BUKTI KORESPONDENSI
ARTIKEL JURNAL NASIONAL TERAKREDITASI SINTA 2

Judul artikel : Determinants of Household Food Security: An Evidence from Small Farmer in Swamp Agroecosystems in Ciamis, Indonesia
Jurnal : Agrosocionomics: Jurnal Sosial Ekonomi dan Kebijakan Pertanian, 2024, Volume 8(1), 166-182
Penulis : Muhamad Nurdin Yusuf

No.	Perihal	Tanggal
1.	Bukti konfirmasi submit artikel dan artikel yang disubmit	15 April 2023
2.	Bukti konfirmasi review melalui OJS dan hasil review pertama	20 April 2023
3.	Bukti konfirmasi review melalui OJS dan hasil review kedua	01 Mei 2023
4.	Bukti konfirmasi submit revisi pertama, respon kepada reviewer pertama, dan artikel yang diresubmit	12 Mei 2023
5.	Bukti konfirmasi submit revisi pertama, respon kepada reviewer kedua, dan artikel yang diresubmit	15 Mei 2023
6.	Bukti konfirmasi artikel accepted	17 Oktober 2023
7.	Bukti konfirmasi artikel published online	14 Maret 2024

1. Bukti Konfirmasi Submit Artikel dan Artikel yang Disubmit (15 April 2023)

[Agrisocionomics] Submission Acknowledgement

1 message

Wiludjeng Roessali <agrisocionomics@gmail.com> 15 April 2023 at 11:24
Reply-To: Muhamad Nurdin Yusuf <muhamadnurdinyusuf@unigal.ac.id>
To: Muhamad Nurdin Yusuf <muhamadnurdinyusuf@unigal.ac.id>

Muhamad Nurdin Yusuf:

Thank you for submitting the manuscript, "DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA" to Agrisocionomics: Jurnal Sosial Ekonomi Pertanian. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL: https://ejournal2.undip.ac.id/index.php/agrisocionomics/author/submission/17988
Username: mnurdin

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Wiludjeng Roessali
Agrisocionomics: Jurnal Sosial Ekonomi Pertanian

agrisocionomics@gmail.com

AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA

Muhamad Nurdin Yusuf
Agribussiness Department, Agriculture Faculty, Galuh University, Ciamis, Indonesia

*Correspondence Email: muhamadnurdinyusuf@unigal.ac.id

Submitted …; Approved …

ABSTRACT

Swamp agroecosystems are sub-optimal lands with distinctive characteristics, namely low fertility, and can only be planted once a year during the dry season. Small farmers whose primary income comes from the agricultural sector are becoming increasingly difficult due to climate-changing changes that can intimidate their household food security. This research aimed to analyze the factors that affect the food security of small farmer households in the swamp agroecosystem. The method used a survey of 247 farmers who run rice farming in swamp agroecosystems in the Ciamis Indonesia, which were determined randomly from a population of 648 farmers using the Slovin formula at an error rate of 5 percent. The research was analyzed by SEM (Structural Equation Models). The result showed that the factors impacting the food security of small farmer households in swamp agroecosystems came from farmer characteristics, income structure, and farm risk. Based on this, the development of small agro-industry in rural areas must be carried out to create household food security.

***Keywords**: Farmer Household, Food Security, Small Farmer, Swamp Agroecosystems*

BACKGROUND

The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern (Candel, 2014; Forero-cantor et al., 2020) due to the increasing population, rising food prices, conversing of agricultural land, and declining production due to global climate change (Forero-cantor et al., 2020; Waha et al., 2018). The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern. However, decreasing the level of community welfare, especially in developing countries (Opaluwa et al., 2018), in the context of food security, availability is an important aspect that must be met

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(Abdullah et al., 2019; Cafiero, 2019). Food availability depends on the land area, the population as a provider of labor capital, and experts to raise production and equitable distribution (Laborde et al., 2016; Maetz, 2013).

As the staple food for half the world's population, including Indonesia, rice is a strategic commodity that plays an essential role in food security (Che Omar et al., 2019; Fahad et al., 2018; Suwarto et al., 2015). Therefore, the efforts to increase rice production sustainably is a necessity (Rusliyadi, 2023; Suparwoto, 2019). The expansion of rice fields on the north coast of Java and other square cities is prolonged. Furthermore, even tends to shrink as a result of land conversion, which is difficult to avoid Abdullah et al. (2019); Abu & Soom (2016); Kassy et al. (2021); Laborde et al. (2016); Ruhyana et al. (2020) therefore, that it has an impact on decreasing rice production.

Generally, thirteen strategic food commodities focus on food self-sufficiency and security: rice, corn, soybeans, shallots, garlic, red chilies, cayenne pepper, chicken meat, chicken eggs, beef/buffalo, sugar cane/sugar, and cooking oil. However, in recent years the Government has focused on increasing production in Indonesia's three commodities with the highest consumption levels, namely rice/rice, corn, and soybeans. Rice is one of the strategic commodities in Indonesia because of its much-needed role in meeting the population's food needs and inflation. There are several indicators used to measure food security (Cafiero, 2019; Candel, 2014; D. Maxwell et al., 2013; Ntshangase et al., 2018) those are: food consumption score (FCS) (Bahta et al., 2017) and household food diversity score (HDDS) (Swindale et al., 2010). Furthermore, shares of food expenditure (PPP) (Yusuf et al., 2018) can capture the utilization dimension. Coping strategy index (CSI) (D. Maxwell et al., 2013; D. G. Maxwell et al., 2017) and household food insecurity access scale (HFIAS) (D. Maxwell et al., 2013), farmer household affordability (DBP) (Yusuf et al., 2018) can capture the dimensions of accessibility and stability. Measuring adequate household food supply per month (MAHFP) (Swindale et al., 2010) and the food subsistence level (TSP) (Rachman et al., 2002) captures food availability and stability.

Most farmers in Asia make rice farming their main livelihood, but it is cultivated on a small scale. This phenomenon contrasts with Australia and the United States, including Latin America, where rice farming has become the main livelihood for their farmers (Firdaus et al., 2020). This phenomenon was also becoming a prominent issue in Indonesia, where structural weaknesses are still inherent in Indonesian farmers, namely narrow land tenure, low education level, family dependents, limited capital, and lack of mastery of technology. This condition causes low production and limited physical and economic access (Firdaus et al., 2020; Samberg et al., 2016; Vaghefi et al., 2016). Nevertheless, farming activities were only carried out to maintain food availability for their families rather than profit-oriented (Abu et al., 2016; Mutea et al., 2019).

There are many efforts to meet the needs of food, which cannot be separated from the characteristics of farmers' households (Yusuf et al., 2018) because it describes the capacity of farmers to meet the needs of food (Ndhleve, et al., 2021). Although the socioeconomic characteristics of farmers are relatively much and varied, the main ones are the farmer's age, education level, principal occupation, and the number of members of the farmer's family. Meanwhile, economic characteristics, including the area of farming land, livestock ownership, and savings ownership, became critical in creating farmers' profit orientation.

Many factors affect household food security, including age, gender, education, remittances, unemployment, inflation, and assets (Ndhleve et al., 2021); farmer capacity (Yunita et al., 2011).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Climate change, extension services, increased cost of production facilities, food price instability, income outside the agricultural sector (Ulrich et al., 2012), land area, income structure, and the number of household members (Bogale, 2012; Ndhleve et al., 2021; Omotesho et al., 2006), agroecosystem characteristics, access to irrigation, and soil fertility (Ulrich et al., 2012). However, the determinants of household food security differ due to agroecosystem differences and their needs (Cafiero, 2019). This research added that the risk of farming is getting higher due to climate change, especially for small farmers who run rice farming in swamp agroecosystems in Indonesia, which can only harvest once a year. Hence, it had the potential to reduce the level of household food security.

The southern part of the Ciamis District is a rice development area, but swamp agroecosystems dominate the condition of the area. Meanwhile, in the swamp agroecosystem, farmers can only plant rice once a year in the dry season after the water begins to recede because it is constantly flooded in the rainy season. Ciamis is the one swamp area in Java Island used as a swamp agroecosystem. Swamp rice is the specific variety to grow. It is an exciting location to study. In Southern Ciamis District, rice production in 2020 decreased by 15.1 percent (63,445 tons) compared to the previous year succeeded, even though there was crop failure in several areas (Badan Pusat Statistik Jawa Barat, 2021). On the other hand, farmers have incurred significant farming costs to run their farms, although often the results of farming itself were not commensurate with the costs incurred and failed in all seasons. This situation traps the farmers, and the farmer survives the situation (Cafiero, 2019; Forero-cantor et al., 2020).

The position of farmers becomes increasingly difficult when faced with the climate change phenomenon as one of the causes of their primary sources of income decreasingly, so the farmers need to look for other sources of income (Pandey et al., 2007; Skoufias et al., 2011; Vaghefi et al., 2016). Several studies have shown that climate change harms food security in most countries in Asia (Gregory et al., 2000). The study that examined the impact of climate change on rice production in East Asia found that extreme weather would reduce rice production by 50%. by 2100 (Sekhar, 2018). Farmers need climate information that can help them determine more farming options for farming activities (Wilke et al., 2015). Then the farmers can protect their fields from uncertainty and farming risks.

Based on several assumptions above, food security can be designed for vulnerable groups of farmer households (Kuzmin, 2016; Rachman et al., 2002). It is because the need for food is a basic human need that must be met at all times. In addition, this present study aims to analyze the factors affecting small farmers' household food security in swamp agroecosystems in Ciamis District.

RESEARCH METHODS

This study was conducted using a survey method to provide an overview of farmers' characteristics, income structure, farming risk, and household food security of small farmers in swamp agroecosystems. Lakbok, Ciamis District was determined purposively by the assumption that there has a swamp agroecosystem. However, this region is a rice center in Ciamis. The survey drove through chosen 247 farmers household from 648 swamp rice farmers based on the Slovin formula determined it at an error rate is 5 percent using simple random sampling spreaded over four areas (Table 1).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 1. Proportional allocation of sample size

No	Village	Population	Sample Size
1	Sukanagara	132	50
2	Kapalasawit	286	109
3	Puloerang	124	47
4	Tambakreja	106	40
	Jumlah	648	247

Source: primary data 2022

The data used in this study included primary data and secondary data. Primary data was obtained directly from the samples through structured questionnaires, in-depth interviews with a few selected respondents and key informants, and FGD (Focus Group Discussion). Meanwhile, the secondary data was obtained from the Department of agriculture authority, Government statistic institutions, extension agents, and farmers' associations.

Data processing and analysis were performed using descriptive statistics and inferential statistics with multiple linear regressions to determine the functional relationship between variables. The multiple linear regression equation models in this study are as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

The analysis tool used SEM (Structural Equation Model) with the AMOS program version 18.0. SEM is a multivariate statistical technique combining factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs. The structural equation model would produce indicators that support the proposed model. Hair et al. (2009) write that there are 7 (seven) stages of structural equation model and analysis: (1) theoretical model development; (2) compiling a path diagram; (3) converting the path diagram into a structural equation; (4) selecting an input matrix for data analysis; (5) assess model identification; (6) evaluate the model estimation, and; (7) interpretation of the model as can be seen in Figure 1.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

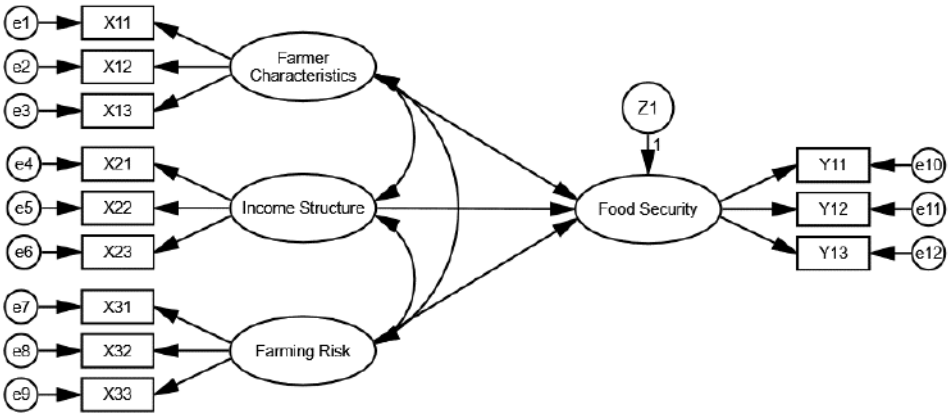

Figure 1. Research method design

Figure 1 showed that food security as an endogenous latent variable as measured by indicators Food subsistence level (Y_{11}), Household affordability (Y_{12}), and Food expenditure shares (Y_{13}). This endogenous latent variable is influenced by exogenous latent variables. The exogenous latent variables included the characteristics of farmers (X1) as measured by indicators age (X_{11}), Education (X_{12}), and Family loads (X_{13}). The exogenous latent variables of income structure (X_2) were measured by the indicators X_{21}, X_{22}, and X_{23}; farming risk (X_3) was measured by the indicators Production Risk (X_{31}), Process Risk (X_{32}), and Income Risk (X_{33}). Both of variable endogenous and exogenous involved in latent variable describing on table 3. All of variables have correlated each other. Therefore, the proper analysis tool is structural equation model (SEM). SEM is a multivariate statistical technique that combines factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs.

This study proposed three hypotheses: 1) Farmer characteristics affect food security; 2) Income structure affects food security; 3) Farming risk affects food security. The test type is two tailed: positive and negative area of hypothesis. In more detail, the latent variables and indicators can be seen in Table 2.

Off-farm income is the income while waiting for farming time; the farmer works in another profession, such as temporary labor. The farmer will return for planting, maintenance, or harvesting when the farming time comes. The main job is farming. Non-farm income is income from work that is not in farming as the primary job.

There is a high risk of farming; small farmers with limited access will look for other sources of income out of the main farm (on-farm) to meet their household needs. For instance: working as farm laborers (on-farm), selling garden products, cultivating livestock, etcetera (off-farm), and even working out of the agricultural sector (non-farm) as construction workers, trade, firm industry etcetera.

Table 2. The latent variables and Indicators in SEM's model

Latent Variable	Indicators	Scale
Farmers' characteristics (X_1)	Age (X_{11})	Interval
	Education (X_{12})	Interval

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Latent Variable	Indicators	Scale
	Family dependents (X_{13})	Interval
Income structure (X_2)	Income on-farm (X_{21})	Interval
	Income off-farm (X_{22})	Interval
	Income non-farm (X_{23})	Interval
Farming risk (X_3)	Production risk (X_{31})	Interval
	Price risk (X_{32})	Interval
	Income risk (X_{33})	Interval
Food security (Y_1)	Food subsistence level (Y_{11})	Interval
	Household affordability (Y_{12})	Interval
	Food expenditure shares (Y_{13})	Interval

Source: Primary data 2022

In agriculture, there is often extreme situation containing risk and uncertainty event. The component that may determine farming risk is the risk of production, price, and income. Production risk in swamp rice farming is higher than in lowland (Sulewski et al., 2014). Agricultural production risk is higher than non-agricultural production risk. Sometimes the harvest is abundant, but the price decrease. This caused an income decrease. The component of farming risk was measured by coefficient variation. Statistically, farming risk consisting of production risk, price risk, and income risk can be calculated using the coefficient of variation by looking at the variability that occurs (Hindarti et al., 2021; Mazwan et al., 2020). Production variance and price variance as a measure of production risk and price risk are based on the experience of farmers doing previous farming activities (Siddik et al., 2015).

RESULT AND DISCUSSION

The research began within the primary field survey of the 247 swamp rice crop farmers to reveal their background and knowledge about their profession. Ciamis has a geographical history of swamp land agroecosystem. In Java Island which swamp agroecosystem is only in Ciamis. This area was severely affected by swamp land condition boundaries. The population in area majority lives under the risk toward poverty line and less rice yield as food intake. This risk would increase the concentration and intensity of flood, which is disturbing rice production, farmer income, and food security.

Farmers' Characteristics

The farmers' characteristics which are the leading research in this present study, have consisted of age, education, experience, and family load:

Table 3. Farmers' characteristics in swamp agroecosystems

Description		Amount (person)	Percentage (%)
1	Age (year)		
a.	15 - 64	201	81
b.	≥ 65	46	19
	Total	247	100

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

	Description	Amount (person)	Percentage (%)
2	Education level		
	a. Elementary	236	96
	b. Junior	7	3
	c. Senior	4	1
	Total	247	100
3	Experience (year)		
	a. 5 - 20	70	28
	b. 21 - 35	129	52
	c. 36 - 50	48	20
		247	100
4	Family load (person)		
	a. 1 - 3	125	51
	b. 4 - 6	122	49
	Total	247	100

Source: Primary data 2022

Table 3 shows that farmers' ages range, from 32 to 71 years old, with an average age of 54 years old, so they are in the span of a productive period. Age is one of the factors related to work ability in carrying out farming activities (Yunita et al., 2011). The number of samples dominated farmers with low formal education. This problem caused the ability to manage lowland rice farming to be optimal productivity. Education is related to their access to food because with higher education, the opportunities to get better jobs are getting bigger to generate more significant income (Nwokolo, 2015). The land area of farmers ranges from 0.04-0.84 hectares with an average of 0.29 hectares which is in the narrow category with the most dominating amount, whereas Omotesho et al. (2010) stated that the land is an asset for farmers in running their or her business which will determine the level of income, the standard of living and welfare.

The experience of farmers in rice farming also varies. Range from 5-50 years with an average of 27 years. Experience is the knowledge that humans collect through their minds and then arrange into a patterned form. A person's experience in farming affected the response to accepting new technologies and innovations (Ntshangase et al., 2018).

This condition shows that the structural weakness of small farmers in rural areas, namely narrow land tenure is still very inherent and causes unequal distribution of income and production. According to Firdaus et al. (2020); Kuok Ho Daniel Tang (2019); Vaghefi et al. (2016), the narrow tenure of land owned can result in farmers being trapped in bare for survival.

The family-loads ranged from one to six people a family with an average of four dependents in a family. The small number of dependents of farming families illustrated those small families in rural areas as the main view of farmers' family members. Thus, it is also related to the proverb of the agrarian society's Javanese culture, assuming that "many children, many fortunes" is still believed. Even in fact, the more the number of family members, the greater the burden of living that must be borne by farmers. Davis et al. (2017); Ndhleve et al. (2021); Nwokolo (2015); Ruhyana et al. (2020) family size will affect the income per capita and household food consumption expenditure.

Formulation Model

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The results of SEM assumptions and data processing to test the hypothesis consisting of a multivariate outlier test, multivariate normality test, and multicollinearity test all meet the required assumptions.

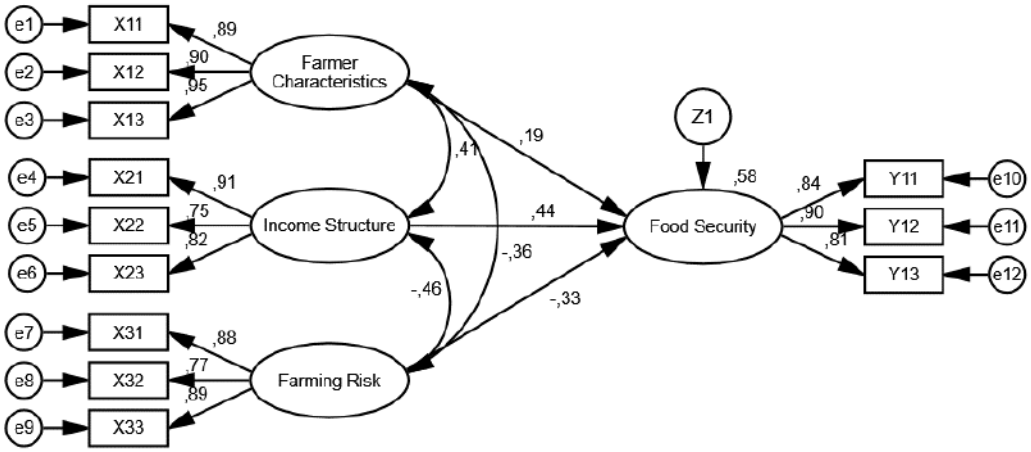

Figure 2. Results of SEM model analysis of farmer household food security in swamp agroecosystems in Ciamis, Indonesia.

This condition was reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

After it fulfilled all the testing assumptions, it could be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis Regency is obtained, as seen in Figure 2.

Table 4. Test results on the feasibility of the full SEM model

The goodness of Fit Indeks	Cut-off Value	Result	Conclusion
Chi-Square	Expected small	81.735	Fit
Significance Probability	≥ 0.05	0.068	Fit
RMSEA	≤ 0.08	0.053	Fit
GFI	≥ 0.90	0.947	Fit
AGFI	≥ 0.90	0.914	Fit
CMIN/DF	≤ 2.00	1.703	Fit
TLI	≥ 0.90	0.978	Fit
CFI	≥ 0.95	0.984	Fit
NFI	≥ 0.90	0.962	Fit

Source: Authors computation (2022), n = 247

Table 4 showed a good model fit index, meaning that the model fits the data. Regression estimation for SEM shows that all variables are significant (Table 5), so all hypotheses are accepted.

Table 5. Regression estimate

Variables	b	SE	CR	P	Note

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Food security<---	Farmers' characteristics	0.191	0.059	3.323	***	Significant
Food security<---	Income structure	0.439	0.071	6.507	***	Significant
Food security<---	Farming risk	-0.327	0.072	-5.193	***	Significant

Source: Authors computation (2022), n = 247

Therefore, based on table 5 could be formed the structural equation of the exogenous latent variable to the endogenous latent variable is as follows:

$$Y = 0.191\ X_1 + 0.439\ X_2 - 0.327\ X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

Table 6. Square multiple correlation

	Estimate
Food Security	0.583

Source: Authors computation (2022)

Table 6 showed that food security was explained by farmer characteristics, income structure, and farming risk of 58.3%. The remaining 41.7% is explained by other factors not included in the structural equation model.

Table 7 displayed good reliability and validity construct for the measurement model of the sample. The value of the reliability construct ranged from 0.7248 to 0.8433, while the value of the validity extracted was more significant than 0.5. The results proved the convergent validity by examining the significance of the loadings factor and the shared variance. The variance captured by the construct should be greater than the measurement error (0.5). The structural equation that was formed explained the causal relationship between changes in food security there was a change in farmer characteristics, income structure, and farming risk.

Table 7. Validity and reliability construct

Variables.	Reliability Construct	Variance Extracted
	CR > 70%	AVE > 50%
Farmers' characteristics	84.33%	83.07%
Income structure	72.48%	68.65%
Farming risk	75.17%	75.02%
Food security	75.12%	71.94%

Source: Authors computation (2022)

Discussion

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Simultaneously, the three variables' effect on farmer households' food security was 58 percent. The remaining 42 percent is explained by other factors not included in the model. The factor influencing most farmers' food security households is the level of food subsistence ($\lambda = 0.84$). The affordability of farmer households ($\lambda = 0.90$); and 3) the share of food expenditure ($\lambda = 0.81$) is the income structure reflected by on-farm, off-farm, and non-farm income.

Farming income ($\lambda = 0.91$), non-farming income ($\lambda = 0.75$), and non-agricultural income ($\lambda = 0.82$) were strong determinants of the latent variable of income structure. Thus, farm, non-farm, and non-agricultural income have the greatest potential contribution to household income.

The results of the SEM analysis showed that the coefficient of the income structure influence was positive. On the other hand, the higher income structure reflected by, the higher income from farming, outside farming, and outside the agricultural sector, the better the food security of farmers' households. This condition is suitable because, with high incomes, farmers' access to food becomes more rational. Ndhleve et al. (2021) household income is an essential determinant of household food insecurity because access to food at the household level is determined by household income (Mutea et al., 2019; Silvestri et al., 2015; Tefera et al., 2014) household income is an estimator of household affordability.

On-farm income is one indicator that most strongly reflects the structure of household income ($\lambda = 0.91$). On-farm was natural, considering that most farmer households rely on rice farming as farmers' main activity. The analysis showed that the average farmer's income from lowland rice farming was 8,993,229 IDR per hectare per year, with an average contribution of 14 percent to the total household income.

This study's findings align with Abu & Soom (2016); Mutea et al. (2019). In subsistence-to-farmer households, food availability is more determined by food production itself. The findings also indicated that more efforts are needed to increase the farmers' knowledge and skills in utilizing the potential and economic resources of farmer households considering that the source of farmers' income does not only come from rice farming but also from outside the farm, the agricultural sector.

Income structure indicators are income outside the agricultural sector ($\lambda = 0.75$) and income outside farming ($\lambda = 0.82$). The analysis results show that the average income of farmers outside the agricultural sector was 9,372,206 IDR per year, with an average contribution of 60 percent to the total household income. Meanwhile, the average income of farmers from outside rice farming but still in the agricultural sector was 4,159,753 IDR per year, with an average contribution of 26 percent to total household income.

Non-agricultural activities carried out by low-income farmer households due to narrow land ownership and low production are one of the efforts to obtain additional income to meet household needs. Owusu et al. (2011) found that the influence of income outside the agricultural sector on household food security in Northern Ghana. The research results of Musumba et al. (2022) showed that farming households in rural Sub-Saharan African countries carry out more than one type of work to increase income. The research findings Haggblade et al. (2010) in rural Sub-Saharan Africa concluded that 50 percent in Asia and Latin America, farmers' income from outside the agricultural sector contributes about 35 percent to total household income. According to Alobo Loison (2015); Mutea et al. (2019); Yusuf et al. (2018), work in the agricultural and non-agricultural sectors is an effort for farmers to earn income because income diversification is closely related to efforts to maintain survival in unfavorable conditions. Alobo Loison (2015); Mutea et al. (2019); Niehof

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(2004); Yaro (2006), It aimed to secure a better standard of living by reducing risk, vulnerability, and poverty and increasing income, security, and wealth.

Farming risk is the second variable that affects the food security of rice farmers' households in the swamp agroecosystem, which is reflected by indicators of production risk, price risk, and income risk. Production risk is the indicator that most strongly reflects farming risk ($\lambda = 0.88$), price risk ($\lambda = 0.77$), and income risk ($\lambda = 0.89$). The influence of production, income, and price risk has the most potential to increase rice farming risk in swamp agroecosystems.

When it looks from the coefficient, which shows a negative sign, this means that the greater risk of farming faced by farmers, the lower household food security. This condition is reasonable considering the facts on the ground show that, on average, farmers face a high risk of farming due to frequent flooding of their fields. Production risks faced by farmers are generally in the form of reduced grain produced due to unpredictable floods. The findings of this study were in line with the research results of Nephawe et al. (2021) insufficient rainfall, pest and disease attacks, and excess rainfall can reduce farm production. The research results of Mutea et al. (2019) also showed that lost yields from production activities are caused by climatic conditions and pests/diseases that attack plants or can lead to low productivity resulting in reduced irrigation water and production inputs. In comparison, the low number of inputs, such as fertilizers, can cause a decrease in rice yields.

Income risk can be assumed as the variable that most strongly reflects farming risk ($\lambda = 0.89$). It can be assumed that the higher the income risk faced by farmers, the lower household food security, considering that farmers have to pay to run their businesses. However, the imbalance between the income earned and the costs incurred causes an income risk. This income risk causes the affordability of farmers to be low, even though, according to Mutea et al. (2019), the income structure owned by farmers will affect their behavior in facing risks to anticipate crop failures. This condition is reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

The countermeasures made by farmers before running rice farming are by preparing large quantities of seeds as reserves because farmers usually do embroidery repeatedly. Facts in the field showed that the use of these seeds reaches 2-3 times the recommended amount. The Lebak swamp has distinctive characteristics, so rice farmers in this agroecosystem are different from farmers working on it Yunita, et al. (2011); Yusuf (2018). Nmadu et al. (2012) stated that to minimize the risk of production due to natural disasters, pests and plant diseases, fires, and other factors whose consequences can be physically calculated and can be overcome by purchasing an agricultural insurance policy. Meanwhile, the risk of a possible decline in production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be anticipated in several ways, including diversification, vertical integration, forward contracting, future markets, hedging, and agricultural options.

Although some of these strategies have been implemented by some farmers, they still have difficulty overcoming the risks of farming. Therefore, another systematic strategy is needed, for example, through agricultural insurance, an economic institution that functions to manage the risks faced by farmers whose objectives are: 1) stabilizing farmers' incomes by reducing losses due to lost yields; 2) stimulating farmers to adopt technology that can increase production and efficient use of resources, and 3) reduce the risks faced by agricultural credit institutions and increase farmers' access

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

to these institutions. Suryanto et al. (2020); Yulia et al. (2023), agricultural insurance is one of the strategies to adapt to climate change, even in developed countries, including several countries in Asia, developing rapidly and effectively protecting farmers.

Farmer characteristics are the third factor that influences the food security of rice farmers' households in the swamp agroecosystem, which is reflected by age ($\lambda = 0.89$); 2) education ($\lambda = 0.90$), and 3) family dependents ($\lambda = 0.95$). The farmer characteristics meant that age, formal education, and family dependents of farmers could increase household food security. It meant that if farmers' capacity increases, farmers' ability to create household food security will be better.

The strongest indicator that reflects the characteristics of farmers is family dependents ($\lambda = 0.95$). Fewer family responsibilities caused household food security to be high. This characteristic was certainly rational considering that farmers with larger family sizes tend to need more food than farmers with fewer family members. The more members of the household, the greater the burden on farmers, which causes household food expenditure to be more significant so that, in the end, household food security is lower. However, family dependents are also positively related to household income, which means that more and more family members lead to greater and more diverse sources of income that households can access.

The results of the study of Ndhleve et al. (2021) in Botswana and South Africa showed a strong influence of family dependents on household food security. Households with many dependents were more food insecure than households with few family dependents. Households with more family dependents mean more people have to be fed, so they need more food. This characteristic was in line with the findings of (Cafiero, 2019; Silvestri et al., 2015). Musumba et al. (2022) that the food available for one family may not be sufficient to meet the needs of all family members but only sufficient for some of the family members.

This study showed that the average size of the farming family in the study area belongs to a small family where most of the family members also work to earn income to ease the burden on the family. In addition, other family members (children) who work outside the city and have an established economy usually send money routinely as a form of responsibility and dedication to their parents.

Farmers who are highly educated, and older in the sense of being more productive and having a small family size, will also have a higher level of household food security. Income is very important for households to provide food through purchases (Corral et al., 2017; Silvestri et al., 2015; Tefera et al., 2014) that income is very important for households to provide food through purchases.

