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MULTIDIMENSIONAL POVERTY OF CASSAVA FARM HOUSEHOLDS IN WONOGIRI REGENCY, INDONESIA

Purpose. *This study analyzed multidimensional poverty in cassava farm households in Wonogiri Regency, Indonesia.*

Methodology / approach. *The main method was a descriptive quantitative approach. Moreover, a purposive method was used in determining the study area, considering that Wonogiri Regency is the largest cassava production area in Central Java Province. The number of research samples was 100 cassava farm households. The data analysis method used the Multidimensional Poverty Index (MPI).*

Results. *The headcount ratio (H) based on an analysis of 0.190 meant that 19 % of cassava farm households had poor multidimensional status, and another 81 % were not poor. Furthermore, the intensity of poverty (A) was 0.333, meaning the average deprivation of poor farmers was 0.333. In addition, the Multidimensional Poverty Index of cassava farm households was 0.063. Although the average weight of deprivation indicators of immunization, child mortality, school participation, sanitation, drinking water, and electricity was 0, it must be maintained to achieve the Sustainable Development Goals.*

Originality / scientific novelty. *Poverty analysis with the Multidimensional Poverty Index approach has never been carried out on cassava farm households in the study area. Previously, data analysis was conducted in the study area included the potential of cassava in the context of food security, cassava-based agro-industrial development strategies, value-added analysis of cassava-based agro-industry, cost structure analysis and feasibility of cassava farming, risk analysis and distribution of cassava farming income as a result of climate change, income distribution with the Gini Index and Lorentz Curve. Therefore, this study fills the gaps in the literature.*

Practical value / implications. *There is a need to improve the education of farmers' children and future generations of farmers, and to increase the knowledge and understanding of farmers through advisory work in agriculture. The change of cooking fuel from wood and shrubs to liquefied petroleum gas needs should be implemented to improve the living standard of cassava farm households. The floor and roof components of houses need to be refined to improve the living standards of cassava households and increase access to the Internet as a means of information and communication. Improvements in education, health and living standards as multifaceted components must be carried out to achieve the Sustainable Development Goals (SDGs), especially in relation to poverty.*

Key words: *cassava, farmers, poverty, multidimensional poverty index, sustainable development goals.*

Introduction and review of the literature. Rural development through agriculture is essential to achieving the Sustainable Development Goals (SDGs), especially regarding food security, poverty eradication, social equity, preservation of natural resources, and environmental protection [1]. The survival and income of small-

scale land farmers play an essential role in poverty alleviation and society's overall well-being, as they are the primary victims of poverty [2]. Agriculture has great potential to alleviate poverty. Several agricultural subsectors, especially the crop subsector, are very important in poverty alleviation. Crops such as cocoa, oil palm, cassava, cashew, etc., are cash crops of farmers and can generate economic returns [3]. Thus, focusing on the transition of rural farmers from subsistence farming due to lack of capital, technological improvement and solving the problem of lack of machinery to commercial agriculture is important. It aims to lift them out of poverty, especially the total income is the most significant variable determining poverty status of farmers [4]. However, commercializing agriculture alone will not eradicate multidimensional poverty in the small-scale agricultural sector. Complementary interventions are needed to improve access to sanitation, health, drinking water, education, and sustainable energy [5]. Sustainable agriculture can help reduce hunger and poverty, as almost 80% of the very poor live in rural areas [6].

Improving agricultural performance in developing countries is a social capital playing an essential role in economic development [7]. Among the many development sectors, agriculture is one of the sectors with the most significant contribution to Indonesia's gross domestic product (GDP). Indonesia is a country rich in natural resources. However, many Indonesian farmers still live in poverty [8]. Extreme poverty tends to be greater in rural areas where the main source of income is the agricultural sector than people living in urban areas or working outside the agricultural sector who benefit from health and social services [9]. Poor people live with subsistence farming and the extraction of natural resources. Alternative life choices that reduce the extraction of natural resources and increase household incomes are necessary to reduce poverty [10].

The pursuit of inclusive and sustainable rural transformation through an integrated approach to food security and nutrition, taking into account the linkages between agriculture, health, education, water, energy, gender equality and poverty, must continue. Reducing poverty and inequality is contained in the SDGs, or the 2030 Agenda for Sustainable Development, agreed upon at the 2015 United Nations Sustainable Development Summit in September 2015. [11]. The agricultural sector improves livelihoods, and economic growth, ending hunger and poverty, improving gender equality, and promoting sustainable development [12]. Therefore, it can be made through the agricultural sector to achieve the SDGs, but poverty still occurs among farmers.

