

Research Article

Triyono Triyono*, Muhammad Fahmi Faruqi Al Qudsi, Nur Rahmawati, Zuhud Rozaki,
Mohd Fauzi Kamarudin

The role of organic rice farm income on farmer household welfare: Evidence from Yogyakarta, Indonesia

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Abstract: The study aims to know the farmer's income from organic rice farming and farmer household income, to determine the welfare of farmer households. This research was conducted by data collection from 70 farmers' households. The data analysis was used for the estimation of the farmer household income exchange rate and good service ratio. The results showed that the farmers are not yet prosperous. Further analysis to determine the role of organic rice farming for farming households has received less attention from researchers. Regarding this study, on-farm income derived from organic rice farming has a role as income contribution about 34.71% on the welfare of farmer households, classified as moderate.

Keywords: income role, organic, rice farming, welfare

1 Introduction

Indonesia is an agricultural country where many people have a livelihood as farmers. Therefore, the agricultural sector is one of the sectors that have a major role in the Indonesian economy. The agricultural sector still plays an important role in economic development [1], namely as a

source of income, opening job opportunities, alleviating poverty, and reminding food security [2–4].

Land and agroecology are very influential factors in agricultural production. The factors maximized are the cultivation environment, soil nutrients, and land management [5]. Therefore, climate change and soil degradation can cause a decrease in soil capacity so that agricultural production falls [6]. In addition, improper tillage can cause the land to be easily damaged or fragile. The characteristics of fragile land are as follows: (i) low soil fertility level, (ii) high porosity, (iii) frequent droughts and floods, and (iv) high soil acidity. Tillage is the most important factor to achieve the expected agricultural production. Therefore, land processing must be improved by preserving the environment and land quality. Improving land quality should be shown in the physical structure of the land, the chemical composition of the land, and the activity of soil biota that is optimal for plants [7].

Organic rice farming is the management of rice farming without input from chemicals so that it is safer for agricultural land. Fertilizers and pesticides used in the production process are sourced from organic matter. The organic material in question is manure derived from animal manure, plant waste, and by-products such as compost, rice straw, or other plant residues. In addition, pest and plant disease control uses biopesticides or products from natural ingredients derived from plants [8]. Thus, it is expected that organic rice production has advantages not only to have a positive effect on body health but also in the long term as an effort to preserve the environment [9,10]. The implementation of environmentally friendly organic rice farming can increase the production, income, and sustainability of agricultural production [11–13].

Sleman Regency is the center of rice in the Special Region of Yogyakarta. There are more certified organic rice farms compared to other regions (BPS, 2016). However, organic rice production in this region is still lower when compared to conventional rice production. Although the price of organic products is relatively more expensive than conventional

* **Corresponding author: Triyono Triyono**, Department of Agribusiness, Universitas Muhammadiyah Yogyakarta, Yogyakarta, 55183, Indonesia; Center for Study of Sustainable Development Goals (SDGs), Universitas Muhammadiyah Yogyakarta, Yogyakarta, Indonesia, e-mail: triyono@umy.ac.id

Muhammad Fahmi Faruqi Al Qudsi, Nur Rahmawati, Zuhud Rozaki: Department of Agribusiness, Universitas Muhammadiyah Yogyakarta, Yogyakarta, 55183, Indonesia

Mohd Fauzi Kamarudin: Faculty of Technology Management and Technopreneurship, Universiti Teknikal Malaysia, Melaka, Malaysia

products, most organic rice production is consumed by farmers themselves or sold to a combination of farmer groups. This is because farmers do not yet have a market for organic rice products [14]. The extent to which the impact of organic rice farming on the welfare of farmer households needs attention in the form of a more in-depth study.