The higher education farmers have taken causes household food security to be higher which is reflected by the higher affordability and the better quality of food consumed by farmer households. The level of education indicates that a person's knowledge level is broader because of education. Generally, the level of education is positively related to the level of income. It meant that the higher the education completed by farmers, the higher the income earned. Farmers with higher education tend to gain more insight and information related to other sources of income.

In contrast to the research findings of, household food security in Botswana and South Africa is not significantly affected by education level. According to him, education is usually related to the level of income because households with a high level of education usually have more money that can be used to purchase food. Thus the higher the level of education of farmers, the income will also be higher the affordability of households will also be higher. In the end, farmers could improve the

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

quality of the food they eat and tend to choose healthier foods. The findings of this study are in line with Nwokolo (2015); Ruhyana et al. (2020) that higher levels of education are associated with increased household income, livelihood opportunities, and food security.

Although the average level of formal education that farmers did is low, on average farmers, they only need to complete primary education. In general, farmers have other sources of income outside of the rice farming they run, namely from outside the farm, which includes farm laborers, selling garden products, livestock products, and operating agroindustry (sales of bananas and coconut sugar). Meanwhile, sources of income from outside the agricultural sector include construction workers and opening small stalls. The source of income is in line with the research findings of Mutea et al. (2019) that to increase income, farmer households in the mountainous region of Kenya usually sell crops, timber, and livestock, while off-farm income comes from trade and business, remittances, house rent, employment. Legal, transportation services, and other informal jobs.

The little indicator that reflect household food security is age ($\lambda = 0.89$). The more productive a person's age allows them to work more productively. With their physical strength, they will be more productive to work outside their farms and seeking additional income outside the agricultural sector. Farmers of productive age were generally more rational in running their businesses. Thus, the income obtained from farming can be more optimal with the minimum use of labor outside the family, which must be paid directly. Productive age implies that farmers do not only rely on their income from one source of income but also from other sources. Facts on the ground show that apart from working in the agricultural sector, they also work outside it. The results of the research by (Frelat et al., 2016) show that to create household food security, farmers in sub-Saharan Africa, in addition to seeking employment opportunities in the agricultural sector, also work outside the agricultural sector.

CONCLUSION AND SUGGESTION

The food security of smallholder households in swamp agroecosystems in the Ciamis District is significantly influenced by farmer characteristics, income structure, and farming risk. The income structure reflected by on-farm, off-farm, and non-farm income is the variable that has the most substantial influence on food security, followed by farm risk, which is reflected by production risk, price risk, and income risk. Meanwhile, the characteristics of farmers as reflected by age, education, and family responsibilities, although they have a significant effect on food security, have the most negligible effect compared to other variables. According to the result of this study, the development of small agroindustry in rural areas must be carried out to create household food security.

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 1–34. doi: 10.1016/j.jssas.2017.05.003

Abu, G. A., & Soom, A. (2016). Analysis of factor affecting food security in rural and urban farming household of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*, *51*(9), 1125–1138. doi: 10.1080/00220388.2015.1046445

Badan Pusat Statistik Jawa Barat. (2021). Produksi Tanaman Padi. In Produksi Tanaman Padi.

Bahta, S., Wanyoike, F., Katjiuongua, H., & Marumo, D. (2017). Characterisation of food security and consumption patterns among smallholder livestock farmers in Botswana. *Agriculture and Food Security*, *6*(1), 1–11. doi: 10.1186/s40066-017-0145-1

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. doi: 10.1007/s12571-012-0208-x

Cafiero, C. (2019). Measuring food insecurity. *Food Security Policy, Evaluation and Impact Assessment*, *February 2010*, 169–205. doi: 10.4324/9781351019828-17

Candel, J. J. L. (2014). Food security governance: A systematic literature review. *Food Security*, *6*(4), 585–601. doi: 10.1007/s12571-014-0364-2

Che Omar, S., Shaharudin, A., Tumin, S. A., & The. (2019). The Status of the Paddy and Rice Industry in Malaysia Key Findings of the Report. In Khazanah Research Institute (Issue April).

Corral, P., & Radchenko, N. (2017). What's so spatial about diversification in Nigeria? *World Development*, *95*, 231–253. doi: 10.1016/j.worlddev.2017.02.028

Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, *67*, 153–174. doi: 10.1016/j.foodpol.2016.09.018

Fahad, S., Rehman, A., Shahzad, B., Tanveer, M., Saud, S., Kamran, M., Ihtisham, M., Khan, S. U., Turan, V., & ur Rahman, M. H. (2018). Rice responses and tolerance to metal/metalloid toxicity. In Advances in Rice Research for Abiotic Stress Tolerance (Issue December). doi: 10.1016/B978-0-12-814332-2.00014-9

Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. In Cogent Social Sciences (Vol. 6, Issue 1). doi: 10.1080/23311886.2020.1818373

Forero-cantor, G., Ribal, J., & Sanjuán, N. (2020). Measuring regional differences in food security from access and stability dimensions : A methodological proposal based on elasticities. *Agricultural Economics – Czech*, *66*(3), 112–119. doi: https://doi.org/10.17221/97/2019-AGRICECON

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., Van Asten, P. J. A., & Van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 458–463. doi: 10.1073/pnas.1518384112

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Gregory, P. J., & Ingram, J. S. I. (2000). Global change and food and forest production: Future scientific challenges. *Agriculture, Ecosystems and Environment*, *82*(1–3), 3–14. doi: 10.1016/S0167-8809(00)00212-7

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, *38*(10), 1429–1441. doi: 10.1016/j.worlddev.2009.06.008

Hindarti, S., Rohmatul Maula, L., & Khoiriyah, N. (2021). Income risk and the decision on onion farming. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(1), 202–209. doi: 10.24843/soca.2021.v15.i01.p18

Kassy, W. C., Ndu, A. C., Okeke, C. C., & Aniwada, E. C. (2021). Food security status and factors affecting household food security in Enugu state, Nigeria. *Journal of Health Care for the Poor and Underserved*, *32*(1), 564–581. doi: 10.1353/hpu.2021.0041

Kuok Ho Daniel Tang. (2019). Climate change and Paddy Yield in Malaysia: A short communication. *Global Journal of Civil and Environmental Engineering*, *July*, 14–19. doi: 10.36811/gjcee.2019.110003

Kuzmin, E. A. (2016). Sustainable food security: Floating balance of markets. *International Journal of Economics and Financial Issues*, *6*(1), 37–44.

Laborde, D., Majeed, F., Tokgoz, S., & Torero, M. (2016). Long-Term Drivers of Food and Nutrition Security. *IFPRI Discussion Paper Series*, *May*.

Maetz, M. (2013). Food Security - definitions and drivers. *Hunger Explained* , *31*(November 1996), 1–25.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare ? Empirical evidence from Tigray. *Feinstein International Center*, *August*, 1–19.

Maxwell, D. G., & Foundation, M. G. (2017). *The Coping Strategies Index A tool for rapid emergencies Second Edition*. *January 2008*.

Mazwan, M. Z., Ibrahim, J. T., & M Fadlan, W. A. (2020). Risk analysis of shallot farming in Malang Regency, Indonesia. *Agricultural Social Economic Journal*, *XX*(3), 201–206. doi: 10.21776/ub.agrise.2020.020.3.3

Musumba, M., Palm, C. A., Komarek, A. M., Mutuo, P. K., & Kaya, B. (2022). Household livelihood diversification in rural Africa. *Agricultural Economics (United Kingdom)*, *53*(2), 246–256. doi: 10.1111/agec.12694

Mutea, E., Bottazzi, P., Jacobi, J., Kiteme, B., Speranza, C. I., & Rist, S. (2019). Livelihoods and food security among rural households in the North-Western Mount Kenya Region. *Frontiers in Sustainable Food Systems*, *3*, 1–12. doi: 10.3389/fsufs.2019.00098

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Dominic, M., Nakin, V., Shisanya, S., & Walker, K. P. (2021). Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(2), 207–224.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Nakin, M. D. V., Shisanya, S., & Walker, K. P. (2021). Household food insecurity status and determinants: The case of Botswana and South Africa. *Agraris*, *7*(2), 207–224. doi: 10.18196/agraris.v7i2.11451

Nephawe, N., Mwale, M., Zuwarimwe, J., & Tjale, M. M. (2021). The impact of water-related challenges on rural communities food security initiatives. *Agraris*, *7*(1), 11–23. doi: 10.18196/agraris.v7i1.9935

Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, *29*(4 SPEC.ISS.), 321–338. doi: 10.1016/j.foodpol.2004.07.009

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade*, *2*(2), 98–108. doi: https://doi.org/10.9734/bjemt/2012/1284

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal province. *Sustainability (Switzerland)*, *10*(2). doi: 10.3390/su10020555

Nwokolo, E. E. (2015). The influence of educational level on sources of income and household food security in alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *52*(3), 208–217. doi: 10.1080/09709274.2015.11906944

Omotesho, O. A., Adewumi, ; M O, Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of food security among the rural farming households in Kwara State, Nigeria. *African Journal of General Agriculture* ©, *2*(1), 7–15. Retrieved from http://www.asopah.org

Omotesho, O. A., Adewumi, M. O., Adewumi, M. O., & Fadimula, K. S. (2010). Food security and poverty of the rural households in Kwara State, Nigeria. *Libyan Agriculture Research Center Journal International*, *1*(1), 56–59. Retrieved from https://www.researchgate.net/publication/46473090

Opaluwa, H. I., Oyibo, F. O., & Jimoh, F. A. (2018). Determinants of Food Security among Farming Households in Akure North Local Government Area of Ondo State, Nigeria. *Journal of Asian Rural Studies*, *2*(2), 164–172. doi: 10.20956/jars.v2i2.1479

Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. doi: 10.1016/j.foodpol.2010.09.002

Pandey, S., Bhandari, H., & Hardy, B. (2007). Economic costs of drought and rice farmers' coping mechanisms: a cross-country comparative analysis. In Journal of Chemical Information and Modeling (Vol. 53).

Rachman, H. P., & Ariani, M. (2002). Ketahanan pangan: Konsep, pengukuran, dan strategi. *Forum Penelitian Agroekonomi*, *20*(1), 12–24. Retrieved from https://ejurnal.litbang.pertanian.go.id

Ruhyana, N. F., Essa, W. Y., & Mardianis. (2020). Sociodemographic factors affecting household food security in Sumedang regency West Java province. *Agraris: Journal of Agribusiness and Rural Development Research*, *6*(1), 38–51. doi: 10.18196/agr.6189

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Rusliyadi, M. (2023). Food security police analysis perspective on food self-sufficiency village programme case in Central Java Indonesia. *Agrisocionomics*, *7*(1), 95–113. Retrieved from http://ejournal2.undip.ac.id/index.php/

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*(12), 1–13. doi: 10.1088/1748-9326/11/12/124010

Sekhar, C. S. C. (2018). Climate change and rice economy in Asia: Implications for trade policy Background paper for The State of Agricultural Commodity Markets (SOCO) 2018. In Fao.

Siddik, M., Mustadjab, M. M., & Hanani, N. (2015). *Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island , Indonesia*. *5*(5), 180–189. doi: 10.5923/j.ijas.20150505.02

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1). doi: 10.1186/s40066-015-0042-4

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). *The poverty impacts of climate change*. *51*(June 2014), 1–5.

Sulewski, P., & Kloczko-Gajewska, A. (2014). Farmers' risk perception, risk aversion and strategies to cope with production risk: An empirical study from Poland. *Studies in Agricultural Economics*, *116*(3), 140–147. doi: 10.7896/j.1414

Suparwoto, S. (2019). Produksi dan pendapatan usahatani padi di lahan rawa lebak Kabupaten Ogan Komering Ilir Sumatera Selatan. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 51. doi: 10.24843/soca.2019.v13.i01.p05

Suryanto, Gravitiani, E., Daerobi, A., & Susilowati, F. (2020). Crop insurance as farmers adaptation for climate change risk on agriculture in Surakarta residency-Indonesia. *International Journal of Trade and Global Markets*, *13*(2), 251–266. doi: 10.1504/IJTGM.2020.106771

Suwarto, Susanto, U., & Nurchasanah, S. (2015). *Perakitan genotipe Padi Tipe Baru untuk mendukung kemandirian pangan*. *c*, 133–139.

Swindale, A., & Bilinsky, P. (2010). Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guide VERSION 4 Paula Bilinsky Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guid. *Fhi 360*.

Tefera, T., & Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. *Journal of Food Security*, *2*(3), 92–99. doi: 10.12691/jfs-2-3-4

Ulrich, A., Ifejika Speranza, C., Roden, P., Kiteme, B., Wiesmann, U., & Nüsser, M. (2012). Small-scale farming in semi-arid areas: Livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. *Journal of Rural Studies*, *28*(3), 241–251. doi: 10.1016/j.jrurstud.2012.02.003

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Vaghefi, N., Shamsudin, M. N., Radam, A., & Rahim, K. A. (2016). Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry. *Journal of Integrative Environmental Sciences*, *13*(1), 19–35. doi: 10.1080/1943815X.2015.1112292

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. doi: 10.1111/gcb.14158

Wilke, A. K., & Morton, L. W. (2015). Climatologists' patterns of conveying climate science to the agricultural community. *Agriculture and Human Values, 32*(1), 99–110. doi: 10.1007/s10460-014-9531-5

Yaro, J. A. (2006). Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *Journal of Modern African Studies*, *44*(1), 125–156. doi: 10.1017/S0022278X05001448

Yulia, D. M., Rachmina, D., & Feryanto. (2023). Farmer's decision to take credit in Indonesia. *Agrisocionomics*, *7*(1), 126–143. Retrieved from http://ejournal2.undip.ac.id/index.php/

Yunita, Ginting B, Asngari Pang S, Susanto Joko, & Amanah Siti. (2011). Ketahanan pangan dan mekanisme koping rumah tangga petani padi sawah lebak berdasarkan status kepemilikan lahan. *Jurnal Ilmu Keluarga & Konseling*, *4*(1), 21–29. doi: https://doi.org/10.24156/jikk.2011.4.1.21

Yusuf, M. N. (2018). *Strategi ketahanan pangan rumah tangga petani dalam menghadapi risiko: Suatu kasus pada petani padi di daerah rawan banjir Kabupaten Pangandaran Propinsi Jawa Barat* [Disertasi]. Universitas Padjadjaran.

Yusuf, M. N., Sulistyowaty, L., Sendjaja, T. P., & Carsono, N. (2018). Food security analysis of household paddy farmer in flooding area. *Journal of Economics and Sustainable Development*, *9*(8), 88–90. doi: 10.7176/JESD

2. Bukti Konfirmasi Review Melalui OJS dan Hasil Review Pertama (20 April 2023)

#17988 Review

Summary | Review | Editing

Submission

Authors	Muhamad Nurdin Yusuf
Title	DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA
Section	Articles
Editor	Tutik Dalmiyatun

Peer Review

Round 1

Review Version	17988-62338-2-RV.docx 17-04-2023
Initiated	17-04-2023
Last modified	03-05-2023
Uploaded file	Reviewer A 17988-62485-1-RV.docx 20-04-2023 Reviewer B 17988-62714-1-RV.docx 01-05-2023

Editor Decision

Decision	Accept Submission 06-06-2023
Notify Editor	Editor/Author Email Record 26-05-2023
Editor Version	17988-62411-1-ED.docx 17-04-2023
Author Version	17988-63099-1-ED.docx 12-05-2023 17988-63099-2-ED.docx 15-05-2023
Upload Author Version	Choose File No file chosen Upload

AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA

Commented [OU1]: What is the novelty of this research in contributing to the development of science?

ABSTRACT

Swamp agroecosystems are sub-optimal lands with distinctive characteristics, namely low fertility, and can only be planted once a year during the dry season. Small farmers whose primary income comes from the agricultural sector are becoming increasingly difficult due to climate-changing changes that can intimidate their household food security. This research aimed to analyze the factors that affect the food security of small farmer households in the swamp agroecosystem. The method used a survey of 247 farmers who run rice farming in swamp agroecosystems in the Ciamis Indonesia, which were determined randomly from a population of 648 farmers using the Slovin formula at an error rate of 5 percent. The research was analyzed by SEM (Structural Equation Models). The result showed that the factors impacting the food security of small farmer households in swamp agroecosystems came from farmer characteristics, income structure, and farm risk. Based on this, the development of small agro-industry in rural areas must be carried out to create household food security.

Keywords*: Farmer Household, Food Security, Small Farmer, Swamp Agroecosystems*

BACKGROUND

Commented [OU2]: What is the cropping pattern in one year in a swamp agroecosystem? What is the picture of the business farming? So far, how do farmers meet their food needs? So this is interesting to study as stated in the title of the study

The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern (Candel, 2014; Forero-cantor et al., 2020) due to the increasing population, rising food prices, conversing of agricultural land, and declining production due to global climate change (Forero-cantor et al., 2020; Waha et al., 2018). The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern. However, decreasing the level of community welfare, especially in developing countries (Opaluwa et al., 2018), in the context of food security, availability is an important aspect that must be met (Abdullah et al., 2019; Cafiero, 2019). Food availability depends on the land area, the population as a provider of labor capital, and experts to raise production and equitable distribution (Laborde et al., 2016; Maetz, 2013).

As the staple food for half the world's population, including Indonesia, rice is a strategic commodity that plays an essential role in food security (Che Omar et al., 2019; Fahad et al., 2018; Suwarto et al., 2015). Therefore, the efforts to increase rice production sustainably is a necessity

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(Rusliyadi, 2023; Suparwoto, 2019). The expansion of rice fields on the north coast of Java and other square cities is prolonged. Furthermore, even tends to shrink as a result of land conversion, which is difficult to avoid Abdullah et al. (2019); Abu & Soom (2016); Kassy et al. (2021); Laborde et al. (2016); Ruhyana et al. (2020) therefore, that it has an impact on decreasing rice production.

Generally, thirteen strategic food commodities focus on food self-sufficiency and security: rice, corn, soybeans, shallots, garlic, red chilies, cayenne pepper, chicken meat, chicken eggs, beef/buffalo, sugar cane/sugar, and cooking oil. However, in recent years the Government has focused on increasing production in Indonesia's three commodities with the highest consumption levels, namely rice/rice, corn, and soybeans. Rice is one of the strategic commodities in Indonesia because of its much-needed role in meeting the population's food needs and inflation. There are several indicators used to measure food security (Cafiero, 2019; Candel, 2014; D. Maxwell et al., 2013; Ntshangase et al., 2018) those are: food consumption score (FCS) (Bahta et al., 2017) and household food diversity score (HDDS) (Swindale et al., 2010). Furthermore, shares of food expenditure (PPP) (Yusuf et al., 2018) can capture the utilization dimension. Coping strategy index (CSI) (D. Maxwell et al., 2013; D. G. Maxwell et al., 2017) and household food insecurity access scale (HFIAS) (D. Maxwell et al., 2013), farmer household affordability (DBP) (Yusuf et al., 2018) can capture the dimensions of accessibility and stability. Measuring adequate household food supply per month (MAHFP) (Swindale et al., 2010) and the food subsistence level (TSP) (Rachman et al., 2002) captures food availability and stability.

Commented [OU3]: Rice/ paddy??

Most farmers in Asia make rice farming their main livelihood, but it is cultivated on a small scale. This phenomenon contrasts with Australia and the United States, including Latin America, where rice farming has become the main livelihood for their farmers (Firdaus et al., 2020). This phenomenon was also becoming a prominent issue in Indonesia, where structural weaknesses are still inherent in Indonesian farmers, namely narrow land tenure, low education level, family dependents, limited capital, and lack of mastery of technology. This condition causes low production and limited physical and economic access (Firdaus et al., 2020; Samberg et al., 2016; Vaghefi et al., 2016). Nevertheless, farming activities were only carried out to maintain food availability for their families rather than profit-oriented (Abu et al., 2016; Mutea et al., 2019).

There are many efforts to meet the needs of food, which cannot be separated from the characteristics of farmers' households (Yusuf et al., 2018) because it describes the capacity of farmers to meet the needs of food (Ndhleve, et al., 2021). Although the socioeconomic characteristics of farmers are relatively much and varied, the main ones are the farmer's age, education level, principal occupation, and the number of members of the farmer's family. Meanwhile, economic characteristics, including the area of farming land, livestock ownership, and savings ownership, became critical in creating farmers' profit orientation.

Many factors affect household food security, including age, gender, education, remittances, unemployment, inflation, and assets (Ndhleve et al., 2021); farmer capacity (Yunita et al., 2011). Climate change, extension services, increased cost of production facilities, food price instability, income outside the agricultural sector (Ulrich et al., 2012), land area, income structure, and the number of household members (Bogale, 2012; Ndhleve et al., 2021; Omotesho et al., 2006), agroecosystem characteristics, access to irrigation, and soil fertility (Ulrich et al., 2012). However, the determinants of household food security differ due to agroecosystem differences and their needs (Cafiero, 2019). This research added that the risk of farming is getting higher due to climate change,

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

especially for small farmers who run rice farming in swamp agroecosystems in Indonesia, which can only harvest once a year. Hence, it had the potential to reduce the level of household food security.

The southern part of the Ciamis District is a rice development area, but swamp agroecosystems dominate the condition of the area. Meanwhile, in the swamp agroecosystem, farmers can only plant rice once a year in the dry season after the water begins to recede because it is constantly flooded in the rainy season. Ciamis is the one swamp area in Java Island used as a swamp agroecosystem. Swamp rice is the specific variety to grow. It is an exciting location to study. In Southern Ciamis District, rice production in 2020 decreased by 15.1 percent (63,445 tons) compared to the previous year succeeded, even though there was crop failure in several areas (Badan Pusat Statistik Jawa Barat, 2021). On the other hand, farmers have incurred significant farming costs to run their farms, although often the results of farming itself were not commensurate with the costs incurred and failed in all seasons. This situation traps the farmers, and the farmer survives the situation (Cafiero, 2019; Forero-cantor et al., 2020).

Commented [OU4]: Tampilkan data luas swamp agroecosystems yang digunakan untuk tanam padi dan produktivitasnya menggunakan data time series. Permasalahan dapat berawal dari data2 ini

The position of farmers becomes increasingly difficult when faced with the climate change phenomenon as one of the causes of their primary sources of income decreasingly, so the farmers need to look for other sources of income (Pandey et al., 2007; Skoufias et al., 2011; Vaghefi et al., 2016). Several studies have shown that climate change harms food security in most countries in Asia (Gregory et al., 2000). The study that examined the impact of climate change on rice production in East Asia found that extreme weather would reduce rice production by 50% by 2100 (Sekhar, 2018). Farmers need climate information that can help them determine more farming options for farming activities (Wilke et al., 2015). Then the farmers can protect their fields from uncertainty and farming risks.

Based on several assumptions above, food security can be designed for vulnerable groups of farmer households (Kuzmin, 2016; Rachman et al., 2002). It is because the need for food is a basic human need that must be met at all times. In addition, this present study aims to analyze the factors affecting small farmers' household food security in swamp agroecosystems in Ciamis District.

RESEARCH METHODS

Commented [OU5]: How to test the validity and reliability of the questionnaire? How many samples were used in this test and what are the results?

Commented [OU6]: Food availability, energy and protein adequacy levels at the household level are not indicators of food security... the availability of food from swamp agroecosystem production is not clearly defined in the research method. This is very important for the study of food security at the household level

This study was conducted using a survey method to provide an overview of farmers' characteristics, income structure, farming risk, and household food security of small farmers in swamp agroecosystems. Lakbok, Ciamis District was determined purposively by the assumption that there has a swamp agroecosystem. However, this region is a rice center in Ciamis. The survey drove through chosen 247 farmers household from 648 swamp rice farmers based on the Slovin formula determined it at an error rate is 5 percent using simple random sampling spreaded over four areas (Table 1).

Table 1. Proportional allocation of sample size

No	Village	Population	Sample Size
1	Sukanagara	132	50
2	Kapalasawit	286	109
3	Puloerang	124	47

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

4	Tambakreja	106	40
	Jumlah	648	247

Source: primary data 2022

The data used in this study included primary data and secondary data. Primary data was obtained directly from the samples through structured questionnaires, in-depth interviews with a few selected respondents and key informants, and FGD (Focus Group Discussion). Meanwhile, the secondary data was obtained from the Department of agriculture authority, Government statistic institutions, extension agents, and farmers' associations.

Data processing and analysis were performed using descriptive statistics and inferential statistics with multiple linear regressions to determine the functional relationship between variables. The multiple linear regression equation models in this study are as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

The analysis tool used SEM (Structural Equation Model) with the AMOS program version 18.0. SEM is a multivariate statistical technique combining factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs. The structural equation model would produce indicators that support the proposed model. Hair et al. (2009) write that there are 7 (seven) stages of structural equation model and analysis: (1) theoretical model development; (2) compiling a path diagram; (3) converting the path diagram into a structural equation; (4) selecting an input matrix for data analysis; (5) assess model identification; (6) evaluate the model estimation, and; (7) interpretation of the model as can be seen in Figure 1.

Commented [OU7]: Author using regression analysis or SEM?? Two different things. It is not clear which analysis was used

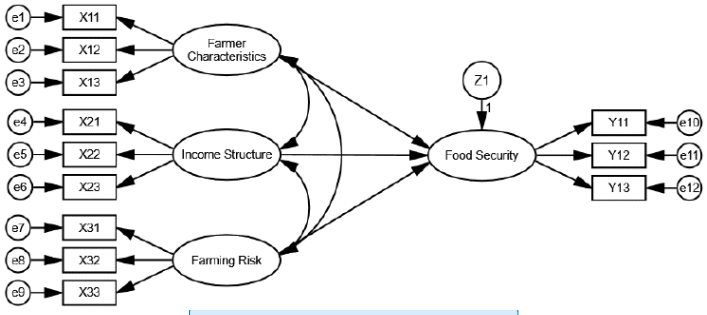

Figure 1. Research method design

Commented [OU8]: Where does this modeling theory base come from? Without a theoretical basis, this model cannot be justified

Figure 1 showed that food security as an endogenous latent variable as measured by indicators Food subsistence level (Y_{11}), Household affordability (Y_{12}), and Food expenditure shares (Y_{13}). This

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

endogenous latent variable is influenced by exogenous latent variables. The exogenous latent variables included the characteristics of farmers (X1) as measured by indicators age (X_{11}), Education (X_{12}), and Family loads (X_{13}). The exogenous latent variables of income structure (X_2) were measured by the indicators X_{21}, X_{22}, and X_{23}; farming risk (X_3) was measured by the indicators Production Risk (X_{31}), Process Risk (X_{32}), and Income Risk (X_{33}). Both of variable endogenous and exogenous involved in latent variable describing on table 3. All of variables have correlated each other. Therefore, the proper analysis tool is structural equation model (SEM). SEM is a multivariate statistical technique that combines factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs.

This study proposed three hypotheses: 1) Farmer characteristics affect food security; 2) Income structure affects food security; 3) Farming risk affects food security. The test type is two tailed: positive and negative area of hypothesis. In more detail, the latent variables and indicators can be seen in Table 2.

Commented [OU9]: What is the mathematical model like? How is the hypothesis testing?

Off-farm income is the income while waiting for farming time; the farmer works in another profession, such as temporary labor. The farmer will return for planting, maintenance, or harvesting when the farming time comes. The main job is farming. Non-farm income is income from work that is not in farming as the primary job.

There is a high risk of farming; small farmers with limited access will look for other sources of income out of the main farm (on-farm) to meet their household needs. For instance: working as farm laborers (on-farm), selling garden products, cultivating livestock, etcetera (off-farm), and even working out of the agricultural sector (non-farm) as construction workers, trade, firm industry etcetera.

Table 2. The latent variables and Indicators in SEM's model

Latent Variable	Indicators	Scale
Farmers' characteristics (X_1)	Age (X_{11})	Interval
	Education (X_{12})	Interval
	Family dependents (X_{13})	Interval
Income structure (X_2)	Income on-farm (X_{21})	Interval
	Income off-farm (X_{22})	Interval
	Income non-farm (X_{23})	Interval
Farming risk (X_3)	Production risk (X_{31})	Interval
	Price risk (X_{32})	Interval
	Income risk (X_{33})	Interval
Food security (Y_1)	Food subsistence level (Y_{11})	Interval
	Household affordability (Y_{12})	Interval
	Food expenditure shares (Y_{13})	Interval

Source: Primary data 2022

Commented [OU10]: The theoretical basis for constructing indicators is not clear. The strength of this research is if there is novelty compared to similar research that has been done by previous researchers.

Commented [OU11]: Is it true, the use of the SEM model uses an interval scale? Where are the references from?

In agriculture, there is often extreme situation containing risk and uncertainty event. The component that may determine farming risk is the risk of production, price, and income. Production

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

risk in swamp rice farming is higher than in lowland (Sulewski et al., 2014). Agricultural production risk is higher than non-agricultural production risk. Sometimes the harvest is abundant, but the price decrease. This caused an income decrease. The component of farming risk was measured by coefficient variation. Statistically, farming risk consisting of production risk, price risk, and income risk can be calculated using the coefficient of variation by looking at the variability that occurs (Hindarti et al., 2021; Mazwan et al., 2020). Production variance and price variance as a measure of production risk and price risk are based on the experience of farmers doing previous farming activities (Siddik et al., 2015).

RESULT AND DISCUSSION

Commented [OU12]: I do not continue to review the discussion because the research method used is not clear, the theoretical basis for constructing the model is also unclear

The research began within the primary field survey of the 247 swamp rice crop farmers to reveal their background and knowledge about their profession. Ciamis has a geographical history of swamp land agroecosystem. In Java Island which swamp agroecosystem is only in Ciamis. This area was severely affected by swamp land condition boundaries. The population in area majority lives under the risk toward poverty line and less rice yield as food intake. This risk would increase the concentration and intensity of flood, which is disturbing rice production, farmer income, and food security.

Farmers' Characteristics

The farmers' characteristics which are the leading research in this present study, have consisted of age, education, experience, and family load:

Commented [OU13]: 1 paragraph consists of at least 2 sentences

Table 3. Farmers' characteristics in swamp agroecosystems

	Description	Amount (person)	Percentage (%)
1	Age (year)		
	a. 15 - 64	201	81
	b. ≥ 65	46	19
	Total	247	100
2	Education level		
	a. Elementary	236	96
	b. Junior	7	3
	c. Senior	4	1
	Total	247	100
3	Experience (year)		
	a. 5 - 20	70	28
	b. 21 - 35	129	52
	c. 36 - 50	48	20
		247	100
4	Family load (person)		
	a. 1 - 3	125	51
	b. 4 - 6	122	49
	Total	247	100

Source: Primary data 2022

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 3 shows that farmers' ages range, from 32 to 71 years old, with an average age of 54 years old, so they are in the span of a productive period. Age is one of the factors related to work ability in carrying out farming activities (Yunita et al., 2011). The number of samples dominated farmers with low formal education. This problem caused the ability to manage lowland rice farming to be optimal productivity. Education is related to their access to food because with higher education, the opportunities to get better jobs are getting bigger to generate more significant income (Nwokolo, 2015). The land area of farmers ranges from 0.04-0.84 hectares with an average of 0.29 hectares which is in the narrow category with the most dominating amount, whereas Omotesho et al. (2010) stated that the land is an asset for farmers in running their or her business which will determine the level of income, the standard of living and welfare.