Poverty is a central challenge to development in countries worldwide, including Indonesia. Poverty is a single-dimensional and multidimensional phenomenon, and the single dimension is based on one indicator, namely per capita income or expenditure [13]. Poverty is basically a phenomenon that occurs in rural areas [14]. Poverty is associated with less productive agricultural land [15]. Only monetary indicators cannot measure multidimensional poverty because there are indicators that cannot be expressed monetarily [16]. The dimensions that cannot be explained monetarily are the dimensions of education, health, and standard of living.

Poverty is one of the phenomena contained in the Sustainable Development Goals as the first goal. The SDGs are a continuation of the Millennium Development Goals (MDGs). The SDGs are considered better because they integrate environmentally-based social and economic development to expand the goal-setting process, the scope of sustainable development to cover all countries, and the inclusion of private sector actors and civil society organizations [17]. The COVID-19 pandemic has impacted poverty [18; 19]. After the COVID-19 pandemic, achieving SDG 1 "No Poverty" will be very challenging in Indonesia. The poverty rate is expected to increase due to the large-scale social distancing policies implemented by provincial, municipal, and local governments throughout Indonesia. Many people have lost their jobs as a result of social distancing imposed. Vulnerable communities are expected to fall into poverty, and the poor are expected to fall into deeper poverty [20]. The solution to the adverse impact of the pandemic is to increase global economic growth, as a challenging element of the SDGs. The pandemic is a challenge to achieving the SDGs at the global level [21].

The COVID-19 pandemic has not only impacted poverty but is even more widespread. COVID-19 impacts employment, microenterprises, food security, access to health, educational services, and social protection programs. More deeply, it gives an idea of the impact of the pandemic on the development and well-being of children [22]. Most countries implemented lockdown policies that resulted in negative economic growth and increased poverty [23]. The outbreak of COVID-19 poses new risks to the quantity and quality of life. Society must allocate resources to mitigate these risks to human well-being [24].

Wonogiri Regency is the largest cassava production area in Central Java Province. Cassava production in Wonogiri Regency in 2019 was 890,438, accounting for 29.9 % of the total production in Central Java Province [25]. The cassava commodity in Wonogiri Regency is often associated with fluctuations in cassava production that affect farmers' agricultural and socioeconomic production [26]. Fluctuations in cassava production affect the uncertainty of farm household incomes, impacting poverty. The income level of cassava farmers in Wonogiri Regency was still low. The expansion of agribusiness to other crops due to pressure from poverty and insistence on subsistence needs is inevitable, and the economic position of farmers is marginal, so the destruction of land ecosystems can be seen as a poverty trap due to income inequality or equitable but low-income distribution [27]. Poverty can be alleviated by applying an integrated approach to improve the socioeconomic dimension in developing countries [28]. Several studies on cassava in Wonogiri Regency have been carried out by several researchers, namely on the potential of cassava in the context of food security [29], cassava-based agro-industrial development strategies [30], analysis of added value in the production and processing of cassava [31], cost structure analysis and feasibility of cassava farming [32], risk analysis and distribution of cassava farming income as a result of climate change [26]. There was a study of cassava farmers in Wonogiri District on income distribution with the Gini Index and the Lorentz Curve [27], but the study has not analyzed multidimensional poverty.

Figure 1 shows the dynamics of changes in the volume of publications on multidimensional poverty in the world during 2002–2022.

