communities.

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