The experience of farmers in rice farming also varies. Range from 5-50 years with an average of 27 years. Experience is the knowledge that humans collect through their minds and then arrange into a patterned form. A person's experience in farming affected the response to accepting new technologies and innovations (Ntshangase et al., 2018).

This condition shows that the structural weakness of small farmers in rural areas, namely narrow land tenure is still very inherent and causes unequal distribution of income and production. According to Firdaus et al. (2020); Kuok Ho Daniel Tang (2019); Vaghefi et al. (2016), the narrow tenure of land owned can result in farmers being trapped in bare for survival.

The family-loads ranged from one to six people a family with an average of four dependents in a family. The small number of dependents of farming families illustrated those small families in rural areas as the main view of farmers' family members. Thus, it is also related to the proverb of the agrarian society's Javanese culture, assuming that "many children, many fortunes" is still believed. Even in fact, the more the number of family members, the greater the burden of living that must be borne by farmers. Davis et al. (2017); Ndhleve et al. (2021); Nwokolo (2015); Ruhyana et al. (2020) family size will affect the income per capita and household food consumption expenditure.

Formulation Model

The results of SEM assumptions and data processing to test the hypothesis consisting of a multivariate outlier test, multivariate normality test, and multicollinearity test all meet the required assumptions.

Commented [OU14]: 1 paragraph consists of at least 2 sentences

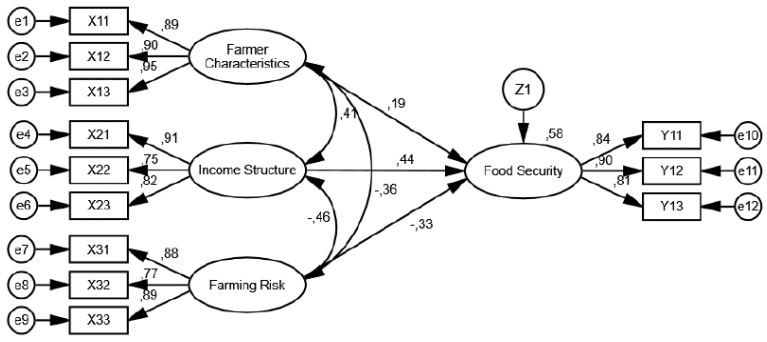

Figure 2. Results of SEM model analysis of farmer household food security in swamp agroecosystems in Ciamis, Indonesia.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

This condition was reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

After it fulfilled all the testing assumptions, it could be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis Regency is obtained, as seen in Figure 2.

Table 4. Test results on the feasibility of the full SEM model

The goodness of Fit Indeks	Cut-off Value	Result	Conclusion
Chi-Square	Expected small	81.735	Fit
Significance Probability	≥ 0.05	0.068	Fit
RMSEA	≤ 0.08	0.053	Fit
GFI	≥ 0.90	0.947	Fit
AGFI	≥ 0.90	0.914	Fit
CMIN/DF	≤ 2.00	1.703	Fit
TLI	≥ 0.90	0.978	Fit
CFI	≥ 0.95	0.984	Fit
NFI	≥ 0.90	0.962	Fit

Source: Authors computation (2022), n = 247

Table 4 showed a good model fit index, meaning that the model fits the data. Regression estimation for SEM shows that all variables are significant (Table 5), so all hypotheses are accepted.

Table 5. Regression estimate

Variables		b	SE	CR	P	Note
Food security<---	Farmers' characteristics	0.191	0.059	3.323	***	Significant
Food security<---	Income structure	0.439	0.071	6.507	***	Significant
Food security<---	Farming risk	-0.327	0.072	-5.193	***	Significant

Source: Authors computation (2022), n = 247

Therefore, based on table 5 could be formed the structural equation of the exogenous latent variable to the endogenous latent variable is as follows:

$$Y = 0.191\ X_1 + 0.439\ X_2 - 0.327\ X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

Table 6. Square multiple correlation

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

	Estimate
Food Security	0.583

Source: Authors computation (2022)

Table 6 showed that food security was explained by farmer characteristics, income structure, and farming risk of 58.3%. The remaining 41.7% is explained by other factors not included in the structural equation model.

Table 7 displayed good reliability and validity construct for the measurement model of the sample. The value of the reliability construct ranged from 0.7248 to 0.8433, while the value of the validity extracted was more significant than 0.5. The results proved the convergent validity by examining the significance of the loadings factor and the shared variance. The variance captured by the construct should be greater than the measurement error (0.5). The structural equation that was formed explained the causal relationship between changes in food security there was a change in farmer characteristics, income structure, and farming risk.

Table 7. Validity and reliability construct

Variables.	Reliability Construct	Variance Extracted
	CR > 70%	AVE > 50%
Farmers' characteristics	84.33%	83.07%
Income structure	72.48%	68.65%
Farming risk	75.17%	75.02%
Food security	75.12%	71.94%

Source: Authors computation (2022)

Discussion

Simultaneously, the three variables' effect on farmer households' food security was 58 percent. The remaining 42 percent is explained by other factors not included in the model. The factor influencing most farmers' food security households is the level of food subsistence ($\lambda = 0.84$). The affordability of farmer households ($\lambda = 0.90$); and 3) the share of food expenditure ($\lambda = 0.81$) is the income structure reflected by on-farm, off-farm, and non-farm income.

Farming income ($\lambda = 0.91$), non-farming income ($\lambda = 0.75$), and non-agricultural income ($\lambda = 0.82$) were strong determinants of the latent variable of income structure. Thus, farm, non-farm, and non-agricultural income have the greatest potential contribution to household income.

The results of the SEM analysis showed that the coefficient of the income structure influence was positive. On the other hand, the higher income structure reflected by, the higher income from farming, outside farming, and outside the agricultural sector, the better the food security of farmers' households. This condition is suitable because, with high incomes, farmers' access to food becomes more rational. Ndhleve et al. (2021) household income is an essential determinant of household food insecurity because access to food at the household level is determined by household income (Mutea et al., 2019; Silvestri et al., 2015; Tefera et al., 2014) household income is an estimator of household affordability.

On-farm income is one indicator that most strongly reflects the structure of household income ($\lambda = 0.91$). On-farm was natural, considering that most farmer households rely on rice farming as

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

farmers' main activity. The analysis showed that the average farmer's income from lowland rice farming was 8,993,229 IDR per hectare per year, with an average contribution of 14 percent to the total household income.

This study's findings align with Abu & Soom (2016); Mutea et al. (2019). In subsistence-to-farmer households, food availability is more determined by food production itself. The findings also indicated that more efforts are needed to increase the farmers' knowledge and skills in utilizing the potential and economic resources of farmer households considering that the source of farmers' income does not only come from rice farming but also from outside the farm, the agricultural sector.

Income structure indicators are income outside the agricultural sector ($\lambda = 0.75$) and income outside farming ($\lambda = 0.82$). The analysis results show that the average income of farmers outside the agricultural sector was 9,372,206 IDR per year, with an average contribution of 60 percent to the total household income. Meanwhile, the average income of farmers from outside rice farming but still in the agricultural sector was 4,159,753 IDR per year, with an average contribution of 26 percent to total household income.

Non-agricultural activities carried out by low-income farmer households due to narrow land ownership and low production are one of the efforts to obtain additional income to meet household needs. Owusu et al. (2011) found that the influence of income outside the agricultural sector on household food security in Northern Ghana. The research results of Musumba et al. (2022) showed that farming households in rural Sub-Saharan African countries carry out more than one type of work to increase income. The research findings Haggblade et al. (2010) in rural Sub-Saharan Africa concluded that 50 percent in Asia and Latin America, farmers' income from outside the agricultural sector contributes about 35 percent to total household income. According to Alobo Loison (2015); Mutea et al. (2019); Yusuf et al. (2018), work in the agricultural and non-agricultural sectors is an effort for farmers to earn income because income diversification is closely related to efforts to maintain survival in unfavorable conditions. Alobo Loison (2015); Mutea et al. (2019); Niehof (2004); Yaro (2006), It aimed to secure a better standard of living by reducing risk, vulnerability, and poverty and increasing income, security, and wealth.

Farming risk is the second variable that affects the food security of rice farmers' households in the swamp agroecosystem, which is reflected by indicators of production risk, price risk, and income risk. Production risk is the indicator that most strongly reflects farming risk ($\lambda = 0.88$), price risk ($\lambda = 0.77$), and income risk ($\lambda = 0.89$). The influence of production, income, and price risk has the most potential to increase rice farming risk in swamp agroecosystems.

When it looks from the coefficient, which shows a negative sign, this means that the greater risk of farming faced by farmers, the lower household food security. This condition is reasonable considering the facts on the ground show that, on average, farmers face a high risk of farming due to frequent flooding of their fields. Production risks faced by farmers are generally in the form of reduced grain produced due to unpredictable floods. The findings of this study were in line with the research results of Nephawe et al. (2021) insufficient rainfall, pest and disease attacks, and excess rainfall can reduce farm production. The research results of Mutea et al. (2019) also showed that lost yields from production activities are caused by climatic conditions and pests/diseases that attack plants or can lead to low productivity resulting in reduced irrigation water and production inputs. In comparison, the low number of inputs, such as fertilizers, can cause a decrease in rice yields.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Income risk can be assumed as the variable that most strongly reflects farming risk (λ = 0.89). It can be assumed that the higher the income risk faced by farmers, the lower household food security, considering that farmers have to pay to run their businesses. However, the imbalance between the income earned and the costs incurred causes an income risk. This income risk causes the affordability of farmers to be low, even though, according to Mutea et al. (2019), the income structure owned by farmers will affect their behavior in facing risks to anticipate crop failures. This condition is reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

The countermeasures made by farmers before running rice farming are by preparing large quantities of seeds as reserves because farmers usually do embroidery repeatedly. Facts in the field showed that the use of these seeds reaches 2-3 times the recommended amount. The Lebak swamp has distinctive characteristics, so rice farmers in this agroecosystem are different from farmers working on it Yunita, et al. (2011); Yusuf (2018). Nmadu et al. (2012) stated that to minimize the risk of production due to natural disasters, pests and plant diseases, fires, and other factors whose consequences can be physically calculated and can be overcome by purchasing an agricultural insurance policy. Meanwhile, the risk of a possible decline in production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be anticipated in several ways, including diversification, vertical integration, forward contracting, future markets, hedging, and agricultural options.

Although some of these strategies have been implemented by some farmers, they still have difficulty overcoming the risks of farming. Therefore, another systematic strategy is needed, for example, through agricultural insurance, an economic institution that functions to manage the risks faced by farmers whose objectives are: 1) stabilizing farmers' incomes by reducing losses due to lost yields; 2) stimulating farmers to adopt technology that can increase production and efficient use of resources, and 3) reduce the risks faced by agricultural credit institutions and increase farmers' access to these institutions. Suryanto et al. (2020); Yulia et al. (2023), agricultural insurance is one of the strategies to adapt to climate change, even in developed countries, including several countries in Asia, developing rapidly and effectively protecting farmers.

Farmer characteristics are the third factor that influences the food security of rice farmers' households in the swamp agroecosystem, which is reflected by age (λ = 0.89); 2) education (λ = 0.90), and 3) family dependents (λ = 0.95). The farmer characteristics meant that age, formal education, and family dependents of farmers could increase household food security. It meant that if farmers' capacity increases, farmers' ability to create household food security will be better.

The strongest indicator that reflects the characteristics of farmers is family dependents (λ = 0.95). Fewer family responsibilities caused household food security to be high. This characteristic was certainly rational considering that farmers with larger family sizes tend to need more food than farmers with fewer family members. The more members of the household, the greater the burden on farmers, which causes household food expenditure to be more significant so that, in the end, household food security is lower. However, family dependents are also positively related to household income, which means that more and more family members lead to greater and more diverse sources of income that households can access.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The results of the study of Ndhleve et al. (2021) in Botswana and South Africa showed a strong influence of family dependents on household food security. Households with many dependents were more food insecure than households with few family dependents. Households with more family dependents mean more people have to be fed, so they need more food. This characteristic was in line with the findings of (Cafiero, 2019; Silvestri et al., 2015). Musumba et al. (2022) that the food available for one family may not be sufficient to meet the needs of all family members but only sufficient for some of the family members.

This study showed that the average size of the farming family in the study area belongs to a small family where most of the family members also work to earn income to ease the burden on the family. In addition, other family members (children) who work outside the city and have an established economy usually send money routinely as a form of responsibility and dedication to their parents.

Farmers who are highly educated, and older in the sense of being more productive and having a small family size, will also have a higher level of household food security. Income is very important for households to provide food through purchases (Corral et al., 2017; Silvestri et al., 2015; Tefera et al., 2014) that income is very important for households to provide food through purchases.

The higher education farmers have taken causes household food security to be higher which is reflected by the higher affordability and the better quality of food consumed by farmer households. The level of education indicates that a person's knowledge level is broader because of education. Generally, the level of education is positively related to the level of income. It meant that the higher the education completed by farmers, the higher the income earned. Farmers with higher education tend to gain more insight and information related to other sources of income.

In contrast to the research findings of, household food security in Botswana and South Africa is not significantly affected by education level. According to him, education is usually related to the level of income because households with a high level of education usually have more money that can be used to purchase food. Thus the higher the level of education of farmers, the income will also be higher the affordability of households will also be higher. In the end, farmers could improve the quality of the food they eat and tend to choose healthier foods. The findings of this study are in line with Nwokolo (2015); Ruhyana et al. (2020) that higher levels of education are associated with increased household income, livelihood opportunities, and food security.

Although the average level of formal education that farmers did is low, on average farmers, they only need to complete primary education. In general, farmers have other sources of income outside of the rice farming they run, namely from outside the farm, which includes farm laborers, selling garden products, livestock products, and operating agroindustry (sales of bananas and coconut sugar). Meanwhile, sources of income from outside the agricultural sector include construction workers and opening small stalls. The source of income is in line with the research findings of Mutea et al. (2019) that to increase income, farmer households in the mountainous region of Kenya usually sell crops, timber, and livestock, while off-farm income comes from trade and business, remittances, house rent, employment. Legal, transportation services, and other informal jobs.

The little indicator that reflect household food security is age ($\lambda = 0.89$). The more productive a person's age allows them to work more productively. With their physical strength, they will be more productive to work outside their farms and seeking additional income outside the agricultural sector. Farmers of productive age were generally more rational in running their businesses. Thus, the income

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

obtained from farming can be more optimal with the minimum use of labor outside the family, which must be paid directly. Productive age implies that farmers do not only rely on their income from one source of income but also from other sources. Facts on the ground show that apart from working in the agricultural sector, they also work outside it. The results of the research by (Frelat et al., 2016) show that to create household food security, farmers in sub-Saharan Africa, in addition to seeking employment opportunities in the agricultural sector, also work outside the agricultural sector.

CONCLUSION AND SUGGESTION

The food security of smallholder households in swamp agroecosystems in the Ciamis District is significantly influenced by farmer characteristics, income structure, and farming risk. The income structure reflected by on-farm, off-farm, and non-farm income is the variable that has the most substantial influence on food security, followed by farm risk, which is reflected by production risk, price risk, and income risk. Meanwhile, the characteristics of farmers as reflected by age, education, and family responsibilities, although they have a significant effect on food security, have the most negligible effect compared to other variables. According to the result of this study, the development of small agroindustry in rural areas must be carried out to create household food security.

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 1–34. doi: 10.1016/j.jssas.2017.05.003

Abu, G. A., & Soom, A. (2016). Analysis of factor affecting food security in rural and urban farming household of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68.

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*, *51*(9), 1125–1138. doi: 10.1080/00220388.2015.1046445

Badan Pusat Statistik Jawa Barat. (2021). Produksi Tanaman Padi. In Produksi Tanaman Padi.

Bahta, S., Wanyoike, F., Katjiuongua, H., & Marumo, D. (2017). Characterisation of food security and consumption patterns among smallholder livestock farmers in Botswana. *Agriculture and Food Security*, *6*(1), 1–11. doi: 10.1186/s40066-017-0145-1

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. doi: 10.1007/s12571-012-0208-x

Cafiero, C. (2019). Measuring food insecurity. *Food Security Policy, Evaluation and Impact Assessment*, *February 2010*, 169–205. doi: 10.4324/9781351019828-17

Candel, J. J. L. (2014). Food security governance: A systematic literature review. *Food Security*, *6*(4), 585–601. doi: 10.1007/s12571-014-0364-2

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Che Omar, S., Shaharudin, A., Tumin, S. A., & The. (2019). The Status of the Paddy and Rice Industry in Malaysia Key Findings of the Report. In Khazanah Research Institute (Issue April).

Corral, P., & Radchenko, N. (2017). What's so spatial about diversification in Nigeria? *World Development*, *95*, 231–253. doi: 10.1016/j.worlddev.2017.02.028

Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, *67*, 153–174. doi: 10.1016/j.foodpol.2016.09.018

Fahad, S., Rehman, A., Shahzad, B., Tanveer, M., Saud, S., Kamran, M., Ihtisham, M., Khan, S. U., Turan, V., & ur Rahman, M. H. (2018). Rice responses and tolerance to metal/metalloid toxicity. In Advances in Rice Research for Abiotic Stress Tolerance (Issue December). doi: 10.1016/B978-0-12-814332-2.00014-9

Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. In Cogent Social Sciences (Vol. 6, Issue 1). doi: 10.1080/23311886.2020.1818373

Forero-cantor, G., Ribal, J., & Sanjuán, N. (2020). Measuring regional differences in food security from access and stability dimensions : A methodological proposal based on elasticities. *Agricultural Economics – Czech*, *66*(3), 112–119. doi: https://doi.org/10.17221/97/2019-AGRICECON

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., Van Asten, P. J. A., & Van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 458–463. doi: 10.1073/pnas.1518384112

Gregory, P. J., & Ingram, J. S. I. (2000). Global change and food and forest production: Future scientific challenges. *Agriculture, Ecosystems and Environment*, *82*(1–3), 3–14. doi: 10.1016/S0167-8809(00)00212-7

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, *38*(10), 1429–1441. doi: 10.1016/j.worlddev.2009.06.008

Hindarti, S., Rohmatul Maula, L., & Khoiriyah, N. (2021). Income risk and the decision on onion farming. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(1), 202–209. doi: 10.24843/soca.2021.v15.i01.p18

Kassy, W. C., Ndu, A. C., Okeke, C. C., & Aniwada, E. C. (2021). Food security status and factors affecting household food security in Enugu state, Nigeria. *Journal of Health Care for the Poor and Underserved*, *32*(1), 564–581. doi: 10.1353/hpu.2021.0041

Kuok Ho Daniel Tang. (2019). Climate change and Paddy Yield in Malaysia: A short communication. *Global Journal of Civil and Environmental Engineering*, *July*, 14–19. doi: 10.36811/gjcee.2019.110003

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Kuzmin, E. A. (2016). Sustainable food security: Floating balance of markets. *International Journal of Economics and Financial Issues*, *6*(1), 37–44.

Laborde, D., Majeed, F., Tokgoz, S., & Torero, M. (2016). Long-Term Drivers of Food and Nutrition Security. *IFPRI Discussion Paper Series*, *May*.

Maetz, M. (2013). Food Security - definitions and drivers. *Hunger Explained* , *31*(November 1996), 1–25.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare ? Empirical evidence from Tigray. *Feinstein International Center*, *August*, 1–19.

Maxwell, D. G., & Foundation, M. G. (2017). *The Coping Strategies Index A tool for rapid emergencies Second Edition*. *January 2008*.

Mazwan, M. Z., Ibrahim, J. T., & M Fadlan, W. A. (2020). Risk analysis of shallot farming in Malang Regency, Indonesia. *Agricultural Social Economic Journal*, *XX*(3), 201–206. doi: 10.21776/ub.agrise.2020.020.3.3

Musumba, M., Palm, C. A., Komarek, A. M., Mutuo, P. K., & Kaya, B. (2022). Household livelihood diversification in rural Africa. *Agricultural Economics (United Kingdom)*, *53*(2), 246–256. doi: 10.1111/agec.12694

Mutea, E., Bottazzi, P., Jacobi, J., Kiteme, B., Speranza, C. I., & Rist, S. (2019). Livelihoods and food security among rural households in the North-Western Mount Kenya Region. *Frontiers in Sustainable Food Systems*, *3*, 1–12. doi: 10.3389/fsufs.2019.00098

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Dominic, M., Nakin, V., Shisanya, S., & Walker, K. P. (2021). Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(2), 207–224.

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Nakin, M. D. V., Shisanya, S., & Walker, K. P. (2021). Household food insecurity status and determinants: The case of Botswana and South Africa. *Agraris*, *7*(2), 207–224. doi: 10.18196/agraris.v7i2.11451

Nephawe, N., Mwale, M., Zuwarimwe, J., & Tjale, M. M. (2021). The impact of water-related challenges on rural communities food security initiatives. *Agraris*, *7*(1), 11–23. doi: 10.18196/agraris.v7i1.9935

Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, *29*(4 SPEC.ISS.), 321–338. doi: 10.1016/j.foodpol.2004.07.009

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade*, *2*(2), 98–108. doi: https://doi.org/10.9734/bjemt/2012/1284

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal province. *Sustainability (Switzerland)*, *10*(2). doi: 10.3390/su10020555

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Nwokolo, E. E. (2015). The influence of educational level on sources of income and household food security in alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *52*(3), 208–217. doi: 10.1080/09709274.2015.11906944

Omotesho, O. A., Adewumi, ; M O, Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of food security among the rural farming households in Kwara State, Nigeria. *African Journal of General Agriculture ©*, *2*(1), 7–15. Retrieved from http://www.asopah.org

Omotesho, O. A., Adewumi, M. O., Adewumi, M. O., & Fadimula, K. S. (2010). Food security and poverty of the rural households in Kwara State, Nigeria. *Libyan Agriculture Research Center Journal International*, *1*(1), 56–59. Retrieved from https://www.researchgate.net/publication/46473090

Opaluwa, H. I., Oyibo, F. O., & Jimoh, F. A. (2018). Determinants of Food Security among Farming Households in Akure North Local Government Area of Ondo State, Nigeria. *Journal of Asian Rural Studies*, *2*(2), 164–172. doi: 10.20956/jars.v2i2.1479

Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. doi: 10.1016/j.foodpol.2010.09.002

Pandey, S., Bhandari, H., & Hardy, B. (2007). Economic costs of drought and rice farmers' coping mechanisms: a cross-country comparative analysis. In Journal of Chemical Information and Modeling (Vol. 53).

Rachman, H. P., & Ariani, M. (2002). Ketahanan pangan: Konsep, pengukuran, dan strategi. *Forum Penelitian Agroekonomi*, *20*(1), 12–24. Retrieved from https://ejurnal.litbang.pertanian.go.id

Ruhyana, N. F., Essa, W. Y., & Mardianis. (2020). Sociodemographic factors affecting household food security in Sumedang regency West Java province. *Agraris: Journal of Agribusiness and Rural Development Research*, *6*(1), 38–51. doi: 10.18196/agr.6189

Rusliyadi, M. (2023). Food security police analysis perspective on food self-sufficiency village programme case in Central Java Indonesia. *Agrisocionomics*, *7*(1), 95–113. Retrieved from http://ejournal2.undip.ac.id/index.php/

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*(12), 1–13. doi: 10.1088/1748-9326/11/12/124010

Sekhar, C. S. C. (2018). Climate change and rice economy in Asia: Implications for trade policy Background paper for The State of Agricultural Commodity Markets (SOCO) 2018. In Fao.

Siddik, M., Mustadjab, M. M., & Hanani, N. (2015). *Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island , Indonesia*. *5*(5), 180–189. doi: 10.5923/j.ijas.20150505.02

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1). doi: 10.1186/s40066-015-0042-4

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). *The poverty impacts of climate change*. *51*(June 2014), 1–5.

Sulewski, P., & Kloczko-Gajewska, A. (2014). Farmers' risk perception, risk aversion and strategies to cope with production risk: An empirical study from Poland. *Studies in Agricultural Economics*, *116*(3), 140–147. doi: 10.7896/j.1414

Suparwoto, S. (2019). Produksi dan pendapatan usahatani padi di lahan rawa lebak Kabupaten Ogan Komering Ilir Sumatera Selatan. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 51. doi: 10.24843/soca.2019.v13.i01.p05

Suryanto, Gravitiani, E., Daerobi, A., & Susilowati, F. (2020). Crop insurance as farmers adaptation for climate change risk on agriculture in Surakarta residency-Indonesia. *International Journal of Trade and Global Markets*, *13*(2), 251–266. doi: 10.1504/IJTGM.2020.106771

Suwarto, Susanto, U., & Nurchasanah, S. (2015). *Perakitan genotipe Padi Tipe Baru untuk mendukung kemandirian pangan*. *c*, 133–139.

Swindale, A., & Bilinsky, P. (2010). Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guide VERSION 4 Paula Bilinsky Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guid. *Fhi 360*.

Tefera, T., & Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. *Journal of Food Security*, *2*(3), 92–99. doi: 10.12691/jfs-2-3-4

Ulrich, A., Ifejika Speranza, C., Roden, P., Kiteme, B., Wiesmann, U., & Nüsser, M. (2012). Small-scale farming in semi-arid areas: Livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. *Journal of Rural Studies*, *28*(3), 241–251. doi: 10.1016/j.jrurstud.2012.02.003

Vaghefi, N., Shamsudin, M. N., Radam, A., & Rahim, K. A. (2016). Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry. *Journal of Integrative Environmental Sciences*, *13*(1), 19–35. doi: 10.1080/1943815X.2015.1112292

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. doi: 10.1111/gcb.14158

Wilke, A. K., & Morton, L. W. (2015). Climatologists' patterns of conveying climate science to the agricultural community. *Agriculture and Human Values*, *32*(1), 99–110. doi: 10.1007/s10460-014-9531-5

Yaro, J. A. (2006). Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *Journal of Modern African Studies*, *44*(1), 125–156. doi: 10.1017/S0022278X05001448

Yulia, D. M., Rachmina, D., & Feryanto. (2023). Farmer's decision to take credit in Indonesia. *Agrisocionomics*, *7*(1), 126–143. Retrieved from http://ejournal2.undip.ac.id/index.php/

Yunita, Ginting B, Asngari Pang S, Susanto Joko, & Amanah Siti. (2011). Ketahanan pangan dan mekanisme koping rumah tangga petani padi sawah lebak berdasarkan status kepemilikan

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

lahan. *Jurnal Ilmu Keluarga & Konseling*, *4*(1), 21–29. doi: https://doi.org/10.24156/jikk.2011.4.1.21

Yusuf, M. N. (2018). *Strategi ketahanan pangan rumah tangga petani dalam menghadapi risiko: Suatu kasus pada petani padi di daerah rawan banjir Kabupaten Pangandaran Propinsi Jawa Barat* [Disertasi]. Universitas Padjadjaran.

Yusuf, M. N., Sulistyowaty, L., Sendjaja, T. P., & Carsono, N. (2018). Food security analysis of household paddy farmer in flooding area. *Journal of Economics and Sustainable Development*, *9*(8), 88–90. doi: 10.7176/JESD

3. Bukti Konfirmasi Review Melalui OJS dan Hasil Review Kedua (01 Mei 2023)

#17988 Review

Summary | Review | Editing

Submission

Authors	Muhamad Nurdin Yusuf
Title	DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA
Section	Articles
Editor	Tutik Dalmiyatun

Peer Review

Round 1

Review Version	17988-62338-2-RV.docx 17-04-2023
Initiated	17-04-2023
Last modified	03-05-2023
Uploaded file	Reviewer A 17988-62485-1-RV.docx 20-04-2023 Reviewer B 17988-62714-1-RV.docx 01-05-2023

Editor Decision

Decision	Accept Submission 06-06-2023
Notify Editor	Editor/Author Email Record 26-05-2023
Editor Version	17988-62411-1-ED.docx 17-04-2023
Author Version	17988-63099-1-ED.docx 12-05-2023 17988-63099-2-ED.docx 15-05-2023
Upload Author Version	Choose File No file chosen Upload

AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA

ABSTRACT

Swamp agroecosystems are sub-optimal lands with distinctive characteristics, namely low fertility, and can only be planted once a year during the dry season. Small farmers whose primary income comes from the agricultural sector are becoming increasingly difficult due to climate-changing changes that can intimidate their household food security. This research aimed to analyze the factors that affect the food security of small farmer households in the swamp agroecosystem. The method used a survey of 247 farmers who run rice farming in swamp agroecosystems in the Ciamis Indonesia, which were determined randomly from a population of 648 farmers using the Slovin formula at an error rate of 5 percent. The research was analyzed by SEM (Structural Equation Models). The result showed that the factors impacting the food security of small farmer households in swamp agroecosystems came from farmer characteristics, income structure, and farm risk. Based on this, the development of small agro-industry in rural areas must be carried out to create household food security.

Keywords*: Farmer Household, Food Security, Small Farmer, Swamp Agroecosystems*

BACKGROUND

The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern (Candel, 2014; Forero-cantor et al., 2020) due to the increasing population, rising food prices, conversing of agricultural land, and declining production due to global climate change (Forero-cantor et al., 2020; Waha et al., 2018). The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern. However, decreasing the level of community welfare, especially in developing countries (Opaluwa et al., 2018), in the context of food security, availability is an important aspect that must be met (Abdullah et al., 2019; Cafiero, 2019). Food availability depends on the land area, the population as a provider of labor capital, and experts to raise production and equitable distribution (Laborde et al., 2016; Maetz, 2013).

As the staple food for half the world's population, including Indonesia, rice is a strategic commodity that plays an essential role in food security (Che Omar et al., 2019; Fahad et al., 2018; Suwarto et al., 2015). Therefore, the efforts to increase rice production sustainably is a necessity

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(Rusliyadi, 2023; Suparwoto, 2019). The expansion of rice fields on the north coast of Java and other square cities is prolonged. Furthermore, even tends to shrink as a result of land conversion, which is difficult to avoid Abdullah et al. (2019); Abu & Soom (2016); Kassy et al. (2021); Laborde et al. (2016); Ruhyana et al. (2020) therefore, that it has an impact on decreasing rice production.