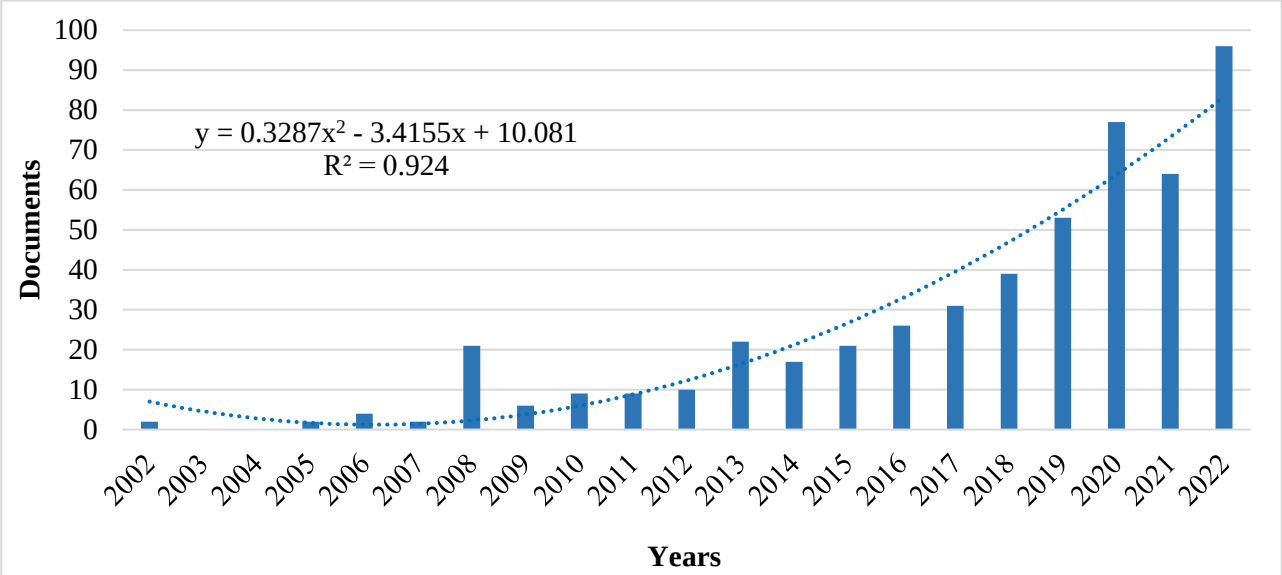

Figure 1. Annual volume of publications on multidimensional poverty in the world, 2002–2022

Source: built by the authors on the basis of the Scopus database.

Although the number of published papers on multidimensional poverty in the world shows an overall increasing trend, there are almost no publications dealing with the multidimensional poverty of cassava farm households. The novelty of this study is the use of the Multidimensional Poverty Index (MPI) method in farmer households, especially cassava in Indonesia. Some of the indicators in Multidimensional Poverty Index have been modified from the previous authors [33]. Therefore, the multidimensional poverty analysis of cassava farmer households is urgent to be examined as a step toward achieving SDGs.

The purpose of the article. This study aimed to analyze the multidimensional poverty of cassava farm households in the Wonogiri Regency, Indonesia.

Material and methods. The methods used to achieve this objective included the primary method. The perspective of this research approach is a descriptive quantitative approach aimed at describing events that occur in the form of meaningful numbers. Furthermore, the purposive method was used in determining the study area, considering that Wonogiri Regency is the largest cassava production area in Central Java Province. The determination of research samples using cluster random sampling is done by selecting samples by the group. Two groups are determined in this study: the sub-district group with high cassava productivity and the sub-district group with low cassava productivity. Determination of sub-district groups based on productivity to provide differences in productivity and income so that the research results can be representative. From each group, 1 sample sub-district was selected for two sub-district samples. The subdistrict groups based on low and high cassava productivity in Wonogiri Regency are shown in Table 1.

The sample selection in this study was cassava farm households in the high-

productivity sub-district group, namely Ngadirojo District, and a district with low cassava productivity, namely Jatiroto District, so there were 2 sample districts, namely Ngadirojo District and Jatiroto District. The method of determining the number of samples in this study is non-probability sampling with a sampling technique, namely quota sampling. The number of respondents in this study was 50 from each sub-district, so the total number of respondents was 100 respondents.

Table 1

The subdistrict groups based on low and high cassava productivity in Wonogiri Regency

Subdistrict groups based on low productivity	Productivity, tons/ha	Subdistrict groups based on high productivity	Productivity, tons/ha
Giriwoyo	18.57	Sidoharjo	24.33
Manyaran	18.53	Karangtengah	24.20
Kismantoro	18.46	**Ngadirojo**	**23.26**
Purwantoro	18.44	Tirtomoyo	20.63
Girimarto	18.39	Slogohimo	20.62
Jatiroto	**18.27**	Paranggupito	20.21
Baturetno	17.85	Wonogiri	19.90
Giritontro	17.71	Jatisrono	19.65
Nguntoronadi	16.71	Batuwarno	19.47
Pracimantoro	16.50	Selogiri	19.45
Eromoko	14.99	Wuryantoro	19.25
Puh Pelem	14.42	-	-
Jatipurno	13.54	-	-
Bulukerto	12.24	-	-
Average productivity of all districts in Wonogiri Regency = 18.62 tons/ha			

Source: Department of Agriculture and Food Wonogiri Regency [34].

A multidimensional poverty analysis was needed to determine the poverty level of cassava farmer households, which was seen in a multidimensional manner, including health, education, and living standards. The Multidimensional Poverty Index approach was used in the analysis of this study. The MPI was initiated by Alkire for global calculations and can be used on a smaller regional scale. The national MPI is a multidimensional poverty measure created by adapting the Alkire-Foster method (on which the MPI is based) to better reflect local realities, needs, and available data. It varies in terms of the number and specification of dimensions and indicators and has different deprivation and poverty limits [33]. In this study, Multidimensional Poverty Index method used the Alkire-Foster method, modified with indicators that matched local realities in Wonogiri Regency. There were three dimensions in the Multidimensional Poverty Index, namely the dimensions of health, education, and standard of living. The calculation of MPI in this study is shown in Table 2.