Various studies that have been conducted related to organic farming show that organic farming can protect the environment by increasing soil productivity and producing healthy products because it is free from chemical fertilizers and other chemicals [15–19]. Increasing public awareness of the dangers of chemical content in agricultural products makes organic agricultural products begin to be in demand by consumers [20,21]. Consumers are increasingly aware and selective of the health quality of food products by consuming organic agricultural products [22–26]. However, studies are still limited to aspects of ecological impacts, production, and market potential of organic food. There is no study of the impact of organic farming on the welfare of farmers. In fact, public interest in switching to organic agricultural products can increase farm income for farmers. The level of farm income, apart from being the main determinant of the welfare of farmer households, is also one of the important factors in conditioning economic growth [27]. In addition to farm income, farmer households have sources of income from outside the farm (off-farm) and non-agricultural (non-farm) activity [28,29].

Income is a factor that is directly related to the welfare of farmer households. Farmer welfare can be developed if actions related to financial, social, and human quality improvement are considered, such as providing subsidies, loans, and allowances, providing counseling, and training. Thus, farmer households can be said to be prosperous if household income can meet household needs and other needs [30].

Based on the search of previous studies, we have not found specifically the relationship between organic rice farming and the welfare of farmers as the main actors of these activities. Therefore, this article will discuss the income of organic rice farmers and its role in the welfare of organic rice farmer households as one of the findings in Indonesia. This study aims to assess the income and welfare of organic farmers. This is important for determining government policies concerning organic farming, which currently are still sluggish.

2 Research method

The selection of the research site was carried out using purposive techniques, namely deliberately selecting the

area of Sleman Regency, considering the largest number of certified organic rice farmer groups in Sleman Regency in the Special Region of Yogyakarta. Farmer populations were conducted using a census technique where all individuals in the organic rice farmer population were interviewed as respondents. In total, there are 70 organic rice farmers from five farmer groups in four sub-districts in Sleman Regency, namely Sleman, Cangkringan, Pakem, and Berbah Districts.

This research method uses a quantitative descriptive approach, namely analysis of numerical data on farming and farmer household income that can provide a detailed picture of the welfare conditions of organic rice farmer households. The mathematical calculation formula can be described as follows:

To find out the income of organic rice farming in Sleman Regency can be known from the formulation:

$$NR = TR - TC_{eks}, \quad (1)$$

where NR = net revenue (IDR); TR = total revenue (IDR); and TC_{eks} = total explicit cost (IDR).

The household income of organic rice farmers consists of three components with formulations:

$$HI = Y1 + Y2 + Y3, \quad (2)$$

where HI = household income; Y1 = on-farm income; Y2 = off-farm income; and Y3 = non-farm income.

Meanwhile, the welfare of organic rice farmer households can be determined from the farmer household income exchange rate (FHIER) and good service ratio (GSR) which are formulated as follows:

$$FHIER = HI/E, \quad (3)$$

where FHIER = farmer household income exchange rate; HI = household income; E = household expenditure; FHIER > 1 shows that peasant households are prosperous; and FHIER < 1 shows that peasant households are not yet prosperous.

$$GSR = \frac{\text{food expenditure}}{\text{non - food expenditure}}, \quad (4)$$

where GSR > 1 means that farming households are less prosperous; GSR = 1 means that peasant households are prosperous; and GSR < 1 means that farmer households are more prosperous.

The role of organic rice farming income on the welfare of farmer households can be known from the proportion of farm income to total household income that can be spent on farmer household needs.

$$\begin{aligned} &\text{The role of on farm income} \\ &= \frac{\text{on farm income/total income}}{\text{total income/total expenditure}} \times 100\%. \end{aligned} \quad (5)$$

3 Results and discussion

3.1 Organic rice farm income

Organic rice-farming income is a source of on-farm income in farmer households, and on-farm income is income from farmers' organic rice farming that contributes to household income [31]. Organic rice-farming income is obtained by calculating the difference between receipts and the total explicit costs incurred by farmers in the process of organic rice farming [32]. The greater the revenue or the smaller the total cost, the higher the farmer's income will be because the difference is farther.