Generally, thirteen strategic food commodities focus on food self-sufficiency and security: rice, corn, soybeans, shallots, garlic, red chilies, cayenne pepper, chicken meat, chicken eggs, beef/buffalo, sugar cane/sugar, and cooking oil. However, in recent years the Government has focused on increasing production in Indonesia's three commodities with the highest consumption levels, namely rice/rice, corn, and soybeans. Rice is one of the strategic commodities in Indonesia because of its much-needed role in meeting the population's food needs and inflation. There are several indicators used to measure food security (Cafiero, 2019; Candel, 2014; D. Maxwell et al., 2013; Ntshangase et al., 2018) those are: food consumption score (FCS) (Bahta et al., 2017) and household food diversity score (HDDS) (Swindale et al., 2010). Furthermore, shares of food expenditure (PPP) (Yusuf et al., 2018) can capture the utilization dimension. Coping strategy index (CSI) (D. Maxwell et al., 2013; D. G. Maxwell et al., 2017) and household food insecurity access scale (HFIAS) (D. Maxwell et al., 2013), farmer household affordability (DBP) (Yusuf et al., 2018) can capture the dimensions of accessibility and stability. Measuring adequate household food supply per month (MAHFP) (Swindale et al., 2010) and the food subsistence level (TSP) (Rachman et al., 2002) captures food availability and stability.

Commented [81]: Banyak singkatan disini yang tidak memiliki arti padahal sudah dijelaskan dalam bahasa inggris. Lebih baik dihilangkan

Most farmers in Asia make rice farming their main livelihood, but it is cultivated on a small scale. This phenomenon contrasts with Australia and the United States, including Latin America, where rice farming has become the main livelihood for their farmers (Firdaus et al., 2020). This phenomenon was also becoming a prominent issue in Indonesia, where structural weaknesses are still inherent in Indonesian farmers, namely narrow land tenure, low education level, family dependents, limited capital, and lack of mastery of technology. This condition causes low production and limited physical and economic access (Firdaus et al., 2020; Samberg et al., 2016; Vaghefi et al., 2016). Nevertheless, farming activities were only carried out to maintain food availability for their families rather than profit-oriented (Abu et al., 2016; Mutea et al., 2019).

There are many efforts to meet the needs of food, which cannot be separated from the characteristics of farmers' households (Yusuf et al., 2018) because it describes the capacity of farmers to meet the needs of food (Ndhleve, et al., 2021). Although the socioeconomic characteristics of farmers are relatively much and varied, the main ones are the farmer's age, education level, principal occupation, and the number of members of the farmer's family. Meanwhile, economic characteristics, including the area of farming land, livestock ownership, and savings ownership, became critical in creating farmers' profit orientation.

Many factors affect household food security, including age, gender, education, remittances, unemployment, inflation, and assets (Ndhleve et al., 2021); farmer capacity (Yunita et al., 2011). Climate change, extension services, increased cost of production facilities, food price instability, income outside the agricultural sector (Ulrich et al., 2012), land area, income structure, and the number of household members (Bogale, 2012; Ndhleve et al., 2021; Omotesho et al., 2006), agroecosystem characteristics, access to irrigation, and soil fertility (Ulrich et al., 2012). However, the determinants of household food security differ due to agroecosystem differences and their needs (Cafiero, 2019). This research added that the risk of farming is getting higher due to climate change,

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

especially for small farmers who run rice farming in swamp agroecosystems in Indonesia, which can only harvest once a year. Hence, it had the potential to reduce the level of household food security.

The southern part of the Ciamis District is a rice development area, but swamp agroecosystems dominate the condition of the area. Meanwhile, in the swamp agroecosystem, farmers can only plant rice once a year in the dry season after the water begins to recede because it is constantly flooded in the rainy season. Ciamis is the one swamp area in Java Island used as a swamp agroecosystem. Swamp rice is the specific variety to grow. It is an exciting location to study. In Southern Ciamis District, rice production in 2020 decreased by 15.1 percent (63,445 tons) compared to the previous year succeeded, even though there was crop failure in several areas (Badan Pusat Statistik Jawa Barat, 2021). On the other hand, farmers have incurred significant farming costs to run their farms, although often the results of farming itself were not commensurate with the costs incurred and failed in all seasons. This situation traps the farmers, and the farmer survives the situation (Cafiero, 2019; Forero-cantor et al., 2020).

The position of farmers becomes increasingly difficult when faced with the climate change phenomenon as one of the causes of their primary sources of income decreasingly, so the farmers need to look for other sources of income (Pandey et al., 2007; Skoufias et al., 2011; Vaghefi et al., 2016). Several studies have shown that climate change harms food security in most countries in Asia (Gregory et al., 2000). The study that examined the impact of climate change on rice production in East Asia found that extreme weather would reduce rice production by 50%. by 2100 (Sekhar, 2018). Farmers need climate information that can help them determine more farming options for farming activities (Wilke et al., 2015). Then the farmers can protect their fields from uncertainty and farming risks.

Based on several assumptions above, food security can be designed for vulnerable groups of farmer households (Kuzmin, 2016; Rachman et al., 2002). It is because the need for food is a basic human need that must be met at all times. In addition, this present study aims to analyze the factors affecting small farmers' household food security in swamp agroecosystems in Ciamis District.

Commented [82]: Novelty (kebaruan) penelitian ini dibanding penelitian lainnya/sebelumnya apa. Perlu penjelasan secara eksplisit.

RESEARCH METHODS

This study was conducted using a survey method to provide an overview of farmers' characteristics, income structure, farming risk, and household food security of small farmers in swamp agroecosystems. Lakbok, Ciamis District was determined purposively by the assumption that there has a swamp agroecosystem. However, this region is a rice center in Ciamis. The survey drove through chosen 247 farmers household from 648 swamp rice farmers based on the Slovin formula determined it at an error rate is 5 percent using simple random sampling spreaded over four areas (Table 1).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 1. Proportional allocation of sample size

No	Village	Population	Sample Size
1	Sukanagara	132	50
2	Kapalasawit	286	109
3	Puloerang	124	47
4	Tambakreja	106	40
	Jumlah	648	247

Source: primary data 2022

The data used in this study included primary data and secondary data. Primary data was obtained directly from the samples through structured questionnaires, in-depth interviews with a few selected respondents and key informants, and FGD (Focus Group Discussion). Meanwhile, the secondary data was obtained from the Department of agriculture authority, Government statistic institutions, extension agents, and farmers' associations.

Data processing and analysis were performed using descriptive statistics and inferential statistics with multiple linear regressions to determine the functional relationship between variables. The multiple linear regression equation models in this study are as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

The analysis tool used SEM (Structural Equation Model) with the AMOS program version 18.0. SEM is a multivariate statistical technique combining factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs. The structural equation model would produce indicators that support the proposed model. Hair et al. (2009) write that there are 7 (seven) stages of structural equation model and analysis: (1) theoretical model development; (2) compiling a path diagram; (3) converting the path diagram into a structural equation; (4) selecting an input matrix for data analysis; (5) assess model identification; (6) evaluate the model estimation, and; (7) interpretation of the model as can be seen in Figure 1.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

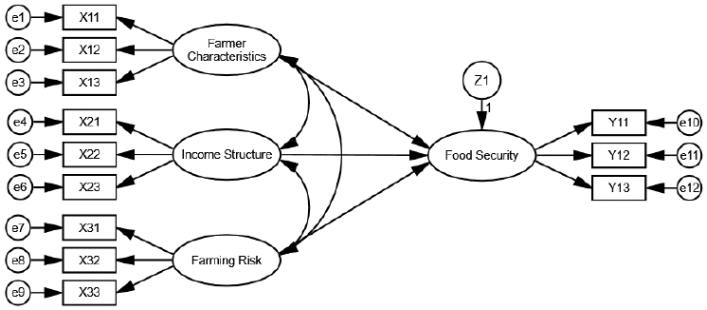

Figure 1. Research method design

Figure 1 showed that food security as an endogenous latent variable as measured by indicators Food subsistence level (Y_{11}), Household affordability (Y_{12}), and Food expenditure shares (Y_{13}). This endogenous latent variable is influenced by exogenous latent variables. The exogenous latent variables included the characteristics of farmers (X1) as measured by indicators age (X_{11}), Education (X_{12}), and Family loads (X_{13}). The exogenous latent variables of income structure (X_2) were measured by the indicators X_{21}, X_{22}, and X_{23}; farming risk (X_3) was measured by the indicators Production Risk (X_{31}), Process Risk (X_{32}), and Income Risk (X_{33}). Both of variable endogenous and exogenous involved in latent variable describing on table 3. All of variables have correlated each other. Therefore, the proper analysis tool is structural equation model (SEM). SEM is a multivariate statistical technique that combines factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs.

This study proposed three hypotheses: 1) Farmer characteristics affect food security; 2) Income structure affects food security; 3) Farming risk affects food security. The test type is two tailed: positive and negative area of hypothesis. In more detail, the latent variables and indicators can be seen in Table 2.

Off-farm income is the income while waiting for farming time; the farmer works in another profession, such as temporary labor. The farmer will return for planting, maintenance, or harvesting when the farming time comes. The main job is farming. Non-farm income is income from work that is not in farming as the primary job.

There is a high risk of farming; small farmers with limited access will look for other sources of income out of the main farm (on-farm) to meet their household needs. For instance: working as farm laborers (on-farm), selling garden products, cultivating livestock, etcetera (off-farm), and even working out of the agricultural sector (non-farm) as construction workers, trade, firm industry etcetera.

Table 2. The latent variables and Indicators in SEM's model

Latent Variable	Indicators	Scale
Farmers' characteristics (X_1)	Age (X_{11})	Interval
	Education (X_{12})	Interval

Commented [83]: Dalam penulisan hipotesis. Ditulisnya H1 apa? H2? Dst… mengikuti kaidah penulisan hipotesis Ho, H1,

Commented [84R3]: Dan dalam penyusunan hipotesis ini hendaknya dijelaskan teori atau penelitian sebelumnya dalam membentuk hipotesis.

Commented [85R3]: Yang menjadi pertanyaan hipotesis karakteristik petani mempengaruhi ketahanan pangan? Membingungkan karakteristik yang mana? Umur, pendidikan, anggota RT? Masing-masing memiliki argumen yang berbeda. Membingungkan jika diinterpretasikan karakteristik petani semakin meningkat maka ketahanan pangan meningkat??
Lebih baik dijabarkan Pengaruh umur, pendidikan, dan RT terhadap ketahanan pangan dalam bentuk manifest variabel

Commented [86R3]: Yang menjadi pertanyaan lagi dalam menyusun hipotesisi income struktur mempengaruhi ketahanan pangan? Income strukture yang sperti apa? income struktur yang meningkat mempengaruhi ketahanan panagn? Income mana yang lebih tinggi?

Commented [87]: Disini dituliskan satuannya apa?

Commented [88]: Lebih detail disini dijelaskan skala intervalnya berapa? Misalnya berapa nilai yang tinggi, rendah, sedang?? Angka berapa yang dimasukkan dalam SEM? Satuannya apa

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Latent Variable	Indicators	Scale
	Family dependents (X_{13})	Interval
Income structure (X_2)	Income on-farm (X_{21})	Interval
	Income off-farm (X_{22})	Interval
	Income non-farm (X_{23})	Interval
Farming risk (X_3)	Production risk (X_{31})	Interval
	Price risk (X_{32})	Interval
	Income risk (X_{33})	Interval
Food security (Y_1)	Food subsistence level (Y_{11})	Interval
	Household affordability (Y_{12})	Interval
	Food expenditure shares (Y_{13})	Interval

Source: Primary data 2022

In agriculture, there is often extreme situation containing risk and uncertainty event. The component that may determine farming risk is the risk of production, price, and income. Production risk in swamp rice farming is higher than in lowland (Sulewski et al., 2014). Agricultural production risk is higher than non-agricultural production risk. Sometimes the harvest is abundant, but the price decrease. This caused an income decrease. The component of farming risk was measured by coefficient variation. Statistically, farming risk consisting of production risk, price risk, and income risk can be calculated using the coefficient of variation by looking at the variability that occurs (Hindarti et al., 2021; Mazwan et al., 2020). Production variance and price variance as a measure of production risk and price risk are based on the experience of farmers doing previous farming activities (Siddik et al., 2015).

RESULT AND DISCUSSION

The research began within the primary field survey of the 247 swamp rice crop farmers to reveal their background and knowledge about their profession. Ciamis has a geographical history of swamp land agroecosystem. In Java Island which swamp agroecosystem is only in Ciamis. This area was severely affected by swamp land condition boundaries. The population in area majority lives under the risk toward poverty line and less rice yield as food intake. This risk would increase the concentration and intensity of flood, which is disturbing rice production, farmer income, and food security.

Farmers' Characteristics

The farmers' characteristics which are the leading research in this present study, have consisted of age, education, experience, and family load:

Table 3. Farmers' characteristics in swamp agroecosystems

	Description	Amount (person)	Percentage (%)
1	Age (year)		
	a. 15 - 64	201	81
	b. ≥ 65	46	19
	Total	247	100

Commented [87]: Disini dituliskan satuannya apa?

Commented [88]: Lebih detail disini dijelaskan skala intervalnya berapa? Misalnya berapa nilai yang tinggi, rendah, sedang?? Angka berapa yang dimasukkan dalam SEM? Satuannya apa

Commented [89]: Disini belum ada penjelasan bagaimana mengukur food security? Skala interval yang seperti apa digunakan disini? Tinggi rendah sedang?

Commented [810]: Bagaimana mengukur 'coefficient of variation'? Di dapatkan dari mana data ini? Data sekunder atau primer? Bagaimana mengukurnya resiko produksi/harga/income tinggi, sedang, rendah? Berapa skala tinggi rendah sedang?

Commented [811]: Disini belum ada hasil karakteristik dari risk farming dan food security.

Commented [812R11]: Ditampilkan juga pendapatan

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

	Description	Amount (person)	Percentage (%)
2	Education level		
	a. Elementary	236	96
	b. Junior	7	3
	c. Senior	4	1
	Total	247	100
3	Experience (year)		
	a. 5 - 20	70	28
	b. 21 - 35	129	52
	c. 36 - 50	48	20
		247	100
4	Family load (person)		
	a. 1 - 3	125	51
	b. 4 - 6	122	49
	Total	247	100

Source: Primary data 2022

Table 3 shows that farmers' ages range, from 32 to 71 years old, with an average age of 54 years old, so they are in the span of a productive period. Age is one of the factors related to work ability in carrying out farming activities (Yunita et al., 2011). The number of samples dominated farmers with low formal education. This problem caused the ability to manage lowland rice farming to be optimal productivity. Education is related to their access to food because with higher education, the opportunities to get better jobs are getting bigger to generate more significant income (Nwokolo, 2015). The land area of farmers ranges from 0.04-0.84 hectares with an average of 0.29 hectares which is in the narrow category with the most dominating amount, whereas Omotesho et al. (2010) stated that the land is an asset for farmers in running their or her business which will determine the level of income, the standard of living and welfare.

The experience of farmers in rice farming also varies. Range from 5-50 years with an average of 27 years. Experience is the knowledge that humans collect through their minds and then arrange into a patterned form. A person's experience in farming affected the response to accepting new technologies and innovations (Ntshangase et al., 2018).

This condition shows that the structural weakness of small farmers in rural areas, namely narrow land tenure is still very inherent and causes unequal distribution of income and production. According to Firdaus et al. (2020); Kuok Ho Daniel Tang (2019); Vaghefi et al. (2016), the narrow tenure of land owned can result in farmers being trapped in bare for survival.

The family-loads ranged from one to six people a family with an average of four dependents in a family. The small number of dependents of farming families illustrated those small families in rural areas as the main view of farmers' family members. Thus, it is also related to the proverb of the agrarian society's Javanese culture, assuming that "many children, many fortunes" is still believed. Even in fact, the more the number of family members, the greater the burden of living that must be borne by farmers. Davis et al. (2017); Ndhleve et al. (2021); Nwokolo (2015); Ruhyana et al. (2020) family size will affect the income per capita and household food consumption expenditure.

Formulation Model

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The results of SEM assumptions and data processing to test the hypothesis consisting of a multivariate outlier test, multivariate normality test, and multicollinearity test all meet the required assumptions.

Commented [813]: Sebelum kesini harusnya ditampilkan uji validitas dan realibilitasnya lebih dahulu.

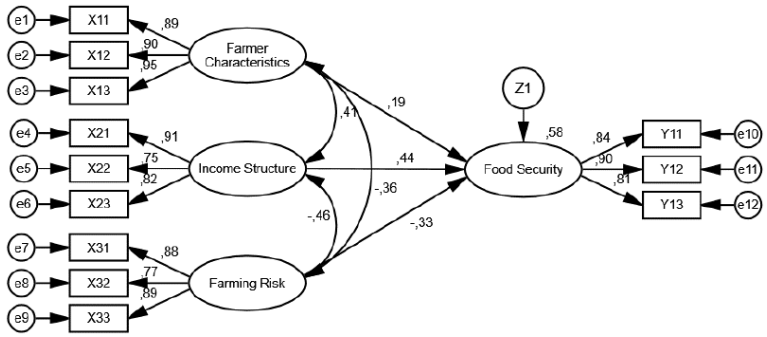

Figure 2. Results of SEM model analysis of farmer household food security in swamp agroecosystems in Ciamis, Indonesia.

This condition was reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

After it fulfilled all the testing assumptions, it could be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis Regency is obtained, as seen in Figure 2.

Table 4. Test results on the feasibility of the full SEM model

The goodness of Fit Indeks	Cut-off Value	Result	Conclusion
Chi-Square	Expected small	81.735	Fit
Significance Probability	≥ 0.05	0.068	Fit
RMSEA	≤ 0.08	0.053	Fit
GFI	≥ 0.90	0.947	Fit
AGFI	≥ 0.90	0.914	Fit
CMIN/DF	≤ 2.00	1.703	Fit
TLI	≥ 0.90	0.978	Fit
CFI	≥ 0.95	0.984	Fit
NFI	≥ 0.90	0.962	Fit

Source: Authors computation (2022), n = 247

Table 4 showed a good model fit index, meaning that the model fits the data. Regression estimation for SEM shows that all variables are significant (Table 5), so all hypotheses are accepted.

Commented [814]: Penjelasan skor yang mana dari tabel 4. Penjelasan singkat

Table 5. Regression estimate

Variables	b	SE	CR	P	Note

Commented [815]: Sebelum kesini ditampilkan hasil pengaruh semua indikator dalam mempengaruhi variabel latent?

Commented [816]: Dirapikan; ditulis H1, h2, h3, sesuai hipotesisnya

Commented [817]: Diberikan keterangan signifikannya di taraf kepercayaan berapa persen??

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Food security<---	Farmers' characteristics	0.191	0.059	3.323	***	Significant
Food security<---	Income structure	0.439	0.071	6.507	***	Significant
Food security<---	Farming risk	-0.327	0.072	-5.193	***	Significant

Source: Authors computation (2022), n = 247

Therefore, based on table 5 could be formed the structural equation of the exogenous latent variable to the endogenous latent variable is as follows:

$$Y = 0.191\ X_1 + 0.439\ X_2 - 0.327\ X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

Table 6. Square multiple correlation

	Estimate
Food Security	0.583

Source: Authors computation (2022)

Table 6 showed that food security was explained by farmer characteristics, income structure, and farming risk of 58.3%. The remaining 41.7% is explained by other factors not included in the structural equation model.

Table 7 displayed good reliability and validity construct for the measurement model of the sample. The value of the reliability construct ranged from 0.7248 to 0.8433, while the value of the validity extracted was more significant than 0.5. The results proved the convergent validity by examining the significance of the loadings factor and the shared variance. The variance captured by the construct should be greater than the measurement error (0.5). The structural equation that was formed explained the causal relationship between changes in food security there was a change in farmer characteristics, income structure, and farming risk.

Table 7. Validity and reliability construct

Variables.	Reliability Construct	Variance Extracted
	CR > 70%	AVE > 50%
Farmers' characteristics	84.33%	83.07%
Income structure	72.48%	68.65%
Farming risk	75.17%	75.02%
Food security	75.12%	71.94%

Source: Authors computation (2022)

Discussion

Commented [818]: Lebih baik dalam pembahasannya setiap variabelnya dipisahkan dan diberi judul sendiri sesuai urutuan; Farmer characteristics, dst..

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Simultaneously, the three variables' effect on farmer households' food security was 58 percent. The remaining 42 percent is explained by other factors not included in the model. The factor influencing most farmers' food security households is the level of food subsistence (λ = 0.84). The affordability of farmer households (λ = 0.90); and 3) the share of food expenditure (λ = 0.81) is the income structure reflected by on-farm, off-farm, and non-farm income.

Farming income (λ = 0.91), non-farming income (λ = 0.75), and non-agricultural income (λ = 0.82) were strong determinants of the latent variable of income structure. Thus, farm, non-farm, and non-agricultural income have the greatest potential contribution to household income.

Commented [819]: Ketika menjelaskan CFA tidak hanya variabel latent food security dan income, tapi variabel latent lainnya bagaimana?

The results of the SEM analysis showed that the coefficient of the income structure influence was positive. On the other hand, the higher income structure reflected by, the higher income from farming, outside farming, and outside the agricultural sector, the better the food security of farmers' households. This condition is suitable because, with high incomes, farmers' access to food becomes more rational. Ndhleve et al. (2021) household income is an essential determinant of household food insecurity because access to food at the household level is determined by household income (Mutea et al., 2019; Silvestri et al., 2015; Tefera et al., 2014) household income is an estimator of household affordability.

On-farm income is one indicator that most strongly reflects the structure of household income (λ = 0.91). On-farm was natural, considering that most farmer households rely on rice farming as farmers' main activity. The analysis showed that the average farmer's income from lowland rice farming was 8,993,229 IDR per hectare per year, with an average contribution of 14 percent to the total household income.

This study's findings align with Abu & Soom (2016); Mutea et al. (2019). In subsistence-to-farmer households, food availability is more determined by food production itself. The findings also indicated that more efforts are needed to increase the farmers' knowledge and skills in utilizing the potential and economic resources of farmer households considering that the source of farmers' income does not only come from rice farming but also from outside the farm, the agricultural sector.

Income structure indicators are income outside the agricultural sector (λ = 0.75) and income outside farming (λ = 0.82). The analysis results show that the average income of farmers outside the agricultural sector was 9,372,206 IDR per year, with an average contribution of 60 percent to the total household income. Meanwhile, the average income of farmers from outside rice farming but still in the agricultural sector was 4,159,753 IDR per year, with an average contribution of 26 percent to total household income.

Non-agricultural activities carried out by low-income farmer households due to narrow land ownership and low production are one of the efforts to obtain additional income to meet household needs. Owusu et al. (2011) found that the influence of income outside the agricultural sector on household food security in Northern Ghana. The research results of Musumba et al. (2022) showed that farming households in rural Sub-Saharan African countries carry out more than one type of work to increase income. The research findings Haggblade et al. (2010) in rural Sub-Saharan Africa concluded that 50 percent in Asia and Latin America, farmers' income from outside the agricultural sector contributes about 35 percent to total household income. According to Alobo Loison (2015); Mutea et al. (2019); Yusuf et al. (2018), work in the agricultural and non-agricultural sectors is an effort for farmers to earn income because income diversification is closely related to efforts to maintain survival in unfavorable conditions. Alobo Loison (2015); Mutea et al. (2019); Niehof

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(2004); Yaro (2006), It aimed to secure a better standard of living by reducing risk, vulnerability, and poverty and increasing income, security, and wealth.

Farming risk is the second variable that affects the food security of rice farmers' households in the swamp agroecosystem, which is reflected by indicators of production risk, price risk, and income risk. Production risk is the indicator that most strongly reflects farming risk ($\lambda = 0.88$), price risk ($\lambda = 0.77$), and income risk ($\lambda = 0.89$). The influence of production, income, and price risk has the most potential to increase rice farming risk in swamp agroecosystems.

When it looks from the coefficient, which shows a negative sign, this means that the greater risk of farming faced by farmers, the lower household food security. This condition is reasonable considering the facts on the ground show that, on average, farmers face a high risk of farming due to frequent flooding of their fields. Production risks faced by farmers are generally in the form of reduced grain produced due to unpredictable floods. The findings of this study were in line with the research results of Nephawe et al. (2021) insufficient rainfall, pest and disease attacks, and excess rainfall can reduce farm production. The research results of Mutea et al. (2019) also showed that lost yields from production activities are caused by climatic conditions and pests/diseases that attack plants or can lead to low productivity resulting in reduced irrigation water and production inputs. In comparison, the low number of inputs, such as fertilizers, can cause a decrease in rice yields.

Income risk can be assumed as the variable that most strongly reflects farming risk ($\lambda = 0.89$). It can be assumed that the higher the income risk faced by farmers, the lower household food security, considering that farmers have to pay to run their businesses. However, the imbalance between the income earned and the costs incurred causes an income risk. This income risk causes the affordability of farmers to be low, even though, according to Mutea et al. (2019), the income structure owned by farmers will affect their behavior in facing risks to anticipate crop failures. This condition is reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

The countermeasures made by farmers before running rice farming are by preparing large quantities of seeds as reserves because farmers usually do embroidery repeatedly. Facts in the field showed that the use of these seeds reaches 2-3 times the recommended amount. The Lebak swamp has distinctive characteristics, so rice farmers in this agroecosystem are different from farmers working on it Yunita, et al. (2011); Yusuf (2018). Nmadu et al. (2012) stated that to minimize the risk of production due to natural disasters, pests and plant diseases, fires, and other factors whose consequences can be physically calculated and can be overcome by purchasing an agricultural insurance policy. Meanwhile, the risk of a possible decline in production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be anticipated in several ways, including diversification, vertical integration, forward contracting, future markets, hedging, and agricultural options.

Although some of these strategies have been implemented by some farmers, they still have difficulty overcoming the risks of farming. Therefore, another systematic strategy is needed, for example, through agricultural insurance, an economic institution that functions to manage the risks faced by farmers whose objectives are: 1) stabilizing farmers' incomes by reducing losses due to lost yields; 2) stimulating farmers to adopt technology that can increase production and efficient use of resources, and 3) reduce the risks faced by agricultural credit institutions and increase farmers' access

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

to these institutions. Suryanto et al. (2020); Yulia et al. (2023), agricultural insurance is one of the strategies to adapt to climate change, even in developed countries, including several countries in Asia, developing rapidly and effectively protecting farmers.

Farmer characteristics are the third factor that influences the food security of rice farmers' households in the swamp agroecosystem, which is reflected by age ($\lambda = 0.89$); 2) education ($\lambda = 0.90$), and 3) family dependents ($\lambda = 0.95$). The farmer characteristics meant that age, formal education, and family dependents of farmers could increase household food security. It meant that if farmers' capacity increases, farmers' ability to create household food security will be better.

The strongest indicator that reflects the characteristics of farmers is family dependents ($\lambda = 0.95$). Fewer family responsibilities caused household food security to be high. This characteristic was certainly rational considering that farmers with larger family sizes tend to need more food than farmers with fewer family members. The more members of the household, the greater the burden on farmers, which causes household food expenditure to be more significant so that, in the end, household food security is lower. However, family dependents are also positively related to household income, which means that more and more family members lead to greater and more diverse sources of income that households can access.

The results of the study of Ndhleve et al. (2021) in Botswana and South Africa showed a strong influence of family dependents on household food security. Households with many dependents were more food insecure than households with few family dependents. Households with more family dependents mean more people have to be fed, so they need more food. This characteristic was in line with the findings of (Cafiero, 2019; Silvestri et al., 2015). Musumba et al. (2022) that the food available for one family may not be sufficient to meet the needs of all family members but only sufficient for some of the family members.

This study showed that the average size of the farming family in the study area belongs to a small family where most of the family members also work to earn income to ease the burden on the family. In addition, other family members (children) who work outside the city and have an established economy usually send money routinely as a form of responsibility and dedication to their parents.

Farmers who are highly educated, and older in the sense of being more productive and having a small family size, will also have a higher level of household food security. Income is very important for households to provide food through purchases (Corral et al., 2017; Silvestri et al., 2015; Tefera et al., 2014) that income is very important for households to provide food through purchases.

The higher education farmers have taken causes household food security to be higher which is reflected by the higher affordability and the better quality of food consumed by farmer households. The level of education indicates that a person's knowledge level is broader because of education. Generally, the level of education is positively related to the level of income. It meant that the higher the education completed by farmers, the higher the income earned. Farmers with higher education tend to gain more insight and information related to other sources of income.

In contrast to the research findings of, household food security in Botswana and South Africa is not significantly affected by education level. According to him, education is usually related to the level of income because households with a high level of education usually have more money that can be used to purchase food. Thus the higher the level of education of farmers, the income will also be higher the affordability of households will also be higher. In the end, farmers could improve the

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

quality of the food they eat and tend to choose healthier foods. The findings of this study are in line with Nwokolo (2015); Ruhyana et al. (2020) that higher levels of education are associated with increased household income, livelihood opportunities, and food security.

Although the average level of formal education that farmers did is low, on average farmers, they only need to complete primary education. In general, farmers have other sources of income outside of the rice farming they run, namely from outside the farm, which includes farm laborers, selling garden products, livestock products, and operating agroindustry (sales of bananas and coconut sugar). Meanwhile, sources of income from outside the agricultural sector include construction workers and opening small stalls. The source of income is in line with the research findings of Mutea et al. (2019) that to increase income, farmer households in the mountainous region of Kenya usually sell crops, timber, and livestock, while off-farm income comes from trade and business, remittances, house rent, employment. Legal, transportation services, and other informal jobs.

The little indicator that reflect household food security is age ($\lambda = 0.89$). The more productive a person's age allows them to work more productively. With their physical strength, they will be more productive to work outside their farms and seeking additional income outside the agricultural sector. Farmers of productive age were generally more rational in running their businesses. Thus, the income obtained from farming can be more optimal with the minimum use of labor outside the family, which must be paid directly. Productive age implies that farmers do not only rely on their income from one source of income but also from other sources. Facts on the ground show that apart from working in the agricultural sector, they also work outside it. The results of the research by (Frelat et al., 2016) show that to create household food security, farmers in sub-Saharan Africa, in addition to seeking employment opportunities in the agricultural sector, also work outside the agricultural sector.