The indicators are contained in the MPI as an effort to achieve SDGs. Health dimensions, including immunization and child mortality, are contained in Goal 3 of the SDG "Good Health and Well-being". The target by 2030 is to end preventable newborn deaths. The education dimension consists of school length and participation in Goal 4 of the SDGs "Quality Education". The target of SDGs education by 2030 is to ensure

that all girls and children complete primary and secondary education free of charge, with equality, and quality, leading to relevant and effective learning outcomes.

Table 2

MPI: dimension, indicator, deprivation cut-offs, and weight

Dimensions	Indicator	Deprived if …	SDG area	Weight	References
Health	Immunization	Household members 12–23 months without complete basic immunization	SDG 3	1/6	BAPPENAS [35] Sumargo and Simanjutak [36]
	Child mortality	Children under 18 years old who died of illness and were unable to access health services in the 5 years before the survey was conducted	SDG 3	1/6	Alkire, Kanagaratman, and Suppa [37]
Education	Length of schooling	Household members 25–60 years old do not finish junior high school	SDG 4	1/6	BAPPENAS [35]
	School participation	School-age children do not attend school	SDG 4	1/6	Budiantoro et al. [38]
Standard of living	Cooking fuel	Households use cooking fuel in the form of wood, charcoal, crops, or shrubs	SDG 7	1/18	Alkire, Kanagaratman, and Suppa [37]
	Sanitation	Sanitation facilities used with other households	SDG 6	1/18	Alkire, Kanagaratman, and Suppa [37]
	Drinking water	No clean drinking water or 30 minutes of commuting distance from home	SDG 6	1/18	BAPPENAS [35]
	Electricity	Households do not have electricity	SDG 7	1/18	Alkire, Kanagaratman, and Suppa [37]
	House	One or more components of the floor, roof, or wall are inadequate	SDG 11	1/18	Alkire, Kanagaratman, and Suppa [37]
	Assets	Households do not have more than 1 asset, including a TV, telephone, computer, motorcycle, or refrigerator, and do not have a car or ruck	SDG 1	1/18	Alkire, Kanagaratman, and Suppa [37]

Source: [37], modified.

Living standards, including cooking fuel and electricity, are contained in Goal 7 of the "Affordable Clean Energy" SDGs. The 2030 target guarantees universal access to affordable, reliable, and modern energy services. Indicators of sanitation and drinking water as Goal 6 of the SDGs "Clean Water and Sanitation". Sanitation targets by 2030 are to achieve access to adequate and equitable sanitation and hygiene for all, stop the practice of open defecation, and pay special attention to the needs of women and vulnerable communities. The target by 2030 for clean water is to achieve universal

and equitable access to safe and affordable drinking water for all. Goal 11 of the SDGs "Sustainable Cities and Communities" in the MPI is achieved through the home indicator. The target by 2030 is to ensure access for all to decent, safe, affordable housing and essential services and organized slums. Asset indicators in the living standards dimension are contained in Goal 1 of the SDG "No Poverty". The target by 2030 is to halve the share of men, women, and children of all ages living in poverty in all dimensions, according to the national definition. The total weight of 3-dimensional deprivation (health, education, and standard of living) is 1, so each dimension has a weight of 1/3. The deprivation weight of 1/3 is subdivided based on the existing indicator to obtain the weight per indicator. Households are categorized as poor if they have a total deprivation weight of 1/3 or more.

Headcount ratio (*H*) is the proportion of multidimensional poor cassava farm households, calculated using the formula:

$$H = \frac{n}{t}, \quad (1)$$

where *n* is the number of poor cassava farmer households;

t is the total number of cassava farmer households.

The intensity of poverty (A) is the average deprivation of poor cassava farm households, calculated using the formula:

$$A = \frac{\sum_1^n c}{n}, \quad (2)$$

where *c* is the total weight of deprivation of poor cassava farm households. Multidimensional Poverty Index is the multiplication of headcount ratio (*H*) and poverty intensity (*A*), with the formula:

$$MPI = H \cdot A. \quad (3)$$

The estimation of the socioeconomic determinants of Multidimensional Poverty Index among the studied cassava farmers in Wonogiri Regency was done using the Logistic Regression Model.

The limitation of the methodology and results of this study is that primary data collection was conducted in January 2022 – February 2022. The respondents in this study were cassava farm households who were doing cassava farming in 2021. Respondents in the study were at least 21 years old considering that they could answer interviews and questionnaire questions well. The dimensions used in the study consisted of 3 dimensions, namely health, education, and living standards and did not include finances because finances are included in monetary poverty, not multidimensional poverty.