Table 1 presents the results of the analysis of organic rice farming for two growing seasons in 1 year. The table

provides information on organic rice-farming income for IDR 6,662,627 per year. Organic rice production is related to income if production is high and then income will increase. The highest income is found in the Sleman sub-district at IDR 7,971,690, although the total production cost is higher, rice production is also higher. In Berbah District, the lowest farm income is because the cultivated land is relatively narrow, so the organic rice production is also low.

3.2 Farmer household income

There are three types of income sources for farmer households, namely income from organic rice farming (on the farm), income outside organic rice farming owned by

Table 1: Analysis of organic rice farming in Sleman Regency

Description	Sleman (2,047 m ²)	Cangkringan (1,763 m ²)	Pakem (1,287 m ²)	Berbah (1,180 m ²)	Average
Production (kg)	2,308	1,881	1,552	1,290	1,757
Price (Rp/kg)	5,047	5,400	6,400	6,050	5,724
Revenue	11,646,409	10,154,700	9,930,667	7,804,500	9,884,069
Explicit cost					
Production inputs					
Seed	139,900	135,525	99,333	71,550	111,577
Solid organic fertilizer	1,003,333	875,000	900,000	845,000	905,833
Liquid organic fertilizer	53,667	63,000	142,333	49,250	77,063
Total input cost of production	1,196,901	1,073,525	1,141,666	965,800	1,094,473
Workforce					
Tillage	—	30,625	—	—	7,656
Planting	580,000	560,063	422,084	501,875	516,005
Fertilization	—	—	—	—	—
Weeding	—	—	—	7,000	1,750
Harvest	747,000	676,500	587,417	583,188	648,526
Total labor cost	1,327,000	1,267,188	1,009,500	1,092,063	1,173,938
Tool depreciation					
Hoes	21,246	16,645	23,852	22,835	21,145
Sabit	12,665	12,733	19,266	13,054	14,430
Weed tool	8,200	6,902	10,933	17,906	10,985
Sprayer	12,728	18,927	38,783	33,153	25,898
Sheeting	18,908	25,875	17,952	17,400	20,034
Braid	5,732	—	—	—	1,433
Angkong	1,667	6,292	—	—	1,990
Total depreciation cost	81,145	87,374	110,786	104,349	95,914
Others					
Land lease	163,334	240,000	106,666	85,000	148,750
Tax	9,666	7,700	21,534	9,850	12,188
Irrigation dues	—	—	12,000	25,800	9,450
Rent farm tools	596,666	425,000	293,334	290,000	401,250
Consumption	300,000	285,750	262,666	293,500	285,479
Others cost total	1,069,667	958,450	696,200	704,150	857,117
Total explicit cost	3,674,712	3,386,537	2,958,152	2,866,362	3,221,441
Income	7,971,690	6,768,163	6,972,515	4,938,138	6,662,627

Source: primary data analysis, 2023.

farmers but still in the agricultural sector (off-farm), and income from outside the agricultural sector (non-farm) [33]. Table 2 presents the average total household income of organic rice farmers for 1 year in Sleman District. Based on Table 2, we can find out the total household income of organic rice farmers in Sleman District for 1 year. The average total household income of organic rice farmers in Sleman Regency is IDR 19,245,127 per year; if converted per month, the average total household income of organic rice farmers in Sleman Regency is IDR 1,603,760. Farmers do not only depend on organic rice farming income but also from other activities to increase household income. The highest farmer household income is found in Sleman District, while the farmer household income in Cangkringan District is the lowest. Overall, most of the income comes from non-farm. In general, food crop farmers in Indonesia are smallholders, so in most farming households, the largest source of household income comes from outside the farm [34]. This is because income from non-farm activities is indeed quite large, such as teachers, traders, private employees, and self-employed, to retirees. Meanwhile, plantation farmers with more land will benefit more from the expansion of farming [35].