CONCLUSION AND SUGGESTION

The food security of smallholder households in swamp agroecosystems in the Ciamis District is significantly influenced by farmer characteristics, income structure, and farming risk. The income structure reflected by on-farm, off-farm, and non-farm income is the variable that has the most substantial influence on food security, followed by farm risk, which is reflected by production risk, price risk, and income risk. Meanwhile, the characteristics of farmers as reflected by age, education, and family responsibilities, although they have a significant effect on food security, have the most negligible effect compared to other variables. According to the result of this study, the development of small agroindustry in rural areas must be carried out to create household food security.

Commented [820]: Disini belum ada saran praktis bagaimana meningkatkan ketahanan pangan di Swamp Agroecosystem

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 1–34. doi: 10.1016/j.jssas.2017.05.003

Abu, G. A., & Soom, A. (2016). Analysis of factor affecting food security in rural and urban farming household of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*, *51*(9), 1125–1138. doi: 10.1080/00220388.2015.1046445

Badan Pusat Statistik Jawa Barat. (2021). Produksi Tanaman Padi. In Produksi Tanaman Padi.

Bahta, S., Wanyoike, F., Katjiuongua, H., & Marumo, D. (2017). Characterisation of food security and consumption patterns among smallholder livestock farmers in Botswana. *Agriculture and Food Security*, *6*(1), 1–11. doi: 10.1186/s40066-017-0145-1

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. doi: 10.1007/s12571-012-0208-x

Cafiero, C. (2019). Measuring food insecurity. *Food Security Policy, Evaluation and Impact Assessment*, *February 2010*, 169–205. doi: 10.4324/9781351019828-17

Candel, J. J. L. (2014). Food security governance: A systematic literature review. *Food Security*, *6*(4), 585–601. doi: 10.1007/s12571-014-0364-2

Che Omar, S., Shaharudin, A., Tumin, S. A., & The. (2019). The Status of the Paddy and Rice Industry in Malaysia Key Findings of the Report. In Khazanah Research Institute (Issue April).

Corral, P., & Radchenko, N. (2017). What's so spatial about diversification in Nigeria? *World Development*, *95*, 231–253. doi: 10.1016/j.worlddev.2017.02.028

Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, *67*, 153–174. doi: 10.1016/j.foodpol.2016.09.018

Fahad, S., Rehman, A., Shahzad, B., Tanveer, M., Saud, S., Kamran, M., Ihtisham, M., Khan, S. U., Turan, V., & ur Rahman, M. H. (2018). Rice responses and tolerance to metal/metalloid toxicity. In Advances in Rice Research for Abiotic Stress Tolerance (Issue December). doi: 10.1016/B978-0-12-814332-2.00014-9

Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. In Cogent Social Sciences (Vol. 6, Issue 1). doi: 10.1080/23311886.2020.1818373

Forero-cantor, G., Ribal, J., & Sanjuán, N. (2020). Measuring regional differences in food security from access and stability dimensions : A methodological proposal based on elasticities. *Agricultural Economics – Czech*, *66*(3), 112–119. doi: https://doi.org/10.17221/97/2019-AGRICECON

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., Van Asten, P. J. A., & Van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 458–463. doi: 10.1073/pnas.1518384112

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Gregory, P. J., & Ingram, J. S. I. (2000). Global change and food and forest production: Future scientific challenges. *Agriculture, Ecosystems and Environment*, *82*(1–3), 3–14. doi: 10.1016/S0167-8809(00)00212-7

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, *38*(10), 1429–1441. doi: 10.1016/j.worlddev.2009.06.008

Hindarti, S., Rohmatul Maula, L., & Khoiriyah, N. (2021). Income risk and the decision on onion farming. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(1), 202–209. doi: 10.24843/soca.2021.v15.i01.p18

Kassy, W. C., Ndu, A. C., Okeke, C. C., & Aniwada, E. C. (2021). Food security status and factors affecting household food security in Enugu state, Nigeria. *Journal of Health Care for the Poor and Underserved*, *32*(1), 564–581. doi: 10.1353/hpu.2021.0041

Kuok Ho Daniel Tang. (2019). Climate change and Paddy Yield in Malaysia: A short communication. *Global Journal of Civil and Environmental Engineering*, *July*, 14–19. doi: 10.36811/gjcee.2019.110003

Kuzmin, E. A. (2016). Sustainable food security: Floating balance of markets. *International Journal of Economics and Financial Issues*, *6*(1), 37–44.

Laborde, D., Majeed, F., Tokgoz, S., & Torero, M. (2016). Long-Term Drivers of Food and Nutrition Security. *IFPRI Discussion Paper Series*, *May*.

Maetz, M. (2013). Food Security - definitions and drivers. *Hunger Explained* , *31*(November 1996), 1–25.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare ? Empirical evidence from Tigray. *Feinstein International Center*, *August*, 1–19.

Maxwell, D. G., & Foundation, M. G. (2017). *The Coping Strategies Index A tool for rapid emergencies Second Edition*. *January 2008*.

Mazwan, M. Z., Ibrahim, J. T., & M Fadlan, W. A. (2020). Risk analysis of shallot farming in Malang Regency, Indonesia. *Agricultural Social Economic Journal*, *XX*(3), 201–206. doi: 10.21776/ub.agrise.2020.020.3.3

Musumba, M., Palm, C. A., Komarek, A. M., Mutuo, P. K., & Kaya, B. (2022). Household livelihood diversification in rural Africa. *Agricultural Economics (United Kingdom)*, *53*(2), 246–256. doi: 10.1111/agec.12694

Mutea, E., Bottazzi, P., Jacobi, J., Kiteme, B., Speranza, C. I., & Rist, S. (2019). Livelihoods and food security among rural households in the North-Western Mount Kenya Region. *Frontiers in Sustainable Food Systems*, *3*, 1–12. doi: 10.3389/fsufs.2019.00098

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Dominic, M., Nakin, V., Shisanya, S., & Walker, K. P. (2021). Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(2), 207–224.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Nakin, M. D. V., Shisanya, S., & Walker, K. P. (2021). Household food insecurity status and determinants: The case of Botswana and South Africa. *Agraris*, *7*(2), 207–224. doi: 10.18196/agraris.v7i2.11451

Nephawe, N., Mwale, M., Zuwarimwe, J., & Tjale, M. M. (2021). The impact of water-related challenges on rural communities food security initiatives. *Agraris*, *7*(1), 11–23. doi: 10.18196/agraris.v7i1.9935

Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, *29*(4 SPEC.ISS.), 321–338. doi: 10.1016/j.foodpol.2004.07.009

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade*, *2*(2), 98–108. doi: https://doi.org/10.9734/bjemt/2012/1284

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal province. *Sustainability (Switzerland)*, *10*(2). doi: 10.3390/su10020555

Nwokolo, E. E. (2015). The influence of educational level on sources of income and household food security in alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *52*(3), 208–217. doi: 10.1080/09709274.2015.11906944

Omotesho, O. A., Adewumi, ; M O, Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of food security among the rural farming households in Kwara State, Nigeria. *African Journal of General Agriculture ©*, *2*(1), 7–15. Retrieved from http://www.asopah.org

Omotesho, O. A., Adewumi, M. O., Adewumi, M. O., & Fadimula, K. S. (2010). Food security and poverty of the rural households in Kwara State, Nigeria. *Libyan Agriculture Research Center Journal International*, *1*(1), 56–59. Retrieved from https://www.researchgate.net/publication/46473090

Opaluwa, H. I., Oyibo, F. O., & Jimoh, F. A. (2018). Determinants of Food Security among Farming Households in Akure North Local Government Area of Ondo State, Nigeria. *Journal of Asian Rural Studies*, *2*(2), 164–172. doi: 10.20956/jars.v2i2.1479

Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. doi: 10.1016/j.foodpol.2010.09.002

Pandey, S., Bhandari, H., & Hardy, B. (2007). Economic costs of drought and rice farmers' coping mechanisms: a cross-country comparative analysis. In Journal of Chemical Information and Modeling (Vol. 53).

Rachman, H. P., & Ariani, M. (2002). Ketahanan pangan: Konsep, pengukuran, dan strategi. *Forum Penelitian Agroekonomi*, *20*(1), 12–24. Retrieved from https://ejurnal.litbang.pertanian.go.id

Ruhyana, N. F., Essa, W. Y., & Mardianis. (2020). Sociodemographic factors affecting household food security in Sumedang regency West Java province. *Agraris: Journal of Agribusiness and Rural Development Research*, *6*(1), 38–51. doi: 10.18196/agr.6189

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Rusliyadi, M. (2023). Food security police analysis perspective on food self-sufficiency village programme case in Central Java Indonesia. *Agrisocionomics*, *7*(1), 95–113. Retrieved from http://ejournal2.undip.ac.id/index.php/

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*(12), 1–13. doi: 10.1088/1748-9326/11/12/124010

Sekhar, C. S. C. (2018). Climate change and rice economy in Asia: Implications for trade policy Background paper for The State of Agricultural Commodity Markets (SOCO) 2018. In Fao.

Siddik, M., Mustadjab, M. M., & Hanani, N. (2015). *Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island , Indonesia*. *5*(5), 180–189. doi: 10.5923/j.ijas.20150505.02

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1). doi: 10.1186/s40066-015-0042-4

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). *The poverty impacts of climate change*. *51*(June 2014), 1–5.

Sulewski, P., & Kloczko-Gajewska, A. (2014). Farmers' risk perception, risk aversion and strategies to cope with production risk: An empirical study from Poland. *Studies in Agricultural Economics*, *116*(3), 140–147. doi: 10.7896/j.1414

Suparwoto, S. (2019). Produksi dan pendapatan usahatani padi di lahan rawa lebak Kabupaten Ogan Komering Ilir Sumatera Selatan. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 51. doi: 10.24843/soca.2019.v13.i01.p05

Suryanto, Gravitiani, E., Daerobi, A., & Susilowati, F. (2020). Crop insurance as farmers adaptation for climate change risk on agriculture in Surakarta residency-Indonesia. *International Journal of Trade and Global Markets*, *13*(2), 251–266. doi: 10.1504/IJTGM.2020.106771

Suwarto, Susanto, U., & Nurchasanah, S. (2015). *Perakitan genotipe Padi Tipe Baru untuk mendukung kemandirian pangan*. *c*, 133–139.

Swindale, A., & Bilinsky, P. (2010). Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guide VERSION 4 Paula Bilinsky Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guid. *Fhi 360*.

Tefera, T., & Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. *Journal of Food Security*, *2*(3), 92–99. doi: 10.12691/jfs-2-3-4

Ulrich, A., Ifejika Speranza, C., Roden, P., Kiteme, B., Wiesmann, U., & Nüsser, M. (2012). Small-scale farming in semi-arid areas: Livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. *Journal of Rural Studies*, *28*(3), 241–251. doi: 10.1016/j.jrurstud.2012.02.003

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Vaghefi, N., Shamsudin, M. N., Radam, A., & Rahim, K. A. (2016). Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry. *Journal of Integrative Environmental Sciences*, *13*(1), 19–35. doi: 10.1080/1943815X.2015.1112292

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. doi: 10.1111/gcb.14158

Wilke, A. K., & Morton, L. W. (2015). Climatologists' patterns of conveying climate science to the agricultural community. *Agriculture and Human Values*, *32*(1), 99–110. doi: 10.1007/s10460-014-9531-5

Yaro, J. A. (2006). Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *Journal of Modern African Studies*, *44*(1), 125–156. doi: 10.1017/S0022278X05001448

Yulia, D. M., Rachmina, D., & Feryanto. (2023). Farmer's decision to take credit in Indonesia. *Agrisocionomics*, *7*(1), 126–143. Retrieved from http://ejournal2.undip.ac.id/index.php/

Yunita, Ginting B, Asngari Pang S, Susanto Joko, & Amanah Siti. (2011). Ketahanan pangan dan mekanisme koping rumah tangga petani padi sawah lebak berdasarkan status kepemilikan lahan. *Jurnal Ilmu Keluarga & Konseling*, *4*(1), 21–29. doi: https://doi.org/10.24156/jikk.2011.4.1.21

Yusuf, M. N. (2018). *Strategi ketahanan pangan rumah tangga petani dalam menghadapi risiko: Suatu kasus pada petani padi di daerah rawan banjir Kabupaten Pangandaran Propinsi Jawa Barat* [Disertasi]. Universitas Padjadjaran.

Yusuf, M. N., Sulistyowaty, L., Sendjaja, T. P., & Carsono, N. (2018). Food security analysis of household paddy farmer in flooding area. *Journal of Economics and Sustainable Development*, *9*(8), 88–90. doi: 10.7176/JESD

4. Bukti Konfirmasi Submit Revisi Pertama, Respon Kepada Reviewer Pertama, dan Artikel yang Diresubmit (12 Mei 2023)

#17988 Review

Summary | Review | Editing

Submission

Authors	Muhamad Nurdin Yusuf
Title	DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA
Section	Articles
Editor	Tutik Dalmiyatun

Peer Review

Round 1

Review Version	17988-62338-2-RV.docx 17-04-2023
Initiated	17-04-2023
Last modified	03-05-2023
Uploaded file	Reviewer A 17988-62485-1-RV.docx 20-04-2023 Reviewer B 17988-62714-1-RV.docx 01-05-2023

Editor Decision

Decision	Accept Submission 06-06-2023
Notify Editor	Editor/Author Email Record 26-05-2023
Editor Version	17988-62411-1-ED.docx 17-04-2023
Author Version	17988-63099-1-ED.docx 12-05-2023 17988-63099-2-ED.docx 15-05-2023
Upload Author Version	Choose File No file chosen Upload

[Agrisocionomics] [ID-17988] Revised Version Acknowledgement

1 message

Wiludjeng Roessali <agrisocionomics@gmail.com> 12 May 2023 at 15:19
Reply-To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>
To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>

Dr. Muhamad Nurdin Yusuf:

Thank you for submitting the revision of manuscript, "DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA" to Agrisocionomics: Jurnal Sosial Ekonomi Pertanian. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL: https://ejournal2.undip.ac.id/index.php/agrisocionomics/author/submission/17988
Username: mnurdin
Editor: Tutik Dalmiyatun

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Wiludjeng Roessali
Agrisocionomics: Jurnal Sosial Ekonomi Pertanian

---

agrisocionomics@gmail.com

AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA

ABSTRACT

Swamp agroecosystems are sub-optimal lands with distinctive characteristics, namely low fertility, and can only be planted once a year during the dry season. Small farmers whose primary income comes from the agricultural sector are becoming increasingly difficult due to climate-changing changes that can intimidate their household food security. This research aimed to analyze the factors that affect the food security of small farmer households in the swamp agroecosystem. The method used a survey of 247 farmers who run rice farming in swamp agroecosystems in the Ciamis Indonesia, which were determined randomly from a population of 648 farmers using the Slovin formula at an error rate of 5 percent. The research was analyzed by SEM (Structural Equation Models). The result showed that the factors impacting the food security of small farmer households in swamp agroecosystems came from farmer characteristics, income structure, and farm risk. Based on this, the development of small agro-industry in rural areas must be carried out to create household food security.

Keywords*: Farmer Household, Food Security, Small Farmer, Swamp Agroecosystems*

BACKGROUND

The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern (Candel, 2014; Forero-cantor et al., 2020) due to the increasing population, rising food prices, conversing of agricultural land, and declining production due to global climate change (Forero-cantor et al., 2020; Waha et al., 2018). The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern. However, decreasing the level of community welfare, especially in developing countries (Opaluwa et al., 2018), in the context of food security, availability is an important aspect that must be met (Abdullah et al., 2019; Cafiero, 2019). Food availability depends on the land area, the population as a provider of labor capital, and experts to raise production and equitable distribution (Laborde et al., 2016; Maetz, 2013).

As the staple food for half the world's population, including Indonesia, rice is a strategic commodity that plays an essential role in food security (Che Omar et al., 2019; Fahad et al., 2018; Suwarto et al., 2015). Therefore, the efforts to increase rice production sustainably is a necessity

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(Rusliyadi, 2023; Suparwoto, 2019). The expansion of rice fields on the north coast of Java and other square cities is prolonged. Furthermore, even tends to shrink as a result of land conversion, which is difficult to avoid Abdullah et al. (2019); Abu & Soom (2016); Kassy et al. (2021); Laborde et al. (2016); Ruhyana et al. (2020) therefore, that it has an impact on decreasing rice production.

Generally, thirteen strategic food commodities focus on food self-sufficiency and security: rice, corn, soybeans, shallots, garlic, red chilies, cayenne pepper, chicken meat, chicken eggs, beef/buffalo, sugar cane/sugar, and cooking oil. However, in recent years the Government has focused on increasing production in Indonesia's three commodities with the highest consumption levels, namely rice/rice, corn, and soybeans. Rice is one of the strategic commodities in Indonesia because of its much-needed role in meeting the population's food needs and inflation. There are several indicators used to measure food security (Cafiero, 2019; Candel, 2014; D. Maxwell et al., 2013; Ntshangase et al., 2018) those are: food consumption score (Bahta et al., 2017) and household food diversity score (Swindale et al., 2010). Furthermore, shares of food expenditure (Yusuf et al., 2018) can capture the utilization dimension. Coping strategy index (D. Maxwell et al., 2013; D. G. Maxwell et al., 2017) and household food insecurity access scale (D. Maxwell et al., 2013), farmer household affordability (Yusuf et al., 2018) can capture the dimensions of accessibility and stability. Measuring adequate household food supply per month (Swindale et al., 2010) and the food subsistence level (Rachman et al., 2002) captures food availability and stability.

Commented [81]: Banyak singkatan disini yang tidak memiliki arti padahal sudah dijelaskan dalam bahasa inggris. Lebih baik dihilangkan

Commented [DF2R1]: Sudah diperbaiki

Most farmers in Asia make rice farming their main livelihood, but it is cultivated on a small scale. This phenomenon contrasts with Australia and the United States, including Latin America, where rice farming has become the main livelihood for their farmers (Firdaus et al., 2020). This phenomenon was also becoming a prominent issue in Indonesia, where structural weaknesses are still inherent in Indonesian farmers, namely narrow land tenure, low education level, family dependents, limited capital, and lack of mastery of technology. This condition causes low production and limited physical and economic access (Firdaus et al., 2020; Samberg et al., 2016; Vaghefi et al., 2016). Nevertheless, farming activities were only carried out to maintain food availability for their families rather than profit-oriented (Abu et al., 2016; Mutea et al., 2019).

There are many efforts to meet the needs of food, which cannot be separated from the characteristics of farmers' households (Yusuf et al., 2018) because it describes the capacity of farmers to meet the needs of food (Ndhleve, et al., 2021). Although the socioeconomic characteristics of farmers are relatively much and varied, the main ones are the farmer's age, education level, principal occupation, and the number of members of the farmer's family. Meanwhile, economic characteristics, including the area of farming land, livestock ownership, and savings ownership, became critical in creating farmers' profit orientation.

Many factors affect household food security, including age, gender, education, remittances, unemployment, inflation, and assets (Ndhleve et al., 2021); farmer capacity (Yunita et al., 2011). Climate change, extension services, increased cost of production facilities, food price instability, income outside the agricultural sector (Ulrich et al., 2012), land area, income structure, and the number of household members (Bogale, 2012; Ndhleve et al., 2021; Omotesho et al., 2006), agroecosystem characteristics, access to irrigation, and soil fertility (Ulrich et al., 2012). However, the determinants of household food security differ due to agroecosystem differences and their needs (Cafiero, 2019).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The southern part of the Ciamis District is a rice development area, but swamp agroecosystems dominate the condition of the area. Meanwhile, in the swamp agroecosystem, farmers can only plant rice once a year in the dry season after the water begins to recede because it is constantly flooded in the rainy season. Ciamis is the one swamp area in Java Island used as a swamp agroecosystem. Swamp rice is the specific variety to grow. It is an exciting location to study. In Southern Ciamis District, rice production in 2020 decreased by 15.1 percent (63,445 tons) compared to the previous year succeeded, even though there was crop failure in several areas (Badan Pusat Statistik Jawa Barat, 2021). On the other hand, farmers have incurred significant farming costs to run their farms, although often the results of farming itself were not commensurate with the costs incurred and failed in all seasons. This situation traps the farmers, and the farmer survives the situation (Cafiero, 2019; Forero-cantor et al., 2020).

The position of farmers becomes increasingly difficult when faced with the climate change phenomenon as one of the causes of their primary sources of income decreasingly, so the farmers need to look for other sources of income (Pandey et al., 2007; Skoufias et al., 2011; Vaghefi et al., 2016). Several studies have shown that climate change harms food security in most countries in Asia (Gregory et al., 2000). The study that examined the impact of climate change on rice production in East Asia found that extreme weather would reduce rice production by 50%. by 2100 (Sekhar, 2018). Farmers need climate information that can help them determine more farming options for farming activities (Wilke et al., 2015). Then the farmers can protect their fields from uncertainty and farming risks. Smallholder farmers' access to food is very limited (Thapa et al., 2011), on average their food needs are met from insufficient self-production until the next harvest period coupled with low productivity causing them to be trapped into food vulnerability (Wildayana et al., 2018; Yusuf et al., 2018). Syuhada et al., (2020) unfavorable swamp agroecosystem conditions cause production instability which in the long run causes low household food security. This research added that the risk of farming is getting higher due to climate change, especially for small farmers who run rice farming in swamp agroecosystems in Indonesia, which can only harvest once a year. Hence, it had the potential to reduce the level of household food security.

Based on several assumptions above, food security can be designed for vulnerable groups of farmer households (Kuzmin, 2016; Rachman et al., 2002). It is because the need for food is a basic human need that must be met at all times. In addition, this present study aims to analyze the factors affecting small farmers' household food security in swamp agroecosystems in Ciamis District.

Commented [83]: Novelty (kebaruan) penelitian ini dibanding penelitian lainnya/sebelumnya apa. Perlu penjelasan secara eksplisit.

Commented [DF4R3]: Sudah diperbaiki sesuai saran

RESEARCH METHODS

This study was conducted using a survey method to provide an overview of farmers' characteristics, income structure, farming risk, and household food security of small farmers in swamp agroecosystems. Lakbok, Ciamis District was determined purposively by the assumption that there has a swamp agroecosystem. However, this region is a rice center in Ciamis. The survey drove through chosen 247 farmers household from 648 swamp rice farmers based on the Slovin formula determined it at an error rate is 5 percent using simple random sampling spreaded over four areas (Table 1).

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 1. Proportional allocation of sample size

No	Village	Population	Sample Size
1	Sukanagara	132	50
2	Kapalasawit	286	109
3	Puloerang	124	47
4	Tambakreja	106	40
	Jumlah	648	247

Source: primary data 2022

The data used in this study included primary data and secondary data. Primary data was obtained directly from the samples through structured questionnaires, in-depth interviews with a few selected respondents and key informants, and FGD (Focus Group Discussion). Meanwhile, the secondary data was obtained from the Department of agriculture authority, Government statistic institutions, extension agents, and farmers' associations.

Data processing and analysis were performed using descriptive statistics and inferential statistics with multiple linear regressions to determine the functional relationship between variables. The multiple linear regression equation models in this study are as follows:

$$Y = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

The analysis tool used SEM (Structural Equation Model) with the AMOS program version 18.0. SEM is a multivariate statistical technique combining factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs. The structural equation model would produce indicators that support the proposed model. Hair et al. (2009) write that there are 7 (seven) stages of structural equation model and analysis: (1) theoretical model development; (2) compiling a path diagram; (3) converting the path diagram into a structural equation; (4) selecting an input matrix for data analysis; (5) assess model identification; (6) evaluate the model estimation, and; (7) interpretation of the model as can be seen in Figure 1.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

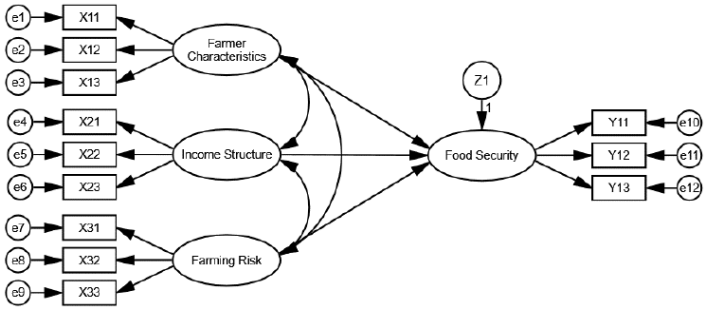

Figure 1. Research method design

Figure 1 showed that food security as an endogenous latent variable as measured by indicators Food subsistence level (Y_{11}), Household affordability (Y_{12}), and Food expenditure shares (Y_{13}). This endogenous latent variable is influenced by exogenous latent variables. The exogenous latent variables included the characteristics of farmers (X1) as measured by indicators age (X_{11}), Education (X_{12}), and Family loads (X_{13}). The exogenous latent variables of income structure (X_2) were measured by the indicators X_{21}, X_{22}, and X_{23}; farming risk (X_3) was measured by the indicators Production Risk (X_{31}), Process Risk (X_{32}), and Income Risk (X_{33}). Both of variable endogenous and exogenous involved in latent variable describing on table 3. All of variables have correlated each other. Therefore, the proper analysis tool is structural equation model (SEM). SEM is a multivariate statistical technique that combines factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs.

This study proposed three hypotheses:

H1 : Farmer characteristics have a positive and significant impact on food security.

H2 : Income structure have a positive and significant impact on food security.

H3 : Farming risk have a positive and significant impact on food security.

The test type is two tailed: positive and negative area of hypothesis. In more detail, the latent variables and indicators can be seen in Table 2.

Off-farm income is the income while waiting for farming time; the farmer works in another profession, such as temporary labor. The farmer will return for planting, maintenance, or harvesting when the farming time comes. The main job is farming. Non-farm income is income from work that is not in farming as the primary job.

There is a high risk of farming; small farmers with limited access will look for other sources of income out of the main farm (on-farm) to meet their household needs. For instance: working as farm laborers (on-farm), selling garden products, cultivating livestock, etcetera (off-farm), and even working out of the agricultural sector (non-farm) as construction workers, trade, firm industry etcetera.

Table 2. The latent variables and Indicators in SEM's model

Commented [85]: Dalam penulisan hipotesis. Ditulisnya H1 apa? H2? Dst... mengikuti kaidah penulisan hipotesis Ho, H1,

Commented [86R5]: Dan dalam penyusunan hipotesis ini hendaknya dijelaskan teori atau penelitian sebelumnya dalam membentuk hipotesis.

Commented [87R5]: Yang menjadi pertanyaan hipotesis karakteristik petani mempengaruhi ketahanan pangan? Membingungkan karakteristik yang mana? Umur, pendidikan, anggota RT? Masing-masing memiliki argumen yang berbeda. Membingungkan jika diinterpretasikan karakteristik petani semakin meningkat maka ketahanan pangan meningkat?? Lebih baik dijabarkan Pengaruh umur, pendidikan, dan RT terhadap ketahanan pangan dalam bentuk manifest variabel

Commented [88R5]: Yang menjadi pertanyaan lagi dalam menyusun hipotesisi income struktur mempengaruhi ketahanan pangan? Income strukture yang sperti apa? income struktur yang meningkat mempengaruhi ketahanan panagn? Income mana yang lebih tinggi?

Commented [MY9R5]: Sudah diperbaiki sesuai saran

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Latent Variable	Indicators	Scale
Farmers' characteristics (X_1)	Age (Year)	1. Low 2. Medium 3. High
	Education (Year)	1. Low 2. Medium 3. High
	Family dependents (Person)	1. Low 2. Medium 3. High
Income structure (X_2)	Income on-farm (IDR/year)	1. Low 2. Medium 3. High
	Income off-farm (IDR/year)	1. Low 2. Medium 3. High
	Income non-farm (IDR/year)	1. Low 2. Medium 3. High
Farming risk (X_3)	Production risk (Coefficient variation)	1. Low 2. Medium 3. High
	Price risk (Coefficient variation)	1. Low 2. Medium 3. High
	Income risk (Coefficient variation)	1. Low 2. Medium 3. High
Food security (Y_1)	Food subsistence level (percent)	1. Low 2. Medium 3. High
	Household affordability (percent)	1. Low 2. Medium 3. High
	Food expenditure shares (percent)	1. Low 2. Medium 3. High

Source: Primary data 2022

Commented [810]: Disini dituliskan satuannya apa?

Commented [DF11R10]: Sudah diperbaiki sesuai saran

Commented [812]: Lebih detail disini dijelaskan skala intervalnya berapa? Misalnya berapa nilai yang tinggi, rendah, sedang?? Angka berapa yang dimasukkan dalam SEM? Satuannya apa

Commented [MY13R12]: Sudah diperbaiki sesuai saran

Commented [814]: Disini belum ada penjelasan bagaimana mengukur food security? Skala interval yang seperti apa digunakan disini? Tinggi rendah sedang?

Commented [MY15R14]: Sudah diperbaiki sesuai saran

In agriculture, there is often extreme situation containing risk and uncertainty event. The component that may determine farming risk is the risk of production, price, and income. Production risk in swamp rice farming is higher than in lowland (Sulewski et al., 2014). Agricultural production risk is higher than non-agricultural production risk, sometimes the harvest is abundant, but the price decrease, this caused an income decrease. The component of farming risk was measured by coefficient variation. Statistically, farming risk consisting of production risk, price risk, and income risk can be calculated using the coefficient of variation by looking at the variability that occurs (Hindarti et al., 2021; Mazwan et al., 2020). Production variance and price variance as a measure of

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

production risk and price risk are based on the experience of farmers doing previous farming activities (Siddik et al., 2015).

Commented [816]: Bagaimana mengukur 'coefficient of variation'? Di dapatkan dari mana data ini? Data sekunder atau primer? Bagaimana mengukurnya resiko produksi/harga/income tinggi, sedang, rendah? Berapa skala tinggi rendah sedang?

Commented [MY17R16]: Sudah diperbaiki sesuai saran

RESULT AND DISCUSSION

The research began within the primary field survey of the 247 swamp rice crop farmers to reveal their background and knowledge about their profession. Ciamis has a geographical history of swamp land agroecosystem. In Java Island which swamp agroecosystem is only in Ciamis. This area was severely affected by swamp land condition boundaries. The population in area majority lives under the risk toward poverty line and less rice yield as food intake. This risk would increase the concentration and intensity of flood, which is disturbing rice production, farmer income, and food security.

Farmers' Characteristics

Commented [818]: Disini belum ada hasil karakteristik dari risk farming dan food security.