Results and discussion. Wonogiri Regency is one of the regencies in Central Java that is geographically reviewed and located between 110º 41' – 111º 18' East Longitude and 7º 32' – 8º 15' South Latitude. The lowest altitude in Wonogiri Regency is Selogiri District, with an altitude of 106 m above sea level (asl), and the highest area is Karangtengah District, with an altitude of >600 m above sea level (asl). Based on regional conditions, Wonogiri Regency is suitable to be a place for cassava cultivation because it meets the requirements for growing cassava plants. A good location, ideal

for cassava plants is between 10–700 m asl, while the tolerance is between 10–1,500 m asl. Based on the Wonogiri Regency Meteorological Station, the air temperature in Wonogiri Regency during the dry and rainy seasons is a maximum of 37ºC and a minimum of 16ºC. It shows that the air temperature in Wonogiri Regency is suitable for cassava growth because it is above 10 degrees Celsius. The socioeconomic characteristics of cassava farm households in Wonogiri Regency are shown in Table 3.

Table 3

Socioeconomic characteristics of cassava farm households

Farmer's characteristics	Indicator	Percentage, %
Gender	Male	89.0
	Female	11.0
Age	0–14 years old	0.0
	15–64 years old	88.0
	> 64 years old	12.0
Education	Not finished primary school	3.0
	Primary school / equivalent	37.0
	Junior high school / equivalent	34.0
	Senior high school / equivalent	23.0
	College	3.0
Land area	< 0.5 ha	39.0
	0.51–1 ha	42.0
	1.1–1.5 ha	14.0
	1.51–2 ha	4.0
	> 2 ha	1.0
Farming experience	<10 years	0.0
	10–20 years	34.0
	21–30 years	44.0
	31–40 years	16.0
	> 40 years	6.0
Number of family dependents	1–2 people	21.0
	3–4 people	77.0
	5–6 people	2.0
Farmer group	Participating in the farmer group	71.0
	Not participating in the farmer group	29.0

Source: Primary Data Analysis, 2022.

The characteristics of cassava farmers in Wonogiri Regency were primarily male (89 %) and female farmers 11 %. Men's role in farming was more significant than women's because they had a more muscular physique. The decision-making of trying to farm cassava was made more by men than women because men, as breadwinners, had more responsibility regarding family finances through the cassava farming business. The knowledge of male farmers was broader than that of women due to their experience and habits in farming. Most cassava farmers were productive from 15–64 years old (88 %), and the other 12 % were non-productive >64 years old. Farmers who were productive in age had a muscular physique to support cassava farming, compared to non-productive aged (>64 years) whose physical strength tended to weaken, so they were not optimal to support cassava farming. About 40 % of farmers

were poorly educated in primary school. Low education affected the cassava farming in management and decision-making because it resulted in farmers having insufficient knowledge. Therefore, the knowledge of cassava farmers needs to be increased.

The farming experience of cassava farmers was mainly 21–30 years, with the average farming experience being 26 years. Compared to inexperienced farmers, increasingly experienced farmers could manage to farm from the production process to post-harvest. Experienced farmers were more agile and knew what to do when there was a cassava farming business problem. Cassava farmers have been running cassava farming businesses since they were young and passed them down from generation to generation. Most cassava farmers had family dependents of 3–4 (77 %). Some cassava farmers in Wonogiri Regency participated in the farmer group (71 %), and another 29 % did not. Most farmers had 0.5–1 ha of land, with an average land area of cassava farmers was 0.68 ha. The expansion of agricultural land was related to the multidimensional poverty level in farm households, so the increase in agricultural production was carried out to increase farmers' household income [39]. The expansion of cassava land can be done by using yard land to be productive, and cassava farmers pay more attention to the planting distance of cassava so that cassava productivity is high.

The results of the multidimensional poverty analysis of cassava farmers in Wonogiri Regency are shown in Table 4.

Table 4

Results of Multidimensional Poverty Index analysis of cassava farmers

Dimensions	Indicator	Mean deprivation
Health	Immunization	0
	Child mortality	0
Education	Years of schooling	0.067
	School participation	0
Standard of living	Cooking fuel	0.018
	Sanitation	0
	Drinking water	0
	Electricity	0
	House	0.026
	Assets	0.033
Headcount ratio (H) = 0.190		
Poverty Intensity (A) = 0.333		
MPI = 0.063		

Source: Primary Data Analysis, 2022.

The headcount ratio based on the Multidimensional Poverty Index can be seen in Figure 2. The interpretation of the results was that the Headcount ratio (H) based on an analysis of 0.190 meant that 19 % of cassava farm households had poor multidimensional status, and another 81 % were not poor. The intensity of poverty (A) was 0.333, meaning that the average deprivation of poor cassava farm households was 0.333. The MPI was 0.063. The average weight of deprivation indicators of immunization, child mortality, school participation, sanitation, drinking water, and

electricity was 0. Although deprivation was worth 0, it must be maintained to achieve the Sustainable Development Goals. Primary immunization is vital to strengthen the child immune system to avoid disease and maximize the child growth. The immunization implementation in Indonesia is regulated in the Regulation of the Minister of Health of the Republic of Indonesia Number 12 of 2017.