3.3 Farmer household welfare

To determine the level of welfare of farmer households, two criteria are used, namely according to the farmer household income exchange rate (FHIER) and GSR. The

reason for measuring the welfare of farmer households using two criteria, namely FHIER and GSR, is because each has different indicators to measure the welfare level of farmer households. FHIER is based on the amount of revenue while GSR is based on the amount of expenditure.

3.3.1 FHIER

FHIER is obtained from the calculation of the division between the total income of farmer households and the total expenditure of farmer households [36]. Table 3 shows the total expenditure of farmer households. Farmer households can be said to be prosperous if the calculation results show $FHIER > 1$ or farmer household income is greater than household expenditure, but if the calculation results show $FHIER < 1$, farmer households are categorized as not prosperous because household expenditure is greater than household income. The greater the value of FHIER, the higher the level of welfare of farmer households [37]. Table 4 presents the level of farmer welfare according to FHIER and the role of organic rice farming income on the welfare of farmer households in Sleman District.

The results of the analysis (Table 4) show that in general, the FHIER is more than one. This shows that organic rice farmers are in a prosperous condition. Only the Cangkringan area of farmers has not prospered because FHIER is less than one. This shows that their households are still unable to meet expenses for household living needs both for food and non-food consumption [37]. Low farm income

Table 2: Total household income of farmers in Sleman Regency

Sources of income	Sleman	Cangkringan	Pakem	Berbah	Average
On-farm	7,971,690	6,768,163	6,972,515	4,938,138	6,662,627
Off-farm					
Farmworker	1,280,000	4,230,000	1,280,000	2,340,000	2,282,500
Breeder	1,760,000	—	—	2,100,000	965,000
Total off-farm	3,040,000	4,230,000	1,280,000	4,440,000	3,247,500
Non-farm					
Welding workshop	—	—	—	1,680,000	420,000
Construction workers	800,000	600,000	720,000	600,000	680,000
Event organizer	1,120,000	—	—	—	280,000
Teacher	3,200,000	2,100,000	—	—	1,325,000
Merchant	400,000	1,920,000	4,800,000	720,000	1,960,000
Vegetable collector	—	—	1,200,000	—	300,000
Official	—	—	4,400,000	—	1,100,000
Pensioner	—	—	—	2,280,000	570,000
Grocery store	4,800,000	900,000	1,200,000	—	1,725,000
Business	—	—	—	3,900,000	975,000
Non-farm revenue	10,320,000	5,520,000	12,320,000	9,180,000	9,335,000
Total revenue	21,331,690	16,518,163	20,572,515	18,558,138	19,245,127

Table 3: Household expenditure of farmers in Sleman Regency

	Household expenses				
	Sleman	Cangkringan	Pakem	Berbah	Average
Food					
Rice	2,012,800	1,425,600	1,862,400	1,668,000	1,742,200
Meat, fish, eggs	3,718,400	3,430,200	3,201,600	2,899,800	3,312,500
Vegetables	408,000	537,600	449,600	518,400	478,400
Fruit	640,000	753,600	694,400	741,600	707,400
Drink	1,222,400	781,200	952,000	1,002,000	989,400
Cooking oil	784,000	795,600	967,200	874,200	855,250
Marinades	1,145,600	1,461,600	2,064,000	1,872,000	1,635,800
Cigarette	1,684,800	1,168,800	1,030,400	1,732,800	1,404,200
Fast food	800,000	168,000	41,600	830,400	460,000
Sum	12,416,000	10,522,200	11,263,200	12,139,200	11,585,150
Non-food					
Fuel, gas, electric	2,312,400	2,454,600	2,572,000	2,197,800	2,384,200
Tax	408,667	298,117	420,429	470,194	399,352
Communication	1,124,000	1,191,000	2,368,000	1,027,200	1,427,550
Education	1,470,000	147,000	320,000	—	484,250
Cleaning	920,000	1,093,800	1,043,200	800,400	964,350
Clothe	54,000	20,000	—	67,500	35,375
Health	282,400	18,000	13,333	16,600	82,583
Social activity	735,093	687,000	1,056,667	811,500	822,565
Others	542,800	382,000	439,333	285,500	412,408
Sum	7,849,360	6,291,517	8,232,962	5,676,694	7,012,633
Total expenditure	20,265,360	16,813,717	19,496,162	17,815,894	18,597,783