Commented [819R18]: Ditampilkan juga pendapatan

The farmers' characteristics which are the leading research in this present study, have consisted of age, education, experience, and family load:

Table 3. Farmers' characteristics in swamp agroecosystems

	Description	Amount (person)	Percentage (%)
1	Age (year)		
	a. 15 - 64	201	81
	b. ≥ 65	46	19
	Total	247	100
2	Education level		
	a. Elementary	236	96
	b. Junior	7	3
	c. Senior	4	1
	Total	247	100
3	Experience (year)		
	a. 5 - 20	70	28
	b. 21 - 35	129	52
	c. 36 - 50	48	20
		247	100
4	Family load (person)		
	a. 1 - 3	125	51
	b. 4 - 6	122	49
	Total	247	100

Source: Primary data 2022

Table 3 shows that farmers' ages range, from 32 to 71 years old, with an average age of 54 years old, so they are in the span of a productive period. Age is one of the factors related to work ability in carrying out farming activities (Yunita et al., 2011). The number of samples dominated farmers with low formal education. This problem caused the ability to manage lowland rice farming to be optimal productivity. Education is related to their access to food because with higher education, the opportunities to get better jobs are getting bigger to generate more significant income (Nwokolo, 2015). The land area of farmers ranges from 0.04-0.84 hectares with an average of 0.29 hectares

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

which is in the narrow category with the most dominating amount, whereas Omotesho et al. (2010) stated that the land is an asset for farmers in running their or her business which will determine the level of income, the standard of living and welfare.

The experience of farmers in rice farming also varies. Range from 5-50 years with an average of 27 years. Experience is the knowledge that humans collect through their minds and then arrange into a patterned form. A person's experience in farming affected the response to accepting new technologies and innovations (Ntshangase et al., 2018).

This condition shows that the structural weakness of small farmers in rural areas, namely narrow land tenure is still very inherent and causes unequal distribution of income and production. According to Firdaus et al. (2020); Kuok Ho Daniel Tang (2019); Vaghefi et al. (2016), the narrow tenure of land owned can result in farmers being trapped in bare for survival.

The family-loads ranged from one to six people a family with an average of four dependents in a family. The small number of dependents of farming families illustrated those small families in rural areas as the main view of farmers' family members. Thus, it is also related to the proverb of the agrarian society's Javanese culture, assuming that "many children, many fortunes" is still believed. Even in fact, the more the number of family members, the greater the burden of living that must be borne by farmers. Davis et al. (2017); Ndhleve et al. (2021); Nwokolo (2015); Ruhyana et al. (2020) family size will affect the income per capita and household food consumption expenditure.

Formulation Model

To determine the indicators used in the model, Confirmatory Factor Analysis (CFA) was used. From the CFA test, the expected loading factor of each indicator was > 0.5; however, the results showed that there was no indicator that the value of loading factor was less than 0.5. Therefore, all indicators in the model could be used to predict the variable (Table 4).

Table 4. Convergen validity

			Factor Loading	P	Note
X11	-->	Farmers characteristics	0.837	***	Significant
X12	-->	Farmers characteristics	0.898	***	Significant
X13	-->	Farmers characteristics	0.807	***	Significant
X21	-->	Income structure	0.885	***	Significant
X22	-->	Income structure	0.897	***	Significant
X23	-->	Income structure	0.951	***	Significant
X31	-->	Farming risk	0.879	***	Significant
X32	-->	Farming risk	0.772	***	Significant
X33	-->	Farming risk	0.890	***	Significant

Source: Authors computation (2022), n = 247, *** (0.001)

Tabel 4 shows that all the indicators used are valid in terms of the loading factor value > 0.5. To test the validity and reliability of exogenous and endogenous latent constructs, CR and AVE were used (Table 5). According to Hair et al. (2010) the construct has good reliability if the value of CR ≥ 0.70 and AVE ≥ 0.50.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 5. Validity and reliability construct

Variables.	Reliability Construct	Variance Extracted
	CR > 70%	AVE > 50%
Farmers' characteristics	84.33%	83.07%
Income structure	72.48%	68.65%
Farming risk	75.17%	75.02%
Food security	75.12%	71.94%

Source: Authors computation (2022)

Table 5 shows good construct validity and reliability for the sample measurement model. The value of convergent validity is greater than 0.5, while the construct reliability value ranges from 0.72 to 0.84, while the value of the validity extracted was more significant than 0.5. The results proved the convergent validity by examining the significance of the loadings factor and the shared variance. The variance captured by the construct should be greater than the measurement error (0.5). The structural equation that was formed explained the causal relationship between changes in food security there was a change in farmer characteristics, income structure, and farming risk.

The results of SEM assumptions and data processing to test the hypothesis consisting of a multivariate outlier test, multivariate normality test, and multicollinearity test all meet the required assumptions. After it fulfills all the testing assumptions, it can be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis is obtained, as seen in Figure 2.

Commented [820]: Sebelum kesini harusnya ditampilkan uji validitas dan realibilitasnya lebih dahulu.

Commented [DF21R20]: Sudah diperbaiki sesuai saran (ada di Tabel 5)

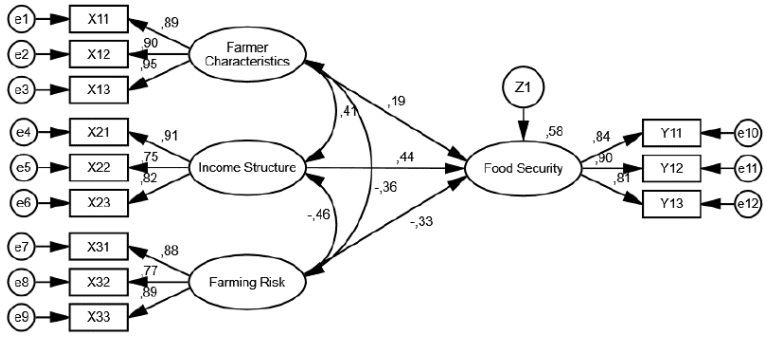

Figure 2. Results of SEM model analysis of farmer household food security in swamp agroecosystems in Ciamis, Indonesia.

This condition was reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

After it fulfilled all the testing assumptions, it could be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis Regency is obtained, as seen in Figure 2.

To test the accuracy of the model, Model Fit Index was used and the results is presented in Table 6.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 6. Test results on the feasibility of the full SEM model

The goodness of Fit Indeks	Cut-off Value	Result	Conclusion
Chi-Square	Expected small	81.735	Fit
Significance Probability	≥ 0.05	0.068	Fit
RMSEA	≤ 0.08	0.053	Fit
GFI	≥ 0.90	0.947	Fit
AGFI	≥ 0.90	0.914	Fit
CMIN/DF	≤ 2.00	1.703	Fit
TLI	≥ 0.90	0.978	Fit
CFI	≥ 0.95	0.984	Fit
NFI	≥ 0.90	0.962	Fit

Source: Authors computation (2022), n = 247

Table 6 showed a good model fit index, GFI, AGFI, TLI, NFI > 0.90, CFI > 0.95, CMIN/DF < 2, RMSEA < 0.08, significance probability > 0.05, and chi-square small, meaning that the model fits the data.

Regression estimation for SEM shows that all variables are significant (Table 7), so all hypotheses are accepted.

Table 7. Regression estimate

Variables			b	SE	CR	P	Note
Farmers characteristics	-->	Food security	0.191	0.059	3.323	***	Significant
Income structure	-->	Food security	0.439	0.071	6.507	***	Significant
Farming risk	-->	Food security	-0.327	0.072	-5.193	***	Significant

Source: Authors computation (2022), n = 247, *** (0.001)

Therefore, based on table 7 could be formed the structural equation of the exogenous latent variable to the endogenous latent variable is as follows:

$$Y = 0.191\ X_1 + 0.439\ X_2 - 0.327\ X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

Table 8. Square multiple correlation

	Estimate
Food Security	0.583

Source: Authors computation (2022)

Commented [822]: Penjelasan skor yang mana dari tabel 4. Penjelasan singkat

Commented [DF23R22]: Sudah diperbaiki sesuai saran

Commented [824]: Sebelum kesini ditampilkan hasil pengaruh semua indikator dalam mempengaruhi variabel latent?

Commented [MY25R24]: Sudah diperbaiki sesuai saran (Tabel 4)

Commented [826]: Dirapikan; ditulis H1, h2, h3, sesuai hipotesisnya

Commented [MY27R26]: Sudah diperbaiki sesuai saran

Commented [828]: Diberikan keterangan signifikannya di taraf kepercayaan berapa persen??

Commented [DF29R28]: Sudah diperbaiki sesuai saran dan ditulis pada keterangan ***(0.001)

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Table 8 showed that food security was explained by farmer characteristics, income structure, and farming risk of 58.3%. The remaining 41.7% is explained by other factors not included in the structural equation model.

Discussion

Simultaneously, the three variables' effect on farmer households' food security was 58 percent. The remaining 42 percent is explained by other factors not included in the model. The factor influencing most farmers' food security households is the level of food subsistence (λ = 0.84). The affordability of farmer households (λ = 0.90); and 3) the share of food expenditure (λ = 0.81) is the income structure reflected by on-farm, off-farm, and non-farm income.

Farming income (λ = 0.91), non-farming income (λ = 0.75), and non-agricultural income (λ = 0.82) were strong determinants of the latent variable of income structure. Thus, farm, non-farm, and non-agricultural income have the greatest potential contribution to household income. Production risk (λ = 0.88), price risk (λ = 0.77), and income risk (λ = 0.89) were strong determinants of the latent variable of farming risk. This shows that production risk, price risk, and income risk have the greatest potential contribution to farming risk. Likewise, age (λ = 0.89), education (λ = 0.90), and family dependents (λ = 0.95) are strong determinants of farmer's characteristic variables so that it can be said that age, education, and family dependents great potential in shaping the characteristics of farmers.

The results of the SEM analysis showed that the coefficient of the income structure influence was positive. On the other hand, the higher income structure reflected by, the higher income from farming, outside farming, and outside the agricultural sector, the better the food security of farmers' households. This condition is suitable because, with high incomes, farmers' access to food becomes more rational. Ndhleve et al. (2021) household income is an essential determinant of household food insecurity because access to food at the household level is determined by household income (Mutea et al., 2019; Silvestri et al., 2015; Tefera et al., 2014) household income is an estimator of household affordability.

Effect of Farmer Characteristics on Household Food Security

Farmer characteristics are the third factor that influences the food security of rice farmers' households in the swamp agroecosystem, which is reflected by age (λ = 0.89); 2) education (λ = 0.90), and 3) family dependents (λ = 0.95). The farmer characteristics meant that age, formal education, and family dependents of farmers could increase household food security. It meant that if farmers' capacity increases, farmers' ability to create household food security will be better.

The strongest indicator that reflects the characteristics of farmers is family dependents (λ = 0.95). Fewer family responsibilities caused household food security to be high. This characteristic was certainly rational considering that farmers with larger family sizes tend to need more food than farmers with fewer family members. The more members of the household, the greater the burden on farmers, which causes household food expenditure to be more significant so that, in the end, household food security is lower. However, family dependents are also positively related to household income, which means that more and more family members lead to greater and more diverse sources of income that households can access.

Commented [830]: Lebih baik dalam pembahasannya setiap variabelnya dipisahkan dan diberi judul sendiri sesuai urutuan; Farmer characteristics, dst..

Commented [MY31R30]: Sudah diperbaiki sesuai saran

Commented [832]: Ketika menjelaskan CFA tidak hanya variabel latent food security dan income, tapi variabel latent lainnya bagaimana?

Commented [MY33R32]: Sudah diperbaiki sesuai saran

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The results of the study of Ndhleve et al. (2021) in Botswana and South Africa showed a strong influence of family dependents on household food security. Households with many dependents were more food insecure than households with few family dependents. Households with more family dependents mean more people have to be fed, so they need more food. This characteristic was in line with the findings of (Cafiero, 2019; Silvestri et al., 2015). Musumba et al. (2022) that the food available for one family may not be sufficient to meet the needs of all family members but only sufficient for some of the family members.

This study showed that the average size of the farming family in the study area belongs to a small family where most of the family members also work to earn income to ease the burden on the family. In addition, other family members (children) who work outside the city and have an established economy usually send money routinely as a form of responsibility and dedication to their parents.

Farmers who are highly educated, and older in the sense of being more productive and having a small family size, will also have a higher level of household food security. Income is very important for households to provide food through purchases (Corral et al., 2017; Silvestri et al., 2015; Tefera et al., 2014) that income is very important for households to provide food through purchases.

The higher education farmers have taken causes household food security to be higher which is reflected by the higher affordability and the better quality of food consumed by farmer households. The level of education indicates that a person's knowledge level is broader because of education. Generally, the level of education is positively related to the level of income. It meant that the higher the education completed by farmers, the higher the income earned. Farmers with higher education tend to gain more insight and information related to other sources of income.

In contrast to the research findings of, household food security in Botswana and South Africa is not significantly affected by education level. According to him, education is usually related to the level of income because households with a high level of education usually have more money that can be used to purchase food. Thus the higher the level of education of farmers, the income will also be higher the affordability of households will also be higher. In the end, farmers could improve the quality of the food they eat and tend to choose healthier foods. The findings of this study are in line with Nwokolo (2015); Ruhyana et al. (2020) that higher levels of education are associated with increased household income, livelihood opportunities, and food security.

Although the average level of formal education that farmers did is low, on average farmers, they only need to complete primary education. In general, farmers have other sources of income outside of the rice farming they run, namely from outside the farm, which includes farm laborers, selling garden products, livestock products, and operating agroindustry (sales of bananas and coconut sugar). Meanwhile, sources of income from outside the agricultural sector include construction workers and opening small stalls. The source of income is in line with the research findings of Mutea et al. (2019) that to increase income, farmer households in the mountainous region of Kenya usually sell crops, timber, and livestock, while off-farm income comes from trade and business, remittances, house rent, employment. Legal, transportation services, and other informal jobs.

The little indicator that reflect household food security is age ($\lambda = 0.89$). The more productive a person's age allows them to work more productively. With their physical strength, they will be more productive to work outside their farms and seeking additional income outside the agricultural sector. Farmers of productive age were generally more rational in running their businesses. Thus, the income

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

obtained from farming can be more optimal with the minimum use of labor outside the family, which must be paid directly. Productive age implies that farmers do not only rely on their income from one source of income but also from other sources. Facts on the ground show that apart from working in the agricultural sector, they also work outside it. The results of the research by (Frelat et al., 2016) show that to create household food security, farmers in sub-Saharan Africa, in addition to seeking employment opportunities in the agricultural sector, also work outside the agricultural sector.

Effect of Income Structure on Household Food Security

On-farm income is one indicator that most strongly reflects the structure of household income ($\lambda = 0.91$). On-farm was natural, considering that most farmer households rely on rice farming as farmers' main activity. The analysis showed that the average farmer's income from lowland rice farming was 8,993,229 IDR per hectare per year, with an average contribution of 14 percent to the total household income.

This study's findings align with Abu & Soom (2016); Mutea et al. (2019). In subsistence-to-farmer households, food availability is more determined by food production itself. The findings also indicated that more efforts are needed to increase the farmers' knowledge and skills in utilizing the potential and economic resources of farmer households considering that the source of farmers' income does not only come from rice farming but also from outside the farm, the agricultural sector.

Income structure indicators are income outside the agricultural sector ($\lambda = 0.75$) and income outside farming ($\lambda = 0.82$). The analysis results show that the average income of farmers outside the agricultural sector was 9,372,206 IDR per year, with an average contribution of 60 percent to the total household income. Meanwhile, the average income of farmers from outside rice farming but still in the agricultural sector was 4,159,753 IDR per year, with an average contribution of 26 percent to total household income.

Non-agricultural activities carried out by low-income farmer households due to narrow land ownership and low production are one of the efforts to obtain additional income to meet household needs. Owusu et al. (2011) found that the influence of income outside the agricultural sector on household food security in Northern Ghana. The research results of Musumba et al. (2022) showed that farming households in rural Sub-Saharan African countries carry out more than one type of work to increase income. The research findings Haggblade et al. (2010) in rural Sub-Saharan Africa concluded that 50 percent in Asia and Latin America, farmers' income from outside the agricultural sector contributes about 35 percent to total household income. According to Alobo Loison (2015); Mutea et al. (2019); Yusuf et al. (2018), work in the agricultural and non-agricultural sectors is an effort for farmers to earn income because income diversification is closely related to efforts to maintain survival in unfavorable conditions. Alobo Loison (2015); Mutea et al. (2019); Niehof (2004); Yaro (2006), It aimed to secure a better standard of living by reducing risk, vulnerability, and poverty and increasing income, security, and wealth.

Effect of Farming Risk on Household Food Security

Farming risk is the second variable that affects the food security of rice farmers' households in the swamp agroecosystem, which is reflected by indicators of production risk, price risk, and income risk. Production risk is the indicator that most strongly reflects farming risk ($\lambda = 0.88$), price risk (λ

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

= 0.77), and income risk (λ = 0.89). The influence of production, income, and price risk has the most potential to increase rice farming risk in swamp agroecosystems.

When it looks from the coefficient, which shows a negative sign, this means that the greater risk of farming faced by farmers, the lower household food security. This condition is reasonable considering the facts on the ground show that, on average, farmers face a high risk of farming due to frequent flooding of their fields. Production risks faced by farmers are generally in the form of reduced grain produced due to unpredictable floods. The findings of this study were in line with the research results of Nephawe et al. (2021) insufficient rainfall, pest and disease attacks, and excess rainfall can reduce farm production. The research results of Mutea et al. (2019) also showed that lost yields from production activities are caused by climatic conditions and pests/diseases that attack plants or can lead to low productivity resulting in reduced irrigation water and production inputs. In comparison, the low number of inputs, such as fertilizers, can cause a decrease in rice yields.

Income risk can be assumed as the variable that most strongly reflects farming risk (λ = 0.89). It can be assumed that the higher the income risk faced by farmers, the lower household food security, considering that farmers have to pay to run their businesses. However, the imbalance between the income earned and the costs incurred causes an income risk. This income risk causes the affordability of farmers to be low, even though, according to Mutea et al. (2019), the income structure owned by farmers will affect their behavior in facing risks to anticipate crop failures. This condition is reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

The countermeasures made by farmers before running rice farming are by preparing large quantities of seeds as reserves because farmers usually do embroidery repeatedly. Facts in the field showed that the use of these seeds reaches 2-3 times the recommended amount. The Lebak swamp has distinctive characteristics, so rice farmers in this agroecosystem are different from farmers working on it Yunita, et al. (2011); Yusuf (2018). Nmadu et al. (2012) stated that to minimize the risk of production due to natural disasters, pests and plant diseases, fires, and other factors whose consequences can be physically calculated and can be overcome by purchasing an agricultural insurance policy. Meanwhile, the risk of a possible decline in production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be anticipated in several ways, including diversification, vertical integration, forward contracting, future markets, hedging, and agricultural options.

Although some of these strategies have been implemented by some farmers, they still have difficulty overcoming the risks of farming. Therefore, another systematic strategy is needed, for example, through agricultural insurance, an economic institution that functions to manage the risks faced by farmers whose objectives are: 1) stabilizing farmers' incomes by reducing losses due to lost yields; 2) stimulating farmers to adopt technology that can increase production and efficient use of resources, and 3) reduce the risks faced by agricultural credit institutions and increase farmers' access to these institutions. Suryanto et al. (2020); Yulia et al. (2023), agricultural insurance is one of the strategies to adapt to climate change, even in developed countries, including several countries in Asia, developing rapidly and effectively protecting farmers.

CONCLUSION AND SUGGESTION

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The food security of smallholder households in swamp agroecosystems in the Ciamis District is significantly influenced by farmer characteristics, income structure, and farming risk. The income structure reflected by on-farm, off-farm, and non-farm income is the variable that has the most substantial influence on food security, followed by farm risk, which is reflected by production risk, price risk, and income risk. Meanwhile, the characteristics of farmers as reflected by age, education, and family responsibilities, although they have a significant effect on food security, have the most negligible effect compared to other variables. According to the result of this study, the development of small agroindustry in rural areas must be carried out to create household food security. The existence of agro-industry allows farmers to obtain other sources of income outside their farming. In addition, farmers should follow the advice of extension agents regarding planting time to avoid losses.

Commented [834]: Disini belum ada saran praktis bagaimana meningkatkan ketahanan pangan di Swamp Agroecosystem

Commented [MY35R34]: Sudah diperbaiki sesuai saran

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 1–34. doi: 10.1016/j.jssas.2017.05.003

Abu, G. A., & Soom, A. (2016). Analysis of factor affecting food security in rural and urban farming household of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68.

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*, *51*(9), 1125–1138. doi: 10.1080/00220388.2015.1046445

Badan Pusat Statistik Jawa Barat. (2021). Produksi Tanaman Padi. In Produksi Tanaman Padi.

Bahta, S., Wanyoike, F., Katjiuongua, H., & Marumo, D. (2017). Characterisation of food security and consumption patterns among smallholder livestock farmers in Botswana. *Agriculture and Food Security*, *6*(1), 1–11. doi: 10.1186/s40066-017-0145-1

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. doi: 10.1007/s12571-012-0208-x

Cafiero, C. (2019). Measuring food insecurity. *Food Security Policy, Evaluation and Impact Assessment, February 2010*, 169–205. doi: 10.4324/9781351019828-17

Candel, J. J. L. (2014). Food security governance: A systematic literature review. *Food Security*, *6*(4), 585–601. doi: 10.1007/s12571-014-0364-2

Che Omar, S., Shaharudin, A., Tumin, S. A., & The. (2019). The Status of the Paddy and Rice Industry in Malaysia Key Findings of the Report. In Khazanah Research Institute (Issue April).

Corral, P., & Radchenko, N. (2017). What's so spatial about diversification in Nigeria? *World Development*, *95*, 231–253. doi: 10.1016/j.worlddev.2017.02.028

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, *67*, 153–174. doi: 10.1016/j.foodpol.2016.09.018

Fahad, S., Rehman, A., Shahzad, B., Tanveer, M., Saud, S., Kamran, M., Ihtisham, M., Khan, S. U., Turan, V., & ur Rahman, M. H. (2018). Rice responses and tolerance to metal/metalloid toxicity. In Advances in Rice Research for Abiotic Stress Tolerance (Issue December). doi: 10.1016/B978-0-12-814332-2.00014-9

Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. In Cogent Social Sciences (Vol. 6, Issue 1). doi: 10.1080/23311886.2020.1818373

Forero-cantor, G., Ribal, J., & Sanjuán, N. (2020). Measuring regional differences in food security from access and stability dimensions : A methodological proposal based on elasticities. *Agricultural Economics – Czech*, *66*(3), 112–119. doi: https://doi.org/10.17221/97/2019-AGRICECON

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., Van Asten, P. J. A., & Van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 458–463. doi: 10.1073/pnas.1518384112

Gregory, P. J., & Ingram, J. S. I. (2000). Global change and food and forest production: Future scientific challenges. *Agriculture, Ecosystems and Environment*, *82*(1–3), 3–14. doi: 10.1016/S0167-8809(00)00212-7

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, *38*(10), 1429–1441. doi: 10.1016/j.worlddev.2009.06.008

Hair, J. F. J., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate Data Analysis* (7th ed.). Pearson Prentice Hall.

Hindarti, S., Rohmatul Maula, L., & Khoiriyah, N. (2021). Income risk and the decision on onion farming. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(1), 202–209. doi: 10.24843/soca.2021.v15.i01.p18

Kassy, W. C., Ndu, A. C., Okeke, C. C., & Aniwada, E. C. (2021). Food security status and factors affecting household food security in Enugu state, Nigeria. *Journal of Health Care for the Poor and Underserved*, *32*(1), 564–581. doi: 10.1353/hpu.2021.0041

Kuok Ho Daniel Tang. (2019). Climate change and Paddy Yield in Malaysia: A short communication. *Global Journal of Civil and Environmental Engineering*, *July*, 14–19. doi: 10.36811/gjcee.2019.110003

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Kuzmin, E. A. (2016). Sustainable food security: Floating balance of markets. *International Journal of Economics and Financial Issues*, *6*(1), 37–44.

Laborde, D., Majeed, F., Tokgoz, S., & Torero, M. (2016). Long-Term Drivers of Food and Nutrition Security. *IFPRI Discussion Paper Series*, *May*.

Maetz, M. (2013). Food Security - definitions and drivers. *Hunger Explained* , *31*(November 1996), 1–25.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare ? Empirical evidence from Tigray. *Feinstein International Center*, *August*, 1–19.

Maxwell, D. G., & Foundation, M. G. (2017). *The Coping Strategies Index A tool for rapid emergencies Second Edition*. *January 2008*.

Mazwan, M. Z., Ibrahim, J. T., & M Fadlan, W. A. (2020). Risk analysis of shallot farming in Malang Regency, Indonesia. *Agricultural Social Economic Journal*, *XX*(3), 201–206. doi: 10.21776/ub.agrise.2020.020.3.3

Musumba, M., Palm, C. A., Komarek, A. M., Mutuo, P. K., & Kaya, B. (2022). Household livelihood diversification in rural Africa. *Agricultural Economics (United Kingdom)*, *53*(2), 246–256. doi: 10.1111/agec.12694

Mutea, E., Bottazzi, P., Jacobi, J., Kiteme, B., Speranza, C. I., & Rist, S. (2019). Livelihoods and food security among rural households in the North-Western Mount Kenya Region. *Frontiers in Sustainable Food Systems*, *3*, 1–12. doi: 10.3389/fsufs.2019.00098

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Dominic, M., Nakin, V., Shisanya, S., & Walker, K. P. (2021). Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(2), 207–224.

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Nakin, M. D. V., Shisanya, S., & Walker, K. P. (2021). Household food insecurity status and determinants: The case of Botswana and South Africa. *Agraris*, *7*(2), 207–224. doi: 10.18196/agraris.v7i2.11451

Nephawe, N., Mwale, M., Zuwarimwe, J., & Tjale, M. M. (2021). The impact of water-related challenges on rural communities food security initiatives. *Agraris*, *7*(1), 11–23. doi: 10.18196/agraris.v7i1.9935

Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, *29*(4 SPEC.ISS.), 321–338. doi: 10.1016/j.foodpol.2004.07.009

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade*, *2*(2), 98–108. doi: https://doi.org/10.9734/bjemt/2012/1284

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal province. *Sustainability (Switzerland)*, *10*(2). doi: 10.3390/su10020555

Nwokolo, E. E. (2015). The influence of educational level on sources of income and household food security in alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *52*(3), 208–217. doi: 10.1080/09709274.2015.11906944

Omotesho, O. A., Adewumi, ; M O, Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of food security among the rural farming households in Kwara State, Nigeria. *African Journal of General Agriculture ©*, *2*(1), 7–15. Retrieved from http://www.asopah.org

Omotesho, O. A., Adewumi, M. O., Adewumi, M. O., & Fadimula, K. S. (2010). Food security and poverty of the rural households in Kwara State, Nigeria. *Libyan Agriculture Research Center Journal International*, *1*(1), 56–59. Retrieved from https://www.researchgate.net/publication/46473090

Opaluwa, H. I., Oyibo, F. O., & Jimoh, F. A. (2018). Determinants of Food Security among Farming Households in Akure North Local Government Area of Ondo State, Nigeria. *Journal of Asian Rural Studies*, *2*(2), 164–172. doi: 10.20956/jars.v2i2.1479

Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. doi: 10.1016/j.foodpol.2010.09.002

Pandey, S., Bhandari, H., & Hardy, B. (2007). Economic costs of drought and rice farmers' coping mechanisms: a cross-country comparative analysis. In Journal of Chemical Information and Modeling (Vol. 53).

Rachman, H. P., & Ariani, M. (2002). Ketahanan pangan: Konsep, pengukuran, dan strategi. *Forum Penelitian Agroekonomi*, *20*(1), 12–24. Retrieved from https://ejurnal.litbang.pertanian.go.id

Ruhyana, N. F., Essa, W. Y., & Mardianis. (2020). Sociodemographic factors affecting household food security in Sumedang regency West Java province. *Agraris: Journal of Agribusiness and Rural Development Research*, *6*(1), 38–51. doi: 10.18196/agr.6189

Rusliyadi, M. (2023). Food security police analysis perspective on food self-sufficiency village programme case in Central Java Indonesia. *Agrisocionomics*, *7*(1), 95–113. Retrieved from http://ejournal2.undip.ac.id/index.php/

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*(12), 1–13. doi: 10.1088/1748-9326/11/12/124010

Sekhar, C. S. C. (2018). Climate change and rice economy in Asia: Implications for trade policy Background paper for The State of Agricultural Commodity Markets (SOCO) 2018. In Fao.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Siddik, M., Mustadjab, M. M., & Hanani, N. (2015). *Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island , Indonesia*. *5*(5), 180–189. doi: 10.5923/j.ijas.20150505.02

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1). doi: 10.1186/s40066-015-0042-4

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). *The poverty impacts of climate change*. *51*(June 2014), 1–5.

Sulewski, P., & Kloczko-Gajewska, A. (2014). Farmers' risk perception, risk aversion and strategies to cope with production risk: An empirical study from Poland. *Studies in Agricultural Economics*, *116*(3), 140–147. doi: 10.7896/j.1414

Suparwoto, S. (2019). Produksi dan pendapatan usahatani padi di lahan rawa lebak Kabupaten Ogan Komering Ilir Sumatera Selatan. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 51. doi: 10.24843/soca.2019.v13.i01.p05

Suryanto, Gravitiani, E., Daerobi, A., & Susilowati, F. (2020). Crop insurance as farmers adaptation for climate change risk on agriculture in Surakarta residency-Indonesia. *International Journal of Trade and Global Markets*, *13*(2), 251–266. doi: 10.1504/IJTGM.2020.106771

Suwarto, Susanto, U., & Nurchasanah, S. (2015). *Perakitan genotipe Padi Tipe Baru untuk mendukung kemandirian pangan*. *c*, 133–139.

Swindale, A., & Bilinsky, P. (2010). Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guide VERSION 4 Paula Bilinsky Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guid. *Fhi 360*.

Syuhada, A., Armanto, M. E., Siswanto, A., Yazid, M., & Wildayana, E. (2020). Food security and environmental sustainability on the South Sumatra Wetlands, Indonesia. *Systematic Reviews in Pharmacy*, *11*(3), 457–464. doi: 10.5530/srp.2020.3.58

Tefera, T., & Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. *Journal of Food Security*, *2*(3), 92–99. doi: 10.12691/jfs-2-3-4

Thapa, G., & Gaiha, R. (2011). Smallholder farming in Asia and the Pacific: Challenges and opportunities. *Conference on New Direction for Smallholder Agriculture*.