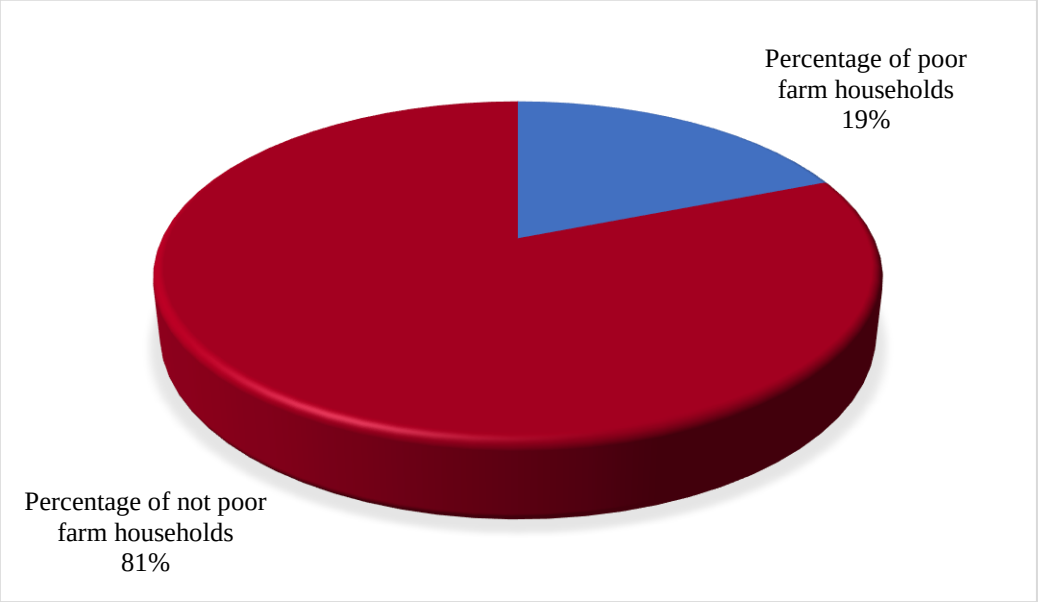

Figure 2. Headcount ratio

Source: built by the authors.

The immunization program in Indonesia aims to reduce the rate of morbidity, disability, and death from diseases that can be prevented by immunization (PD3I). Cassava farmers in Wonogiri Regency had an average age of 53 years, so they did not have children aged 12–13 months who must be immunized. In the case of child deaths, there were no deaths of children under the age of 18 years within 5 years before the survey for all samples of cassava farmers. The children of sick cassava farmers could access health services without child death. All the children of cassava farmers participated in the school, so the deprivation weight was 0. The children of cassava farmer households went to school according to their age level of schooling. Although cassava farmers were poorly educated, they were trying to improve their children's education so that they had extensive knowledge and hoped to increase family income in the future when they worked.

Sanitation is not only a public health problem but also a problem with economic management and quality of life broadly. Poor sanitation impacts environmental damage, so the community's quality of life decreases. All cassava farmers had sanitation facilities that were not used by other households. Sanitation of cassava farmers also had no practice of open defecation. It could prevent the transmission of diseases that might occur due to using sanitation together or in the open to improve health and quality of life of cassava farmers. The household drinking water of cassava farmers was clean and came from dug wells, pump wells, PANSIMAS, and PDAM so that cassava farm households could get this clean water. It accelerated the achievement of the Sustainable Development Goals targets regarding clean water. Clean water can

affect health and daily life. Therefore, using clean water is significant to avoid diseases caused by poor water quality, such as diarrhea, cholera, dysentery, and so on. All cassava farm households used electricity for lighting, electronics, and other household purposes. Using electricity in all cassava farming households accelerated the achievement of SDGs.