can be caused by high production costs, but low agricultural production [38]. Therefore, there is a need for input or output-based subsidy programs to increase the income and distribution of farmers' income [39].

Table 4 shows that the average role of organic rice farming income in household welfare is 34.71%, which means that organic rice farming income contributes 34.71% to the welfare of organic rice farmer households. The sub-district with the largest role of organic rice farming income is Cangkringan District with a percentage of 40.97%, while the sub-district with the lowest role of organic rice farming income is Berbah District with a percentage of 26.61%. This is because

the income from organic rice farming in Cangkringan District is above average and the household expenditure of farmers in Cangkringan District is the lowest among other districts. Meanwhile, the Berbah sub-district has the lowest average income from organic rice farming of all sub-districts.

Organic rice-farming households with the prosperous category are indicated by total household income greater than total household expenditure. The source of household income is not only from on-farm or organic rice farming but also from off-farm and non-farm. To improve household welfare, additional income from businesses or other activities is needed outside of the income obtained from

Table 4: FHIER analysis of farmer households in Sleman Regency

	Sleman	Cangkringan	Pakem	Berbah	Average
<i>On-farm</i>	7,971,690	6,768,163	6,972,515	4,938,138	6,662,627
<i>Off-farm</i>	3,040,000	4,230,000	1,280,000	4,440,000	3,247,500
<i>Non-farm</i>	10,320,000	5,520,000	12,320,000	9,180,000	9,335,000
Total income	21,331,690	16,518,163	20,572,515	18,558,138	19,245,127
Food	12,416,000	10,522,200	11,263,200	12,139,200	11,585,150
Non-food	7,849,360	6,291,517	8,232,962	5,676,694	7,012,633
Total expenditure	20,265,360	16,813,717	19,496,162	17,815,894	18,597,783
FHIER	1.05	0.98	1.06	1.04	1.03
Role of on-farm (%)	37.37	40.97	33.89	26.61	34.71

Table 5: Farmer household welfare based on GSR analysis

Expenditure	Sleman	Cangkringan	Pakem	Berbah	Average
Food	12,416,000	10,522,200	11,263,200	12,139,200	11,585,150
Non-food	7,849,360	6,291,517	8,232,962	5,676,694	7,012,633
GSR	1.58	1.67	1.37	2.14	1.69

farming, so that it will help farmers meet household needs. This can be done through activities of agricultural extension services and farmer-based organizations for technology adoption [40]. Increasing agricultural land area can also be a solution, which is proven to improve the welfare of Wheat farming households in Pakistan and farming households in Klaten, Central Java [41,42]. In contrast, farmers in China who lost farmland showed that their household welfare levels were at low levels [43]. In addition, easy market access can increase the income and welfare of farmer households, such as the results of research on chili farmers in Java, legume farmers in China, peanut farmers in Ghana, corn farmers in Tanzania, and breeders in Ethiopia [44–48]. Innovations in agriculture, the use of agricultural technology, and the use of mobile money applied by farmers in Ghana, Ethiopia, and China can increase agricultural output and household income, as a result of which household expenditure also increases, so that the welfare of farmer households also increases [49–54]. Therefore, science and technology considering the demand for spices cannot necessarily improve the welfare of farmer households in Indonesia if farmers are still weak in science and technology [55]. Meanwhile, outsourcing agricultural services in China can be a solution to improving the welfare of cotton farmer households by increasing household income and increasing household spending [56].