Ulrich, A., Ifejika Speranza, C., Roden, P., Kiteme, B., Wiesmann, U., & Nüsser, M. (2012). Small-scale farming in semi-arid areas: Livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. *Journal of Rural Studies*, *28*(3), 241–251. doi: 10.1016/j.jrurstud.2012.02.003

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Vaghefi, N., Shamsudin, M. N., Radam, A., & Rahim, K. A. (2016). Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry. *Journal of Integrative Environmental Sciences*, *13*(1), 19–35. doi: 10.1080/1943815X.2015.1112292

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. doi: 10.1111/gcb.14158

Wildayana, E., & Armanto, M. E. (2018). Lebak swamp typology and rice production potency in Jakabaring South Sumatra. *Agriekonomika*, *7*(1), 30–36. doi: 10.21107/agriekonomika.v7i1.2513

Wilke, A. K., & Morton, L. W. (2015). Climatologists' patterns of conveying climate science to the agricultural community. *Agriculture and Human Values*, *32*(1), 99–110. doi: 10.1007/s10460-014-9531-5

Yaro, J. A. (2006). Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *Journal of Modern African Studies*, *44*(1), 125–156. doi: 10.1017/S0022278X05001448

Yulia, D. M., Rachmina, D., & Feryanto. (2023). Farmer's decision to take credit in Indonesia. *Agrisocionomics*, *7*(1), 126–143. Retrieved from http://ejournal2.undip.ac.id/index.php/

Yunita, Ginting B, Asngari Pang S, Susanto Joko, & Amanah Siti. (2011). Ketahanan pangan dan mekanisme koping rumah tangga petani padi sawah lebak berdasarkan status kepemilikan lahan. *Jurnal Ilmu Keluarga & Konseling*, *4*(1), 21–29. doi: https://doi.org/10.24156/jikk.2011.4.1.21

Yusuf, M. N. (2018). *Strategi ketahanan pangan rumah tangga petani dalam menghadapi risiko: Suatu kasus pada petani padi di daerah rawan banjir Kabupaten Pangandaran Propinsi Jawa Barat* [Disertasi]. Universitas Padjadjaran.

Yusuf, M. N., Sulistyowaty, L., Sendjaja, T. P., & Carsono, N. (2018). Food security analysis of household paddy farmer in flooding area. *Journal of Economics and Sustainable Development*, *9*(8), 88–90. doi: 10.7176/JESD

5. Bukti Konfirmasi Submit Revisi Pertama, Respon Kepada Reviewer Kedua, dan Artikel yang Diresubmit (15 Mei 2023)

#17988 Review

Summary | Review | Editing

Submission

Authors	Muhamad Nurdin Yusuf
Title	DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA
Section	Articles
Editor	Tutik Dalmiyatun

Peer Review

Round 1

Review Version	17988-62338-2-RV.docx 17-04-2023
Initiated	17-04-2023
Last modified	03-05-2023
Uploaded file	Reviewer A 17988-62485-1-RV.docx 20-04-2023 Reviewer B 17988-62714-1-RV.docx 01-05-2023

Editor Decision

Decision	Accept Submission 06-06-2023
Notify Editor	Editor/Author Email Record 26-05-2023
Editor Version	17988-62411-1-ED.docx 17-04-2023
Author Version	17988-63099-1-ED.docx 12-05-2023 17988-63099-2-ED.docx 15-05-2023
Upload Author Version	Choose File No file chosen Upload

[Agrisocionomics] [ID-17988] Revised Version Acknowledgement

1 message

Wiludjeng Roessali <agrisocionomics@gmail.com> 15 May 2023 at 18:18
Reply-To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>
To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>

Dr. Muhamad Nurdin Yusuf:

Thank you for submitting the revision of manuscript, "DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA" to Agrisocionomics: Jurnal Sosial Ekonomi Pertanian. With the online journal management system that we are using, you will be able to track its progress through the editorial process by logging in to the journal web site:

Manuscript URL: https://ejournal2.undip.ac.id/index.php/agrisocionomics/author/submission/17988
Username: mnurdin
Editor: Tutik Dalmiyatun

If you have any questions, please contact me. Thank you for considering this journal as a venue for your work.

Wiludjeng Roessali
Agrisocionomics: Jurnal Sosial Ekonomi Pertanian

---

agrisocionomics@gmail.com

AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA

Commented [OU1]: What is the novelty of this research in contributing to the development of science?

Commented [MY2R1]: has been repaired according to the suggestions

ABSTRACT

Swamp agroecosystems are sub-optimal lands with distinctive characteristics, namely low fertility, and can only be planted once a year during the dry season. Small farmers whose primary income comes from the agricultural sector are becoming increasingly difficult due to climate-changing changes that can intimidate their household food security. This research aimed to analyze the factors that affect the food security of small farmer households in the swamp agroecosystem. The method used a survey of 247 farmers who run rice farming in swamp agroecosystems in the Ciamis Indonesia, which were determined randomly from a population of 648 farmers using the Slovin formula at an error rate of 5 percent. The research was analyzed by SEM (Structural Equation Models). The result showed that the factors impacting the food security of small farmer households in swamp agroecosystems came from farmer characteristics, income structure, and farm risk. Based on this, the development of small agro-industry in rural areas must be carried out to create household food security.

***Keywords**: Farmer Household, Food Security, Small Farmer, Swamp Agroecosystems*

BACKGROUND

Commented [OU3]: What is the cropping pattern in one year in a swamp agroecosystem? What is the picture of the business farming? So far, how do farmers meet their food needs? So this is interesting to study as stated in the title of the study

Commented [MY4R3]: It has been explained in paragraph 7

The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern (Candel, 2014; Forero-cantor et al., 2020) due to the increasing population, rising food prices, conversing of agricultural land, and declining production due to global climate change (Forero-cantor et al., 2020; Waha et al., 2018). The world population will reach 9 billion by 2045, with Indonesia's population at 350 million. This increase in population is simultaneously followed by increasing energy and food needs. The world's population has now reached 8 billion people. China, India, Indonesia, and Pakistan are Asian countries are the largest population. Improving the agricultural system is the right solution to ensure the achievement of food self-sufficiency in the country. Therefore, food security is becoming a central issue of world concern. However, decreasing the level of community welfare, especially in developing countries (Opaluwa et al., 2018), in the context of food security, availability is an important aspect that must be met (Abdullah et al., 2019; Cafiero, 2019). Food availability depends on the land area, the population as a provider of labor capital, and experts to raise production and equitable distribution (Laborde et al., 2016; Maetz, 2013).

As the staple food for half the world's population, including Indonesia, rice is a strategic commodity that plays an essential role in food security (Che Omar et al., 2019; Fahad et al., 2018; Suwarto et al., 2015). Therefore, the efforts to increase rice production sustainably is a necessity

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

(Rusliyadi, 2023; Suparwoto, 2019). The expansion of rice fields on the north coast of Java and other square cities is prolonged. Furthermore, even tends to shrink as a result of land conversion, which is difficult to avoid Abdullah et al. (2019); Abu & Soom (2016); Kassy et al. (2021); Laborde et al. (2016); Ruhyana et al. (2020) therefore, that it has an impact on decreasing rice production.

Generally, thirteen strategic food commodities focus on food self-sufficiency and security: rice, corn, soybeans, shallots, garlic, red chilies, cayenne pepper, chicken meat, chicken eggs, beef/buffalo, sugar cane/sugar, and cooking oil. However, in recent years the Government has focused on increasing production in Indonesia's three commodities with the highest consumption levels, namely paddy, corn, and soybeans. Rice is one of the strategic commodities in Indonesia because of its much-needed role in meeting the population's food needs and inflation. There are several indicators used to measure food security (Cafiero, 2019; Candel, 2014; D. Maxwell et al., 2013; Ntshangase et al., 2018) those are: food consumption score (FCS) (Bahta et al., 2017) and household food diversity score (HDDS) (Swindale et al., 2010). Furthermore, shares of food expenditure (PPP) (Yusuf et al., 2018) can capture the utilization dimension. Coping strategy index (CSI) (D. Maxwell et al., 2013; D. G. Maxwell et al., 2017) and household food insecurity access scale (HFIAS) (D. Maxwell et al., 2013), farmer household affordability (DBP) (Yusuf et al., 2018) can capture the dimensions of accessibility and stability. Measuring adequate household food supply per month (MAHFP) (Swindale et al., 2010) and the food subsistence level (TSP) (Rachman et al., 2002) captures food availability and stability.

Most farmers in Asia make rice farming their main livelihood, but it is cultivated on a small scale. This phenomenon contrasts with Australia and the United States, including Latin America, where rice farming has become the main livelihood for their farmers (Firdaus et al., 2020). This phenomenon was also becoming a prominent issue in Indonesia, where structural weaknesses are still inherent in Indonesian farmers, namely narrow land tenure, low education level, family dependents, limited capital, and lack of mastery of technology. This condition causes low production and limited physical and economic access (Firdaus et al., 2020; Samberg et al., 2016; Vaghefi et al., 2016). Nevertheless, farming activities were only carried out to maintain food availability for their families rather than profit-oriented (Abu et al., 2016; Mutea et al., 2019).

There are many efforts to meet the needs of food, which cannot be separated from the characteristics of farmers' households (Yusuf et al., 2018) because it describes the capacity of farmers to meet the needs of food (Ndhleve, et al., 2021). Although the socioeconomic characteristics of farmers are relatively much and varied, the main ones are the farmer's age, education level, principal occupation, and the number of members of the farmer's family. Meanwhile, economic characteristics, including the area of farming land, livestock ownership, and savings ownership, became critical in creating farmers' profit orientation.

Many factors affect household food security, including age, gender, education, remittances, unemployment, inflation, and assets (Ndhleve et al., 2021); farmer capacity (Yunita et al., 2011). Climate change, extension services, increased cost of production facilities, food price instability, income outside the agricultural sector (Ulrich et al., 2012), land area, income structure, and the number of household members (Bogale, 2012; Ndhleve et al., 2021; Omotesho et al., 2006), agroecosystem characteristics, access to irrigation, and soil fertility (Ulrich et al., 2012). However, the determinants of household food security differ due to agroecosystem differences and their needs (Cafiero, 2019).

Commented [MY6R5]: has been repaired according to the suggestions

Commented [OU5]: Rice/ paddy??

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

The southern part of the Ciamis District is a rice development area, but swamp agroecosystems dominate the condition of the area. Meanwhile, in the swamp agroecosystem, farmers can only plant rice once a year in the dry season after the water begins to recede because it is constantly flooded in the rainy season. Ciamis is the one swamp area in Java Island used as a swamp agroecosystem. Swamp rice is the specific variety to grow. It is an exciting location to study. In Southern Ciamis District, rice production in 2020 decreased by 15.1 percent (63,445 tons) compared to the previous year succeeded, even though there was crop failure in several areas (Badan Pusat Statistik Jawa Barat, 2021). Data from Balai Penyuluhan Pertanian (2021) shows that a total of 360 hectares of swamp rice fields in the area can only be planted once a year during the dry season. However, farmers usually always force themselves to plant at the beginning of the rainy season so that it results in losses.

On the other hand, farmers have incurred significant farming costs to run their farms, although often the results of farming itself were not commensurate with the costs incurred and failed in all seasons. This situation traps the farmers, and the farmer survives the situation (Cafiero, 2019; Forero-cantor et al., 2020).

The position of farmers becomes increasingly difficult when faced with the climate change phenomenon as one of the causes of their primary sources of income decreasingly, so the farmers need to look for other sources of income (Pandey et al., 2007; Skoufias et al., 2011; Vaghefi et al., 2016). Several studies have shown that climate change harms food security in most countries in Asia (Gregory et al., 2000). The study that examined the impact of climate change on rice production in East Asia found that extreme weather would reduce rice production by 50% by 2100 (Sekhar, 2018). Farmers need climate information that can help them determine more farming options for farming activities (Wilke et al., 2015). Then the farmers can protect their fields from uncertainty and farming risks. Smallholder farmers' access to food is very limited (Thapa et al., 2011), on average their food needs are met from insufficient self-production until the next harvest period coupled with low productivity causing them to be trapped into food vulnerability (Wildayana et al., 2018; Yusuf et al., 2018). Syuhada et al., (2020) unfavorable swamp agroecosystem conditions cause production instability which in the long run causes low household food security. This research added that the risk of farming is getting higher due to climate change, especially for small farmers who run rice farming in swamp agroecosystems in Indonesia, which can only harvest once a year. Hence, it had the potential to reduce the level of household food security.

Based on several assumptions above, food security can be designed for vulnerable groups of farmer households (Kuzmin, 2016; Rachman et al., 2002). It is because the need for food is a basic human need that must be met at all times. In addition, this present study aims to analyze the factors affecting small farmers' household food security in swamp agroecosystems in Ciamis District.

RESEARCH METHODS

This study was conducted using a survey method to provide an overview of farmers' characteristics, income structure, farming risk, and household food security of small farmers in swamp agroecosystems. Lakbok, Ciamis District was determined purposively by the assumption that there has a swamp agroecosystem. However, this region is a rice center in Ciamis. The survey drove through chosen 247 farmers household from 648 swamp rice farmers based on the Slovin formula

Commented [OU7]: Tampilkan data luas swamp agroecosystems yang digunakan untuk tanam padi dan produktivitasnya menggunakan data time series. Permasalahan dapat berawal dari data2 ini

Commented [MY8R7]: Sudah diperbaiki sesuai saran

Commented [OU9]: How to test the validity and reliability of the questionnaire? How many samples were used in this test and what are the results?

Commented [MY10R9]: has been repaired according to the suggestions

Commented [OU11]: Food availability, energy and protein adequacy levels at the household level are not indicators of food security... the availability of food from swamp agroecosystem production is not clearly defined in the research method. This is very important for the study of food security at the household level

Commented [MY12R11]: based on the references I read, this is one indicator of food security

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

determined it at an error rate is 5 percent using simple random sampling spreaded over four areas (Table 1).

Table 1. Proportional allocation of sample size

No	Village	Population	Sample Size
1	Sukanagara	132	50
2	Kapalasawit	286	109
3	Puloerang	124	47
4	Tambakreja	106	40
	Jumlah	648	247

Source: primary data 2022

The data used in this study included primary data and secondary data. Primary data was obtained directly from the samples through structured questionnaires, in-depth interviews with a few selected respondents and key informants, and FGD (Focus Group Discussion). The questionnaire was tested on 27 respondents who were taken randomly and the results were that all question/statement items in the questionnaire were valid and reliable. Meanwhile, the secondary data was obtained from the Department of agriculture authority, Government statistic institutions, extension agents, and farmers' associations.

Data processing and analysis were performed using descriptive statistics and inferential statistics with SEM (Structural Equation Model) with the AMOS program version 18.0. SEM is a multivariate statistical technique combining factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs. The structural equation model would produce indicators that support the proposed model. Hair et al. (2009) write that there are 7 (seven) stages of structural equation model and analysis: (1) theoretical model development; (2) compiling a path diagram; (3) converting the path diagram into a structural equation; (4) selecting an input matrix for data analysis; (5) assess model identification; (6) evaluate the model estimation, and; (7) interpretation of the model as can be seen in Figure 1.

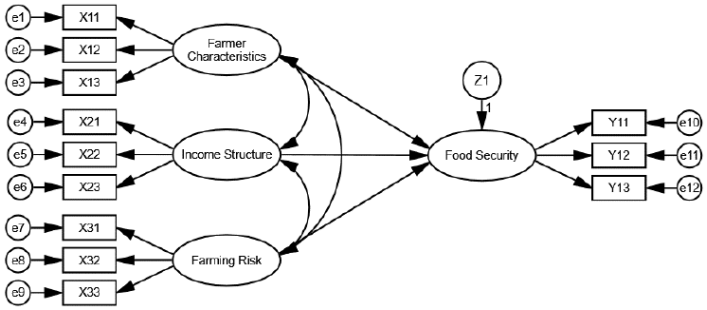

Figure 1. Research method design

Commented [OU13]: Author using regression analysis or SEM?? Two different things. It is not clear which analysis was used

Commented [MY14R13]: has been repaired according to the suggestions

Commented [OU15]: Where does this modeling theory base come from? Without a theoretical basis, this model cannot be justified

Commented [MY16R15]: The journal template does not provide discussion for discussion of theoretical framework so that it is presented in the background.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Figure 1 showed that food security as an endogenous latent variable as measured by indicators Food subsistence level (Y_{11}), Household affordability (Y_{12}), and Food expenditure shares (Y_{13}). This endogenous latent variable is influenced by exogenous latent variables. The exogenous latent variables included the characteristics of farmers (X_1) as measured by indicators age (X_{11}), Education (X_{12}), and Family loads (X_{13}). The exogenous latent variables of income structure (X_2) were measured by the indicators X_{21}, X_{22}, and X_{23}; farming risk (X_3) was measured by the indicators Production Risk (X_{31}), Process Risk (X_{32}), and Income Risk (X_{33}). Both of variable endogenous and exogenous involved in latent variable describing on table 3. All of variables have correlated each other. Therefore, the proper analysis tool is structural equation model (SEM). SEM is a multivariate statistical technique that combines factor analysis and regression (correlation) analysis, which aims to examine the relationship between variables in a model, both indicators and constructs, or relationships between constructs.

This study proposed three hypotheses:

H1 : Farmer characteristics have a positive and significant impact on food security.

H2 : Income structure have a positive and significant impact on food security.

H3 : Farming risk have a positive and significant impact on food security.

The test type is two tailed: positive and negative area of hypothesis. In more detail, the latent variables and indicators can be seen in Table 2.

Off-farm income is the income while waiting for farming time; the farmer works in another profession, such as temporary labor. The farmer will return for planting, maintenance, or harvesting when the farming time comes. The main job is farming. Non-farm income is income from work that is not in farming as the primary job.

There is a high risk of farming; small farmers with limited access will look for other sources of income out of the main farm (on-farm) to meet their household needs. For instance: working as farm laborers (on-farm), selling garden products, cultivating livestock, etcetera (off-farm), and even working out of the agricultural sector (non-farm) as construction workers, trade, firm industry etcetera.

Table 2. The latent variables and Indicators in SEM's model

Latent Variable	Indicators	Scale
Farmers' characteristics (X_1)	Age (X_{11})	Interval
	Education (X_{12})	Interval
	Family dependents (X_{13})	Interval
Income structure (X_2)	Income on-farm (X_{21})	Interval
	Income off-farm (X_{22})	Interval
	Income non-farm (X_{23})	Interval
Farming risk (X_3)	Production risk (X_{31})	Interval
	Price risk (X_{32})	Interval
	Income risk (X_{33})	Interval
Food security (Y_1)	Food subsistence level (Y_{11})	Interval
	Household affordability (Y_{12})	Interval
	Food expenditure shares (Y_{13})	Interval

Commented [OU17]: What is the mathematical model like? How is the hypothesis testing?

Commented [MY18R17]: has been repaired according to the suggestions

Commented [OU19]: Is it true, the use of the SEM model uses an interval scale? Where are the references from?

Commented [MY20R19]: Referring to Sarwono (2010) that one of the SEM assumptions is the data interval

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Source: Primary data 2022

In agriculture, there is often extreme situation containing risk and uncertainty event. The component that may determine farming risk is the risk of production, price, and income. Production risk in swamp rice farming is higher than in lowland (Sulewski et al., 2014). Agricultural production risk is higher than non-agricultural production risk. Sometimes the harvest is abundant, but the price decrease. This caused an income decrease. The component of farming risk was measured by coefficient variation. Statistically, farming risk consisting of production risk, price risk, and income risk can be calculated using the coefficient of variation by looking at the variability that occurs (Hindarti et al., 2021; Mazwan et al., 2020). Production variance and price variance as a measure of production risk and price risk are based on the experience of farmers doing previous farming activities (Siddik et al., 2015).

RESULT AND DISCUSSION

The research began within the primary field survey of the 247 swamp rice crop farmers to reveal their background and knowledge about their profession. Ciamis has a geographical history of swamp land agroecosystem. In Java Island which swamp agroecosystem is only in Ciamis. This area was severely affected by swamp land condition boundaries. The population in area majority lives under the risk toward poverty line and less rice yield as food intake. This risk would increase the concentration and intensity of flood, which is disturbing rice production, farmer income, and food security.

Farmers' Characteristics

Characteristics of farmers are characteristics that are inherent in the farmers themselves. The farmers' characteristics which are the leading research in this present study, have consisted of age, education, experience, and family load:

Commented [OU21]: 1 paragraph consists of at least 2 sentences

Commented [MY22R21]: has been repaired according to the suggestions

Table 3. Farmers' characteristics in swamp agroecosystems

	Description	Amount (person)	Percentage (%)
1	Age (year)		
	a. 15 - 64	201	81
	b. ≥ 65	46	19
	Total	247	100
2	Education level		
	a. Elementary	236	96
	b. Junior	7	3
	c. Senior	4	1
	Total	247	100
3	Experience (year)		
	a. 5 - 20	70	28
	b. 21 - 35	129	52
	c. 36 - 50	48	20
		247	100
4	Family load (person)		
	a. 1 - 3	125	51

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

	Description	Amount (person)	Percentage (%)
b.	4 - 6	122	49
	Total	247	100

Source: Primary data 2022

Table 3 shows that farmers' ages range, from 32 to 71 years old, with an average age of 54 years old, so they are in the span of a productive period. Age is one of the factors related to work ability in carrying out farming activities (Yunita et al., 2011). The number of samples dominated farmers with low formal education. This problem caused the ability to manage lowland rice farming to be optimal productivity. Education is related to their access to food because with higher education, the opportunities to get better jobs are getting bigger to generate more significant income (Nwokolo, 2015). The land area of farmers ranges from 0.04-0.84 hectares with an average of 0.29 hectares which is in the narrow category with the most dominating amount, whereas Omotesho et al. (2010) stated that the land is an asset for farmers in running their or her business which will determine the level of income, the standard of living and welfare.

The experience of farmers in rice farming also varies. Range from 5-50 years with an average of 27 years. Experience is the knowledge that humans collect through their minds and then arrange into a patterned form. A person's experience in farming affected the response to accepting new technologies and innovations (Ntshangase et al., 2018).

This condition shows that the structural weakness of small farmers in rural areas, namely narrow land tenure is still very inherent and causes unequal distribution of income and production. According to Firdaus et al. (2020); Kuok Ho Daniel Tang (2019); Vaghefi et al. (2016), the narrow tenure of land owned can result in farmers being trapped in bare for survival.

The family-loads ranged from one to six people a family with an average of four dependents in a family. The small number of dependents of farming families illustrated those small families in rural areas as the main view of farmers' family members. Thus, it is also related to the proverb of the agrarian society's Javanese culture, assuming that "many children, many fortunes" is still believed. Even in fact, the more the number of family members, the greater the burden of living that must be borne by farmers. Davis et al. (2017); Ndhleve et al. (2021); Nwokolo (2015); Ruhyana et al. (2020) family size will affect the income per capita and household food consumption expenditure.

Formulation Model

Before the data were analyzed using SEM, a number of assumptions were required to be tested first. The results of SEM assumptions and data processing to test the hypothesis consisting of a multivariate outlier test, multivariate normality test, and multicollinearity test all meet the required assumptions.

Commented [OU23]: 1 paragraph consists of at least 2 sentences

Commented [MY24R23]: has been repaired according to the suggestions

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

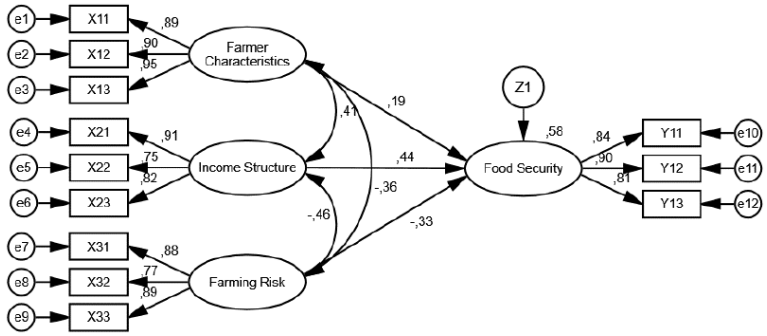

Figure 2. Results of SEM model analysis of farmer household food security in swamp agroecosystems in Ciamis, Indonesia.

This condition was reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

After it fulfilled all the testing assumptions, it could be concluded that the output of the AMOS model, SEM model, and household food security in the swamp agroecosystem in Ciamis Regency is obtained, as seen in Figure 2.

Table 4. Test results on the feasibility of the full SEM model

The goodness of Fit Indeks	Cut-off Value	Result	Conclusion
Chi-Square	Expected small	81.735	Fit
Significance Probability	≥ 0.05	0.068	Fit
RMSEA	≤ 0.08	0.053	Fit
GFI	≥ 0.90	0.947	Fit
AGFI	≥ 0.90	0.914	Fit
CMIN/DF	≤ 2.00	1.703	Fit
TLI	≥ 0.90	0.978	Fit
CFI	≥ 0.95	0.984	Fit
NFI	≥ 0.90	0.962	Fit

Source: Authors computation (2022), n = 247

Table 4 showed a good model fit index, meaning that the model fits the data. Regression estimation for SEM shows that all variables are significant (Table 5), so all hypotheses are accepted.

Table 5. Regression estimate

Variables		b	SE	CR	P	Note
Food security<---	Farmers' characteristics	0.191	0.059	3.323	***	Significant
Food security<---	Income structure	0.439	0.071	6.507	***	Significant
Food security<---	Farming risk	-0.327	0.072	-5.193	***	Significant

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Source: Authors computation (2022), n = 247

Therefore, based on table 5 could be formed the structural equation of the exogenous latent variable to the endogenous latent variable is as follows:

$$Y = 0.191\ X_1 + 0.439\ X_2 - 0.327\ X_3 + e$$

Notification:

Y : Food security
$\beta_1, \beta_2, \beta_3$: Coefficient of regression
X_1 : Farmer characteristic
X_2 : Income structure
X_3 : Risk farming
e : Error

Table 6. Square multiple correlation

	Estimate
Food Security	0.583

Source: Authors computation (2022)

Table 6 showed that food security was explained by farmer characteristics, income structure, and farming risk of 58.3%. The remaining 41.7% is explained by other factors not included in the structural equation model.

Table 7 displayed good reliability and validity construct for the measurement model of the sample. The value of the reliability construct ranged from 0.7248 to 0.8433, while the value of the validity extracted was more significant than 0.5. The results proved the convergent validity by examining the significance of the loadings factor and the shared variance. The variance captured by the construct should be greater than the measurement error (0.5). The structural equation that was formed explained the causal relationship between changes in food security there was a change in farmer characteristics, income structure, and farming risk.

Table 7. Validity and reliability construct

Variables.	Reliability Construct	Variance Extracted
	CR > 70%	AVE > 50%
Farmers' characteristics	84.33%	83.07%
Income structure	72.48%	68.65%
Farming risk	75.17%	75.02%
Food security	75.12%	71.94%

Source: Authors computation (2022)

Discussion

Simultaneously, the three variables' effect on farmer households' food security was 58 percent. The remaining 42 percent is explained by other factors not included in the model. The factor influencing most farmers' food security households is the level of food subsistence ($\lambda = 0.84$). The

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

affordability of farmer households (λ = 0.90); and 3) the share of food expenditure (λ = 0.81) is the income structure reflected by on-farm, off-farm, and non-farm income.

Farming income (λ = 0.91), non-farming income (λ = 0.75), and non-agricultural income (λ = 0.82) were strong determinants of the latent variable of income structure. Thus, farm, non-farm, and non-agricultural income have the greatest potential contribution to household income.

The results of the SEM analysis showed that the coefficient of the income structure influence was positive. On the other hand, the higher income structure reflected by, the higher income from farming, outside farming, and outside the agricultural sector, the better the food security of farmers' households. This condition is suitable because, with high incomes, farmers' access to food becomes more rational. Ndhleve et al. (2021) household income is an essential determinant of household food insecurity because access to food at the household level is determined by household income (Mutea et al., 2019; Silvestri et al., 2015; Tefera et al., 2014) household income is an estimator of household affordability.

On-farm income is one indicator that most strongly reflects the structure of household income (λ = 0.91). On-farm was natural, considering that most farmer households rely on rice farming as farmers' main activity. The analysis showed that the average farmer's income from lowland rice farming was 8,993,229 IDR per hectare per year, with an average contribution of 14 percent to the total household income.

This study's findings align with Abu & Soom (2016); Mutea et al. (2019). In subsistence-to-farmer households, food availability is more determined by food production itself. The findings also indicated that more efforts are needed to increase the farmers' knowledge and skills in utilizing the potential and economic resources of farmer households considering that the source of farmers' income does not only come from rice farming but also from outside the farm, the agricultural sector.

Income structure indicators are income outside the agricultural sector (λ = 0.75) and income outside farming (λ = 0.82). The analysis results show that the average income of farmers outside the agricultural sector was 9,372,206 IDR per year, with an average contribution of 60 percent to the total household income. Meanwhile, the average income of farmers from outside rice farming but still in the agricultural sector was 4,159,753 IDR per year, with an average contribution of 26 percent to total household income.

Non-agricultural activities carried out by low-income farmer households due to narrow land ownership and low production are one of the efforts to obtain additional income to meet household needs. Owusu et al. (2011) found that the influence of income outside the agricultural sector on household food security in Northern Ghana. The research results of Musumba et al. (2022) showed that farming households in rural Sub-Saharan African countries carry out more than one type of work to increase income. The research findings Haggblade et al. (2010) in rural Sub-Saharan Africa concluded that 50 percent in Asia and Latin America, farmers' income from outside the agricultural sector contributes about 35 percent to total household income. According to Alobo Loison (2015); Mutea et al. (2019); Yusuf et al. (2018), work in the agricultural and non-agricultural sectors is an effort for farmers to earn income because income diversification is closely related to efforts to maintain survival in unfavorable conditions. Alobo Loison (2015); Mutea et al. (2019); Niehof (2004); Yaro (2006), It aimed to secure a better standard of living by reducing risk, vulnerability, and poverty and increasing income, security, and wealth.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Farming risk is the second variable that affects the food security of rice farmers' households in the swamp agroecosystem, which is reflected by indicators of production risk, price risk, and income risk. Production risk is the indicator that most strongly reflects farming risk ($\lambda = 0.88$), price risk ($\lambda = 0.77$), and income risk ($\lambda = 0.89$). The influence of production, income, and price risk has the most potential to increase rice farming risk in swamp agroecosystems.