Cassava farm households with high formal education have a smaller chance of becoming poor, so education plays an essential role in reducing the poverty of cassava farmer households [40]. The average deprivation of years of schooling indicators was 0.067 because household members aged 25–60 did not finish junior high school. Formal education in most cassava farmers reached the elementary school stage as much as 40 %. It means that it is necessary to increase the formal education of the children of farmers and the next generation of farmers to reduce poverty. The compulsory education program in Indonesia for free began in 1984, namely the 6-year compulsory education program. Furthermore, in 1994 the compulsory education program from 6 years was changed to 9 years compulsory education. Cassava farmers were born before the learning program was created and endorsed by the Indonesian government, so there were still many farmers who could not go to school at that time because of cost and opportunity constraints. Therefore, few farmers have completed 9 years of education. Improving farmer education may be difficult, but farmers' knowledge can be improved through government programs to enhance cassava farmers' human resources through extension. In addition, the cultivation of cassava farmers in agriculture is crucial for increasing agricultural production and productivity [41]. The formal education of cassava farmers in Wonogiri Regency was indeed low. Nevertheless, we hope that the long experience of cassava cultivation can support cassava production to increase productivity and reduce poverty. The increase in productivity in agriculture can be achieved through the use of technology and the use of existing resources more efficiently [42]. Arable land, agricultural inputs, crop intensification, and crop extensification are strongly associated with poverty because zero hunger is a prerequisite for eradicating poverty [43]. Cassava farming in Wonogiri Regency was still run traditionally and manually, especially for small-scale cassava farmers.

The average weight of cooking fuel deprivation was 0.018, meaning that there were still cassava farmer households who used wood and shrubs because they felt that liquefied petroleum gas (LPG) prices were high and wasteful, so they preferred to use wood and shrubs to save household expenses. The housing indicator had an average deprivation weight of 0.026 because there were still cassava farming households whose one of the house's components (floor, roof, and wall) was not feasible, namely the floor using soil or cement and the roof using asbestos. Assets had an average deprivation weight of 0.033 because there were still cassava farm households who did not have cars, trucks, or computers, could not access the internet because they did not have smartphones, and did not have wireless fidelity to support the availability of internet access. Internet access has become necessary in education, economic transactions, entertainment, and communication [44]. The condition of internet network access in

the research area was complex and weak.

The obstacles experienced by cassava farmers were poor transportation infrastructure, low resource capacity, and inequalities in the spread of services [45]. The access road in Wonogiri Regency was damaged, even the rural highway has not been paved, and only rocks were arranged as access roads in the countryside. It would hamper the logistical process of agricultural inputs and products because the path would be longer. The easily damaged characteristic of farm products, in this case, cassava, did not have a high risk of damage like horticultural products. Still, bumpy roads would cause damage due to the collision of cassava tubers with one another. Although damage to the tuber skins was only minor, it still affected the quality of the tubers sold, as some buyers preferred tuber skins that did not peel off. The low formal education of cassava farmers characterized low resource capacity taken in Wonogiri Regency. Most peasant households were poor because they did not have a stable source of income and depended on subsistence agriculture [46]. Cassava farmers in the Wonogiri region rely not only on income from cassava cultivation but also on external income (such as livestock and non-agricultural businesses). This was done to improve the welfare of farmers. Fluctuations in cassava prices, uncertainty over the availability of production inputs and limited capital have forced farmers to seek increased income for better welfare [47]. The selling price of cassava decreased to Rp 600.00–800.00 during COVID-19 and decreased cassava farmers' incomes. Lower acceptance of cassava farmers will increase the chances of farmers becoming poor. Improving education, health, and living standards as multidimensional components must be carried out to achieve SDGs, especially regarding poverty.

The assessment of the impact of socioeconomic on Multidimensional Poverty Index of cassava farm households was performed using the Logistic Regression Model. The following variables are used in the logistic regression: Y – poverty status (1 = poor, 0 = not poor); X_1 – land area (ha); X_2 – education (years); X_3 – age (years); X_4 – farming experience (years); X_5 – farmer group (1 = participating in the farmer group, 0 = not participating in the farmer group).

The results of the analysis of the determinants of poverty among cassava farm households in Wonogiri Regency using Minitab software are shown in Table 5.

Table 5

Logistic regression of the socioeconomic determinants of Multidimensional Poverty Index of cassava farmers

Variable	Coefficient	p-value	Odds ratio
Regression	5.97	0.000	-
X_1 (land area)	-2.82	0.045	0.0594
X_2 (education)	-0.552	0.012	0.5761
X_3 (age)	-0.0131	0.857	0.9870
X_4 (farming experience)	0.0033	0.956	1.0034
X_5 (farmer group)	-2.952	0.000	0.0522
Deviance R-sq = 55.75			
Hosmer Lemeshow = 0.065			

Source: Primary Data Analysis, 2022.

The logistic regression model is presented below:

$$Y = 5.97 - 2.82\ X_1 - 0.552\ X_2 - 0.0131\ X_3 + 0.0033\ X_4 - 2.952\ X_5.$$

The goodness of fit test using Hosmer-Lemeshow showed a *p*-value of $0.065 \geq \alpha$ (0.05), so it can be concluded that the model is feasible.