3.3.2 GSR

GSR is an analysis of the level of household welfare by comparing food and non-food expenditure. If non-food expenditure is greater than food expenditure, farmer households can be said to be prosperous, this is because farmers can meet

household food needs so that they can allocate income to non-food needs. Table 5 shows the welfare level of organic rice farmers in Sleman District based on GSR analysis. Based on Table 5, farmer households in Sleman Regency according to the welfare level analysis with the GSR indicator are classified as less prosperous households. This is indicated by the average GSR value of >1 , which is 1.69. From all sub-districts in Sleman Regency, it shows that food expenditure is greater than non-food expenditure, this means that the income obtained by farmers from organic rice farming and outside farming is used by farmers to meet food needs so that farmers cannot allocate more income for non-food needs. Thus, food expenditure is the highest expenditure of farmer households [57].

In general, the welfare of food crops and horticulture farming households in Indonesia is still low as rice-farming households in Kalimantan [58]. Meanwhile, mango farmers in East Java are also not prosperous [59]. Therefore, the increase in household expenditure for both food and non-food needs must be balanced with an increase in farmer household income [60].

The level of welfare of a society can be said to be good if household income increases and part of the income can be used for non-food consumption needs. Therefore, the expenditure or consumption pattern of a society is determined by the family income obtained [61]. This is based on Engel's law which states that the greater the income, the smaller the share of income used for food consumption, and the smaller the income, the smaller the share of income used for non-food consumption. If household food expenditure is greater than non-food expenditure, then the farmer's household is declared less prosperous; if food expenditure is less than non-food expenditure, then the farmer's household is declared prosperous [62].

Table 6: Distribution of farmer household welfare based on GSR value

Category	Sleman		Cangkringan		Pakem		Berbah		Sum	
	Person	%	Person	%	Person	%	Person	%	Person	%
Prosperous	2	13,33	0	0	3	20,00	0	0	5	7,14
Less prosperous	13	86,67	20	100	12	80,00	20	100	65	92,86
Total	15	100	20	100	15	100	20	100	70	100

Source: primary data analysis, 2021.

In general, respondents with less prosperous categories prefer to use income for food expenditure and have not acted to set aside money for non-food expenses such as housing facilities, health, education, and so on. Meanwhile, respondents with a more prosperous category have the idea that income is not only used to meet food needs but also non-food needs as well. They think that education, health, home facilities, recreation, paying taxes, and more are important. They try to allocate income for food and non-food needs [63].

The distribution of farmer household welfare based on GSR value is presented in Table 6. It can be seen from Table 6 that 7.14% or as many as 5 farmer households in Sleman Regency are classified as more prosperous. This shows that only a small percentage of farming households in Sleman Regency can allocate the total household income obtained for non-food needs, not to meet food needs alone. Meanwhile, farmer households that are classified as less prosperous are much more with a percentage of 92.86% or as many as 65 households, meaning that the total household income obtained by farmers can only be used to meet food needs and then the rest is used for basic non-food needs.

4 Conclusions and recommendations

Income from organic rice farming (on the farm) in Sleman Regency for a year amounted to IDR 6,662,627. The household income of organic rice farmers for 1 year sourced from on-farm, off-farm, and non-farm income is IDR 19,245,127. From this income, it has not been able to provide significant welfare for farming households. This is shown by the level of household welfare of organic rice farmers in Sleman Regency based on the FHIER showing 1.03 which means it is prosperous but based on the GSR value shows 1.69 which means less prosperous. Organic rice-farming income contributes to the welfare of farmer households by 34.71%. It means that the role of organic rice farming is enough. Therefore, it is necessary to innovate farming and optimize agricultural resources based on science and technology to increase agricultural production to increase household income and welfare. This innovation necessitates a study of resource optimization and the precise identification of determining elements in order to boost agricultural production, income, and farmer welfare.

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