When it looks from the coefficient, which shows a negative sign, this means that the greater risk of farming faced by farmers, the lower household food security. This condition is reasonable considering the facts on the ground show that, on average, farmers face a high risk of farming due to frequent flooding of their fields. Production risks faced by farmers are generally in the form of reduced grain produced due to unpredictable floods. The findings of this study were in line with the research results of Nephawe et al. (2021) insufficient rainfall, pest and disease attacks, and excess rainfall can reduce farm production. The research results of Mutea et al. (2019) also showed that lost yields from production activities are caused by climatic conditions and pests/diseases that attack plants or can lead to low productivity resulting in reduced irrigation water and production inputs. In comparison, the low number of inputs, such as fertilizers, can cause a decrease in rice yields.

Income risk can be assumed as the variable that most strongly reflects farming risk ($\lambda = 0.89$). It can be assumed that the higher the income risk faced by farmers, the lower household food security, considering that farmers have to pay to run their businesses. However, the imbalance between the income earned and the costs incurred causes an income risk. This income risk causes the affordability of farmers to be low, even though, according to Mutea et al. (2019), the income structure owned by farmers will affect their behavior in facing risks to anticipate crop failures. This condition is reasonable considering that the average age of farmers is in the productive age range. It could work more optimally because it would be supported by adequate physical strength. Therefore, they could access other sources of income outside of lowland rice farming.

The countermeasures made by farmers before running rice farming are by preparing large quantities of seeds as reserves because farmers usually do embroidery repeatedly. Facts in the field showed that the use of these seeds reaches 2-3 times the recommended amount. The Lebak swamp has distinctive characteristics, so rice farmers in this agroecosystem are different from farmers working on it Yunita, et al. (2011); Yusuf (2018). Nmadu et al. (2012) stated that to minimize the risk of production due to natural disasters, pests and plant diseases, fires, and other factors whose consequences can be physically calculated and can be overcome by purchasing an agricultural insurance policy. Meanwhile, the risk of a possible decline in production quality can be overcome by applying appropriate cultivation and post-harvest technology. Meanwhile, market risk can be anticipated in several ways, including diversification, vertical integration, forward contracting, future markets, hedging, and agricultural options.

Although some of these strategies have been implemented by some farmers, they still have difficulty overcoming the risks of farming. Therefore, another systematic strategy is needed, for example, through agricultural insurance, an economic institution that functions to manage the risks faced by farmers whose objectives are: 1) stabilizing farmers' incomes by reducing losses due to lost yields; 2) stimulating farmers to adopt technology that can increase production and efficient use of resources, and 3) reduce the risks faced by agricultural credit institutions and increase farmers' access to these institutions. Suryanto et al. (2020); Yulia et al. (2023), agricultural insurance is one of the

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

strategies to adapt to climate change, even in developed countries, including several countries in Asia, developing rapidly and effectively protecting farmers.

Farmer characteristics are the third factor that influences the food security of rice farmers' households in the swamp agroecosystem, which is reflected by age ($\lambda = 0.89$); 2) education ($\lambda = 0.90$), and 3) family dependents ($\lambda = 0.95$). The farmer characteristics meant that age, formal education, and family dependents of farmers could increase household food security. It meant that if farmers' capacity increases, farmers' ability to create household food security will be better.

The strongest indicator that reflects the characteristics of farmers is family dependents ($\lambda = 0.95$). Fewer family responsibilities caused household food security to be high. This characteristic was certainly rational considering that farmers with larger family sizes tend to need more food than farmers with fewer family members. The more members of the household, the greater the burden on farmers, which causes household food expenditure to be more significant so that, in the end, household food security is lower. However, family dependents are also positively related to household income, which means that more and more family members lead to greater and more diverse sources of income that households can access.

The results of the study of Ndhleve et al. (2021) in Botswana and South Africa showed a strong influence of family dependents on household food security. Households with many dependents were more food insecure than households with few family dependents. Households with more family dependents mean more people have to be fed, so they need more food. This characteristic was in line with the findings of (Cafiero, 2019; Silvestri et al., 2015). Musumba et al. (2022) that the food available for one family may not be sufficient to meet the needs of all family members but only sufficient for some of the family members.

This study showed that the average size of the farming family in the study area belongs to a small family where most of the family members also work to earn income to ease the burden on the family. In addition, other family members (children) who work outside the city and have an established economy usually send money routinely as a form of responsibility and dedication to their parents.

Farmers who are highly educated, and older in the sense of being more productive and having a small family size, will also have a higher level of household food security. Income is very important for households to provide food through purchases (Corral et al., 2017; Silvestri et al., 2015; Tefera et al., 2014) that income is very important for households to provide food through purchases.

The higher education farmers have taken causes household food security to be higher which is reflected by the higher affordability and the better quality of food consumed by farmer households. The level of education indicates that a person's knowledge level is broader because of education. Generally, the level of education is positively related to the level of income. It meant that the higher the education completed by farmers, the higher the income earned. Farmers with higher education tend to gain more insight and information related to other sources of income.

In contrast to the research findings of, household food security in Botswana and South Africa is not significantly affected by education level. According to him, education is usually related to the level of income because households with a high level of education usually have more money that can be used to purchase food. Thus the higher the level of education of farmers, the income will also be higher the affordability of households will also be higher. In the end, farmers could improve the quality of the food they eat and tend to choose healthier foods. The findings of this study are in line

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

with Nwokolo (2015); Ruhyana et al. (2020) that higher levels of education are associated with increased household income, livelihood opportunities, and food security.

Although the average level of formal education that farmers did is low, on average farmers, they only need to complete primary education. In general, farmers have other sources of income outside of the rice farming they run, namely from outside the farm, which includes farm laborers, selling garden products, livestock products, and operating agroindustry (sales of bananas and coconut sugar). Meanwhile, sources of income from outside the agricultural sector include construction workers and opening small stalls. The source of income is in line with the research findings of Mutea et al. (2019) that to increase income, farmer households in the mountainous region of Kenya usually sell crops, timber, and livestock, while off-farm income comes from trade and business, remittances, house rent, employment. Legal, transportation services, and other informal jobs.

The little indicator that reflect household food security is age ($\lambda = 0.89$). The more productive a person's age allows them to work more productively. With their physical strength, they will be more productive to work outside their farms and seeking additional income outside the agricultural sector. Farmers of productive age were generally more rational in running their businesses. Thus, the income obtained from farming can be more optimal with the minimum use of labor outside the family, which must be paid directly. Productive age implies that farmers do not only rely on their income from one source of income but also from other sources. Facts on the ground show that apart from working in the agricultural sector, they also work outside it. The results of the research by (Frelat et al., 2016) show that to create household food security, farmers in sub-Saharan Africa, in addition to seeking employment opportunities in the agricultural sector, also work outside the agricultural sector.

CONCLUSION AND SUGGESTION

The food security of smallholder households in swamp agroecosystems in the Ciamis District is significantly influenced by farmer characteristics, income structure, and farming risk. The income structure reflected by on-farm, off-farm, and non-farm income is the variable that has the most substantial influence on food security, followed by farm risk, which is reflected by production risk, price risk, and income risk. Meanwhile, the characteristics of farmers as reflected by age, education, and family responsibilities, although they have a significant effect on food security, have the most negligible effect compared to other variables. According to the result of this study, the development of small agroindustry in rural areas must be carried out to create household food security.

REFERENCES

Abdullah, Zhou, D., Shah, T., Ali, S., Ahmad, W., Din, I. U., & Ilyas, A. (2019). Factors affecting household food security in rural northern hinterland of Pakistan. *Journal of the Saudi Society of Agricultural Sciences*, *18*(2), 1–34. doi: 10.1016/j.jssas.2017.05.003

Abu, G. A., & Soom, A. (2016). Analysis of factor affecting food security in rural and urban farming household of Benue State, Nigeria. *International Journal of Food and Agricultural Economics*, *4*(1), 55–68.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Alobo Loison, S. (2015). Rural livelihood diversification in Sub-Saharan Africa: A literature review. *Journal of Development Studies*, *51*(9), 1125–1138. doi: 10.1080/00220388.2015.1046445

Badan Pusat Statistik Jawa Barat. (2021). Produksi Tanaman Padi. In Produksi Tanaman Padi.

Bahta, S., Wanyoike, F., Katjiuongua, H., & Marumo, D. (2017). Characterisation of food security and consumption patterns among smallholder livestock farmers in Botswana. *Agriculture and Food Security*, *6*(1), 1–11. doi: 10.1186/s40066-017-0145-1

Balai Penyuluhan Pertanian. (2021). *Luas Panen, Produksi, dan Produktivitas Padi di Kecamatan Lakbok*. Lakbok.

Bogale, A. (2012). Vulnerability of smallholder rural households to food insecurity in Eastern Ethiopia. *Food Security*, *4*(4), 581–591. doi: 10.1007/s12571-012-0208-x

Cafiero, C. (2019). Measuring food insecurity. *Food Security Policy, Evaluation and Impact Assessment*, *February 2010*, 169–205. doi: 10.4324/9781351019828-17

Candel, J. J. L. (2014). Food security governance: A systematic literature review. *Food Security*, *6*(4), 585–601. doi: 10.1007/s12571-014-0364-2

Che Omar, S., Shaharudin, A., Tumin, S. A., & The. (2019). The Status of the Paddy and Rice Industry in Malaysia Key Findings of the Report. In Khazanah Research Institute (Issue April).

Corral, P., & Radchenko, N. (2017). What's so spatial about diversification in Nigeria? *World Development*, *95*, 231–253. doi: 10.1016/j.worlddev.2017.02.028

Davis, B., Di Giuseppe, S., & Zezza, A. (2017). Are African households (not) leaving agriculture? Patterns of households' income sources in rural Sub-Saharan Africa. *Food Policy*, *67*, 153–174. doi: 10.1016/j.foodpol.2016.09.018

Fahad, S., Rehman, A., Shahzad, B., Tanveer, M., Saud, S., Kamran, M., Ihtisham, M., Khan, S. U., Turan, V., & ur Rahman, M. H. (2018). Rice responses and tolerance to metal/metalloid toxicity. In Advances in Rice Research for Abiotic Stress Tolerance (Issue December). doi: 10.1016/B978-0-12-814332-2.00014-9

Firdaus, R. B. R., Leong Tan, M., Rahmat, S. R., & Senevi Gunaratne, M. (2020). Paddy, rice and food security in Malaysia: A review of climate change impacts. In Cogent Social Sciences (Vol. 6, Issue 1). doi: 10.1080/23311886.2020.1818373

Forero-cantor, G., Ribal, J., & Sanjuán, N. (2020). Measuring regional differences in food security from access and stability dimensions : A methodological proposal based on elasticities. *Agricultural Economics – Czech*, *66*(3), 112–119. doi: https://doi.org/10.17221/97/2019-AGRICECON

Frelat, R., Lopez-Ridaura, S., Giller, K. E., Herrero, M., Douxchamps, S., Djurfeldt, A. A., Erenstein, O., Henderson, B., Kassie, M., Paul, B. K., Rigolot, C., Ritzema, R. S., Rodriguez, D., Van

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Asten, P. J. A., & Van Wijk, M. T. (2016). Drivers of household food availability in sub-Saharan Africa based on big data from small farms. *Proceedings of the National Academy of Sciences of the United States of America*, *113*(2), 458–463. doi: 10.1073/pnas.1518384112

Gregory, P. J., & Ingram, J. S. I. (2000). Global change and food and forest production: Future scientific challenges. *Agriculture, Ecosystems and Environment*, *82*(1–3), 3–14. doi: 10.1016/S0167-8809(00)00212-7

Haggblade, S., Hazell, P., & Reardon, T. (2010). The rural non-farm economy: Prospects for growth and poverty reduction. *World Development*, *38*(10), 1429–1441. doi: 10.1016/j.worlddev.2009.06.008

Hindarti, S., Rohmatul Maula, L., & Khoiriyah, N. (2021). Income risk and the decision on onion farming. *SOCA: Jurnal Sosial Ekonomi Pertanian*, *15*(1), 202–209. doi: 10.24843/soca.2021.v15.i01.p18

Kassy, W. C., Ndu, A. C., Okeke, C. C., & Aniwada, E. C. (2021). Food security status and factors affecting household food security in Enugu state, Nigeria. *Journal of Health Care for the Poor and Underserved*, *32*(1), 564–581. doi: 10.1353/hpu.2021.0041

Kuok Ho Daniel Tang. (2019). Climate change and Paddy Yield in Malaysia: A short communication. *Global Journal of Civil and Environmental Engineering*, *July*, 14–19. doi: 10.36811/gjcee.2019.110003

Kuzmin, E. A. (2016). Sustainable food security: Floating balance of markets. *International Journal of Economics and Financial Issues*, *6*(1), 37–44.

Laborde, D., Majeed, F., Tokgoz, S., & Torero, M. (2016). Long-Term Drivers of Food and Nutrition Security. *IFPRI Discussion Paper Series*, *May*.

Maetz, M. (2013). Food Security - definitions and drivers. *Hunger Explained* , *31*(November 1996), 1–25.

Maxwell, D., Coates, J., & Vaitla, B. (2013). How do different indicators of household food security compare ? Empirical evidence from Tigray. *Feinstein International Center*, *August*, 1–19.

Maxwell, D. G., & Foundation, M. G. (2017). *The Coping Strategies Index A tool for rapid emergencies Second Edition*. *January 2008*.

Mazwan, M. Z., Ibrahim, J. T., & M Fadlan, W. A. (2020). Risk analysis of shallot farming in Malang Regency, Indonesia. *Agricultural Social Economic Journal*, *XX*(3), 201–206. doi: 10.21776/ub.agrise.2020.020.3.3

Musumba, M., Palm, C. A., Komarek, A. M., Mutuo, P. K., & Kaya, B. (2022). Household livelihood diversification in rural Africa. *Agricultural Economics (United Kingdom)*, *53*(2), 246–256. doi: 10.1111/agec.12694

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Mutea, E., Bottazzi, P., Jacobi, J., Kiteme, B., Speranza, C. I., & Rist, S. (2019). Livelihoods and food security among rural households in the North-Western Mount Kenya Region. *Frontiers in Sustainable Food Systems*, *3*, 1–12. doi: 10.3389/fsufs.2019.00098

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Dominic, M., Nakin, V., Shisanya, S., & Walker, K. P. (2021). Household Food Insecurity Status and Determinants: The Case of Botswana and South Africa. *AGRARIS: Journal of Agribusiness and Rural Development Research*, *7*(2), 207–224.

Ndhleve, S., Dapira, C., Kabiti, H. M., Mpongwana, Z., Cishe, E. N., Nakin, M. D. V., Shisanya, S., & Walker, K. P. (2021). Household food insecurity status and determinants: The case of Botswana and South Africa. *Agraris*, *7*(2), 207–224. doi: 10.18196/agraris.v7i2.11451

Nephawe, N., Mwale, M., Zuwarimwe, J., & Tjale, M. M. (2021). The impact of water-related challenges on rural communities food security initiatives. *Agraris*, *7*(1), 11–23. doi: 10.18196/agraris.v7i1.9935

Niehof, A. (2004). The significance of diversification for rural livelihood systems. *Food Policy*, *29*(4 SPEC.ISS.), 321–338. doi: 10.1016/j.foodpol.2004.07.009

Nmadu, J. N., Eze, G. P., & Jirgi, A. J. (2012). Determinants of risk status of small scale farmers in Niger State, Nigeria. *British Journal of Economics, Management & Trade*, *2*(2), 98–108. doi: https://doi.org/10.9734/bjemt/2012/1284

Ntshangase, N. L., Muroyiwa, B., & Sibanda, M. (2018). Farmers' perceptions and factors influencing the adoption of no-till conservation agriculture by small-scale farmers in Zashuke, KwaZulu-Natal province. *Sustainability (Switzerland)*, *10*(2). doi: 10.3390/su10020555

Nwokolo, E. E. (2015). The influence of educational level on sources of income and household food security in alice, Eastern Cape, South Africa. *Journal of Human Ecology*, *52*(3), 208–217. doi: 10.1080/09709274.2015.11906944

Omotesho, O. A., Adewumi, ; M O, Muhammad-Lawal, A., & Ayinde, O. E. (2006). Determinants of food security among the rural farming households in Kwara State, Nigeria. *African Journal of General Agriculture* ©, *2*(1), 7–15. Retrieved from http://www.asopah.org

Omotesho, O. A., Adewumi, M. O., Adewumi, M. O., & Fadimula, K. S. (2010). Food security and poverty of the rural households in Kwara State, Nigeria. *Libyan Agriculture Research Center Journal International*, *1*(1), 56–59. Retrieved from https://www.researchgate.net/publication/46473090

Opaluwa, H. I., Oyibo, F. O., & Jimoh, F. A. (2018). Determinants of Food Security among Farming Households in Akure North Local Government Area of Ondo State, Nigeria. *Journal of Asian Rural Studies*, *2*(2), 164–172. doi: 10.20956/jars.v2i2.1479

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Owusu, V., Abdulai, A., & Abdul-Rahman, S. (2011). Non-farm work and food security among farm households in Northern Ghana. *Food Policy*, *36*(2), 108–118. doi: 10.1016/j.foodpol.2010.09.002

Pandey, S., Bhandari, H., & Hardy, B. (2007). Economic costs of drought and rice farmers' coping mechanisms: a cross-country comparative analysis. In Journal of Chemical Information and Modeling (Vol. 53).

Rachman, H. P., & Ariani, M. (2002). Ketahanan pangan: Konsep, pengukuran, dan strategi. *Forum Penelitian Agroekonomi*, *20*(1), 12–24. Retrieved from https://ejurnal.litbang.pertanian.go.id

Ruhyana, N. F., Essa, W. Y., & Mardianis. (2020). Sociodemographic factors affecting household food security in Sumedang regency West Java province. *Agraris: Journal of Agribusiness and Rural Development Research*, *6*(1), 38–51. doi: 10.18196/agr.6189

Rusliyadi, M. (2023). Food security police analysis perspective on food self-sufficiency village programme case in Central Java Indonesia. *Agrisocionomics*, *7*(1), 95–113. Retrieved from http://ejournal2.undip.ac.id/index.php/

Samberg, L. H., Gerber, J. S., Ramankutty, N., Herrero, M., & West, P. C. (2016). Subnational distribution of average farm size and smallholder contributions to global food production. *Environmental Research Letters*, *11*(12), 1–13. doi: 10.1088/1748-9326/11/12/124010

Sekhar, C. S. C. (2018). Climate change and rice economy in Asia: Implications for trade policy Background paper for The State of Agricultural Commodity Markets (SOCO) 2018. In Fao.

Siddik, M., Mustadjab, M. M., & Hanani, N. (2015). *Economic Behaviors of Virginia Tobacco Farmers Households in Facing Farming Risks in Lombok Island , Indonesia*. *5*(5), 180–189. doi: 10.5923/j.ijas.20150505.02

Silvestri, S., Sabine, D., Patti, K., Wiebke, F., Maren, R., Ianetta, M., Carlos, Q. F., Mario, H., Anthony, N., Nicolas, N., Joash, M., Lieven, C., & Rufino, M. C. (2015). Households and food security: Lessons from food secure households in East Africa. *Agriculture and Food Security*, *4*(1). doi: 10.1186/s40066-015-0042-4

Skoufias, E., Rabassa, M., Olivieri, S., & Brahmbhatt, M. (2011). *The poverty impacts of climate change*. *51*(June 2014), 1–5.

Sulewski, P., & Kloczko-Gajewska, A. (2014). Farmers' risk perception, risk aversion and strategies to cope with production risk: An empirical study from Poland. *Studies in Agricultural Economics*, *116*(3), 140–147. doi: 10.7896/j.1414

Suparwoto, S. (2019). Produksi dan pendapatan usahatani padi di lahan rawa lebak Kabupaten Ogan Komering Ilir Sumatera Selatan. *SOCA: Jurnal Sosial, Ekonomi Pertanian*, 51. doi: 10.24843/soca.2019.v13.i01.p05

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Suryanto, Gravitiani, E., Daerobi, A., & Susilowati, F. (2020). Crop insurance as farmers adaptation for climate change risk on agriculture in Surakarta residency-Indonesia. *International Journal of Trade and Global Markets*, *13*(2), 251–266. doi: 10.1504/IJTGM.2020.106771

Suwarto, Susanto, U., & Nurchasanah, S. (2015). *Perakitan genotipe Padi Tipe Baru untuk mendukung kemandirian pangan*. *c*, 133–139.

Swindale, A., & Bilinsky, P. (2010). Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guide VERSION 4 Paula Bilinsky Months of Adequate Household Food Provisioning (MAHFP) for Measurement of Household Food Access : Indicator Guid. *Fhi 360*.

Syuhada, A., Armanto, M. E., Siswanto, A., Yazid, M., & Wildayana, E. (2020). Food security and environmental sustainability on the South Sumatra Wetlands, Indonesia. *Systematic Reviews in Pharmacy*, *11*(3), 457–464. doi: 10.5530/srp.2020.3.58

Tefera, T., & Tefera, F. (2014). Determinants of households food security and coping strategies for food shortfall in Mareko District, Guraghe Zone Southern Ethiopia. *Journal of Food Security*, *2*(3), 92–99. doi: 10.12691/jfs-2-3-4

Thapa, G., & Gaiha, R. (2011). Smallholder farming in Asia and the Pacific: Challenges and opportunities. *Conference on New Direction for Smallholder Agriculture*.

Ulrich, A., Ifejika Speranza, C., Roden, P., Kiteme, B., Wiesmann, U., & Nüsser, M. (2012). Small-scale farming in semi-arid areas: Livelihood dynamics between 1997 and 2010 in Laikipia, Kenya. *Journal of Rural Studies*, *28*(3), 241–251. doi: 10.1016/j.jrurstud.2012.02.003

Vaghefi, N., Shamsudin, M. N., Radam, A., & Rahim, K. A. (2016). Impact of climate change on food security in Malaysia: economic and policy adjustments for rice industry. *Journal of Integrative Environmental Sciences*, *13*(1), 19–35. doi: 10.1080/1943815X.2015.1112292

Waha, K., van Wijk, M. T., Fritz, S., See, L., Thornton, P. K., Wichern, J., & Herrero, M. (2018). Agricultural diversification as an important strategy for achieving food security in Africa. *Global Change Biology*, *24*(8), 3390–3400. doi: 10.1111/gcb.14158

Wildayana, E., & Armanto, M. E. (2018). Lebak swamp typology and rice production potency in Jakabaring South Sumatra. *Agriekonomika*, *7*(1), 30–36. doi: 10.21107/agriekonomika.v7i1.2513

Wilke, A. K., & Morton, L. W. (2015). Climatologists' patterns of conveying climate science to the agricultural community. *Agriculture and Human Values*, *32*(1), 99–110. doi: 10.1007/s10460-014-9531-5

Yaro, J. A. (2006). Is deagrarianisation real? A study of livelihood activities in rural northern Ghana. *Journal of Modern African Studies*, *44*(1), 125–156. doi: 10.1017/S0022278X05001448

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol (No): page-page, Issue Year

Yulia, D. M., Rachmina, D., & Feryanto. (2023). Farmer's decision to take credit in Indonesia. *Agrisocionomics*, *7*(1), 126–143. Retrieved from http://ejournal2.undip.ac.id/index.php/

Yunita, Ginting B, Asngari Pang S, Susanto Joko, & Amanah Siti. (2011). Ketahanan pangan dan mekanisme koping rumah tangga petani padi sawah lebak berdasarkan status kepemilikan lahan. *Jurnal Ilmu Keluarga & Konseling*, *4*(1), 21–29. doi: https://doi.org/10.24156/jikk.2011.4.1.21

Yusuf, M. N. (2018). *Strategi ketahanan pangan rumah tangga petani dalam menghadapi risiko: Suatu kasus pada petani padi di daerah rawan banjir Kabupaten Pangandaran Propinsi Jawa Barat* [Disertasi]. Universitas Padjadjaran.

Yusuf, M. N., Sulistyowaty, L., Sendjaja, T. P., & Carsono, N. (2018). Food security analysis of household paddy farmer in flooding area. *Journal of Economics and Sustainable Development*, *9*(8), 88–90. doi: 10.7176/JESD

6. Bukti Konfirmasi Artikel Accepted (17 Oktober 2023)

LOA AGRISOCIONOMICS JOURNAL

1 message

Agrisocionomics Undip <agrisocionomicsundip@gmail.com> 17 October 2023 at 14:17
To: muhamadnurdinyusuf@unigal.ac.id

Dear Author(s)

On behalf of the Agrisocionomics committee, we are pleased to inform you that your paper has been accepted and will be proceeded to publication in the Agrisocionomics: Journal of Agricultural Socio Economic and Policy **Volume 08 No 01, March 2024** issue.

You are requested to complete the payment (IDR 1,000,000) within 5 working days. After making payment, kindly send us the digital copy of your payment receipt for our record to our email address and confirm via WhatsApp to 081805171761. The payment should be addressed to:

Account holder : Suryani Nurfadilah
Bank name : BANK BNI
Account number : 1117235300

Thank you for submitting your work to our journal. Please don't hesitate to contact us if you have any further questions. For the contact number is 085731743929 (Kadhung Prayoga).

Regards.

Yusuf, 2024.pdf
182K

7. Bukti Konfirmasi Artikel Published Online
(14 Maret 2024)

[Agrisocionomics] New Issue Published - Vol 8, No 1 (2024): March 2024

2 messages

Kadhung Prayoga <mail@ejournal2.undip.ac.id> 14 March 2024 at 13:48
Reply-To: Kadhung Prayoga <kadhungprayoga@gmail.com>
To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>

Readers:

Agrisocionomics: Jurnal Sosial Ekonomi Pertanian has just published its latest issue at https://ejournal2.undip.ac.id/index.php/agrisocionomics. We invite you to review the Table of Contents here and then visit our web site to review articles and items of interest.

Thanks for the continuing interest in our work,
Kadhung Prayoga
Faculty of Animal and Agricultural Sciences, Diponegoro University
Phone +6285731743929
kadhungprayoga@gmail.com

Agrisocionomics: Jurnal Sosial Ekonomi Pertanian

Vol 8, No 1 (2024): March 2024
Table of Contents
https://ejournal2.undip.ac.id/index.php/agrisocionomics/issue/view/1315

Articles

Author(s): *Ba'itsuddin 'Adlih*, *Kadhung Prayoga*, *Joko Mariyono*
DOI: https://doi.org/10.14710/agrisocionomics.v8i1.17962

- DETERMINANTS OF HOUSEHOLD FOOD SECURITY: AN EVIDENCE FROM SMALL FARMER IN SWAMP AGROECOSYSTEMS IN CIAMIS, INDONESIA (pp. 166-182)
  Author(s): *Muhamad Nurdin Yusuf*
  DOI: https://doi.org/10.14710/jekk.v%25vi%25i.17988

- AGRICULTURAL EXTENSION DURING THE NEW NORMAL ERA (pp. 183-192)
  Author(s): *Andi Warnaen*, *Nurlaili Nurlaili*, *Yastutik Yastutik*, *Dowi Karunia*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18035

- INCOME ANALYSIS OF MAIZE FARMERS ON RUBBER PLANTATION HIATEN LAND UTILIZATION SUNGEI PUTIH RESEARCH UNIT (pp. 193-204)
  Author(s): *Trydha Yanti Ginting*, *Rini Mastuti*, *Supristiwendi Supristiwendi*, *Bulkaini Bulkaini*
  DOI: https://doi.org/10.14710/jekk.v%25vi%25i.18040

- THE EFFECT OF FOOD PRICE VOLATILITY (FPV) ON INFLATION IN PAREPARE CITY (pp. 205-215)
  Author(s): *Andi Nixia Tenriawaru*, *Ayu Anisa Amir*, *Siti Hardiyanti Syam*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18081

- EXPORT PERFORMANCE OF INDONESIAN BLACK PEPPER IN THE UNITED STATES MARKET (pp. 216-230)
  Author(s): *Anita Carolin Aprilia Tarigan*, *Suharno Suharno*, *Harmini Harmini*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18116

- FACTORS INFLUENCING WORKING MOTIVATION OF AGRICULTURAL EXTENSION AGENTS IN CENTRAL JAVA PROVINCE (pp. 231-241)
  Author(s): *Warsana Warsana*, *Wulan Sumekar*, *Yanuar Luqman*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18207

- MEASURING THE SATISFACTION AND LOYALTY LEVEL OF MILLENNIAL FARMERS: A CASE STUDY ON SUGARCANE FARMING IN THE PARTNERSHIP BETWEEN FARMER AND PTPN XI EAST JAVA (pp. 242-259)
  Author(s): *Ahadyah Ayu Umaiya*, *Irham Irham*, *Hani Perwitasari*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18351

- UNCERTAINTY IN THE RICE SUPPLY CHAIN DURING PRE AND POST PANDEMIC - A CROSS CASE OF AGRICULTURAL COOPERATIVES IN INDONESIA (pp. 260-287)
  Author(s): *Rosyadi Rosyadi*, *Adi Wijaya*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.18713

- OPTIMIZATION OF GEDONG GINCU MANGO DISTRIBUTION COSTS IN MAJALENGKA DISTRICT (pp. 288-309)
  Author(s): *Jaka Sulaksana*, *Ida Marina*, *Inka Fatimah*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.19404

- SUPPLY CHAIN ANALYSIS OF RICE MARKETING ACTORS IN DUMAI CITY IN SUPPORTING URBAN FOOD SECURITY (pp. 310-321)
  Author(s): *Fanny Septya*, *Yulia Andriani*, *Sispa Pebrian*, *Roza Yulida*, *Rosnita Rosnita*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.19791

- COLLABORATION AMONG FARMER'S AND INTERMEDIARY TRADERS IN MARKETING OF GREENHOUSE HYDROPONIC PRODUCTS IN GREATER MALANG (pp. 322-335)
  Author(s): *Ni Made Gita Santhika Dewi*, *Ketut Budi Susrusa*, *Gede Mekse Korri Arisena*, *Ary Bakhtiar*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.19825

- COCOA MARKETING CHANNEL ANALYSIS IN MARGOLEMBO VILLAGE, MANGKUTANA DISTRICT, EAST LUWU REGENCY (pp. 336-349)
  Author(s): *Heliawaty Heliawaty*, *Didi Rukmana*, *IIn Wulan Khotimah*
  DOI: https://doi.org/10.14710/agrisocionomics.v8i1.17978

---

agrisocionomics@gmail.com

Kadhung Prayoga <mail@ejournal2.undip.ac.id> 14 March 2024 at 13:49
Reply-To: Kadhung Prayoga <kadhungprayoga@gmail.com>

To: "Dr. Muhamad Nurdin Yusuf" <muhamadnurdinyusuf@unigal.ac.id>

[Quoted text hidden]