The *p*-value regression of $0.000 \leq \alpha$ (0.05) means that a statistically significant relationship between variables X_1, X_2, X_3, X_4, and X_5 is associated with Y (poverty status). In our case, the *p*-value for X_3 (age) of $0.857 \geq \alpha$ (0.05) indicates no significant relationship between X_3 and Y (poverty status). The *p*-value for X_4 (farming experience) of $0.956 \geq \alpha$ (0.05) means there is no significant relationship between X_4 and Y (poverty status). At the same time, *p*-values for X_1, X_2 and $X_5 \leq \alpha$ (0.05) mean that there is a statistically significant influence of each of these variables (land area, education, farmer group) on Y (poverty status).

The land area affects the poverty level of cassava farm household because the more land that is cultivated, the higher the productivity and the lower the poverty. Education can increase productivity because cassava farmers who are highly educated have extensive knowledge and understanding in cassava cultivation, post-harvest, and marketing. The participation of cassava farmers in farmer groups made it easier for farm households to obtain subsidized fertilizers from the government, so input costs were low. Cassava farmers who did not participate in farmer groups bore high input costs.

Poverty occurs because of deprivation of capabilities [48]. Capability is a fundamental element that can improve the response to existing opportunities. Development must include human capability, not human capital because human capital only focuses on increasing production and productivity to increase economic growth. Human capability is the ability to meet needs in terms of freedom. In the context of development, growth and development have different meanings. Growth focuses only on production, while development is concerned with human development which includes health, education, and living standards. Thus, efforts to reduce poverty in this case of multidimensional poverty will contribute to economic development. Economic development in the agricultural sector strongly involves farmers as the main actors in agriculture. Therefore, it is necessary to increase the capability of farmers, in this study, namely cassava farmers. Human development will reduce poverty. Improving the capability of farm households can be done by improving farmer education. This is because farmers' education is still low so that farmers' abilities and knowledge are limited. The Multidimensional Poverty Index in this study can determine the deprivation of health, education, and living standards in farm households. The construction of the farm will be achieved if the overall dimensions are improved. This agricultural development will support the achievement of the Sustainable Development Goals initiated by the United Nations.

Poverty alleviation is the first goal of the Sustainable Development Goals. Education is the basic element of human capability. Education plays an important role in poverty. The low level of education of cassava farmers will hinder poverty alleviation. Education of cassava farmers, who have only reached the basic level, has

limited knowledge and skills. Knowledge about cassava farming is obtained from knowledge passed down from previous generations in the family. Improving farmers' education and knowledge can improve the quality of farmers' resources. Cassava farmers have passed the formal education period so that increasing farmers' knowledge can be done with agricultural counseling. Agricultural counseling improves farmers' knowledge about cassava cultivation. So far, in Wonogiri Regency there has been no special counseling related to cassava commodities, despite the fact that Wonogiri Regency is the largest cassava producer in Central Java Province. Optimization of increasing the knowledge of cassava farmers through agricultural extension needs to be done so that cassava farmers get out of the circle of poverty. Education improvement also aims to support the Sustainable Development Goals. Education is contained in the pillar of social development goal 4 of SDGs. Continuous improvement of education can reduce poverty while supporting the achievement of the Sustainable Development Goals so as to create the quality human resources in the agricultural sector.

Conclusions. This study fills the gap in the literature by examining multidimensional poverty in cassava farm households in Wonogiri Regency, Indonesia. The multidimensional poverty of farmers with low cassava cultivation was characterized by a Headcount ratio value of 0.190, poverty intensity of 0.333, and a Multidimensional Poverty Index of 0.063. Indicators of immunization, child mortality, school participation, sanitation, drinking water, and electricity weighed 0, so they need to be maintained. The old deprivation weight of the school was 0.067, the cooking fuel was 0.018, the house was 0.026, and the asset was 0.033. The average land area of cassava farmers in Wonogiri Regency is 0.68 ha. About 40 % of farmers were poorly educated in primary school. Policy implications need to improve the education dimension of the schooling indicator, the standard of the living dimension of the cooking fuel indicator, houses, and assets to reduce deprivation and poverty. Improving the education of farmer children and future generations of farmers needs to be done, and increasing the knowledge and insight of farmers needs to be done through agricultural extension. The change of cooking fuel from wood and shrubs to LPG needs to be done to improve the standard of living of cassava farmers. Improvements to the components of the floor and roof houses need to be carried out to improve the standard of living of cassava farmers and increase internet access as a medium for the delivery of information and communication. Improving education, health, and living standards as multidimensional components must be carried out to achieve Sustainable Development Goals, especially regarding poverty.

The results of this study are important for multidimensional poverty reduction efforts, so it is necessary to involve each stakeholder in health, education, and living standards. This research topic is very promising for multidimensional poverty reduction efforts and can be used as a basis for determining policies related to education, health, and living standards. This research can be developed using other indicators on dimensions corresponding to the research area.

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