ISSN: 0067-3064

LIVELIHOOD DIVERSIFICATION OF RICE FARMING HOUSEHOLDS IN INDRAMAYU DISTRICT, WEST JAVA, INDONESIA

Wiwik Ambarsari[12*], Lies Sulistyowati[3], Trisna Insan Noor[3], Eliana Wulandari[3]

[1*]Agricultural Science Study Program, Faculty of Agriculture, Universitas Padjadjaran, Sumedang 45363, Indonesia
[2] Department of Agribusiness, Faculty of Agriculture, Universitas Wiralodra, Indramayu, 45213, Indonesia
[3] Department of Agricultural Socio-Economics, Faculty of Agriculture, Universitas Padjadjaran, Sumedang 45363, Indonesia
**) Correspondence email: wiwik19001@mail.unpad.ac.id*

ABSTRACT

Rice farming households with limited capital often employ various strategies to diversify their livelihoods for life sustenance. Therefore, this study aims to determine the effect of the household capital of rice farmers on livelihood diversification in Indramayu District. A survey method was utilized and data were obtained from 214 rice farming households, which were selected using the proportional simple random sampling technique. The data obtained in this study were analyzed using the partial least square method. The results showed that the household capital of rice farmers had a positive and significant effect on livelihood diversification. Based on these findings, the recommendation for the government to carry out policies by increasing rice farmer household capital in order of priority of physical capital, natural capital, financial capital, social capital, and human capital. Then, the government and stakeholders who have an interest (such as academics, business actors, community, and media) synergistically and collaboratively in opening new livelihoods in rural areas for rice farming household members in the future so that livelihoods continue and achieve prosperity for rice farming households in rural areas.

Keywords: entropy index, livelihood diversification, Partial Least Square, rice farming households

INTRODUCTION

Rice farming households are known to play a crucial role in generating national revenue due to their contribution to the agricultural sector. Previous reports have shown that paddy rice commodities solely account for approximately 60% of the income generated in this sector in Indonesia (Ministry of Agriculture, 2020). However, a concerning trend has emerged, where the ownership of rice fields is becoming increasingly limited. A previous survey among 15.89 million agricultural households showed that each of them owned an average of 0.5 hectares of land (Ministry of

Agriculture, 2020). The decreasing ownership of paddy fields has led to a decrease in the overall area of rice cultivation and a reduction in production. Over the last 5 years (2015-2019), Indonesia has witnessed a significant decrease of 27.58% in the rice production (Indonesia Central Bureau of Statistics, 2017, 2020), leading to decreased income for farming households. Consequently, these households are struggling to meet their basic needs, and their standard of living has been adversely affected.

Indramayu District was selected as the location for this study due to its prominent status as a rice production center. The agricultural conditions in this area are characterized by subsistence farming practices and high susceptibility to various risks. These risks include drought during the dry season, flooding in the rainy season, and reduced paddy fields due to seawater intrusion (Indramayu Regency Central Bureau of Statistics, 2021). To mitigate these conditions, rice farming households have adopted livelihood diversification strategies to obtain additional income. Smallholder farmers, in particular, are more inclined to diversify their livelihoods to minimize variations in revenue (Ellis, 1999). The diversification strategy can reduce stress, such as floods, droughts, and diseases(Anani, 1999; Otundo Richard, 2019), as well as provide security and improved standard of living (Ellis, 1999). Rural households with this strategy are also better positioned to develop more robust and less vulnerable assets compared to others (Gebru et al., 2018).

The diversification of agricultural livelihoods provides benefits for environmental sustainability. Diversifying crops can stabilize the productivity of cropping systems, decrease negative environmental impacts, and reduce biodiversity (Fanchone et al., 2020; Hufnagel et al., 2020). The implementation of this strategy outside farming (*off-farm diversification*) provides additional income through farm labor and entrepreneurial activities (Akhtar et al., 2019). However, rice farming households affected by limited land area and low income often find it difficult to cultivate high-value cash crops, making diversification unsuccessful (Damanhuri et al., 2017). Various factors have also been identified to inhibit the diverseness of agricultural livelihoods, such as poor market access, market instability, limited government support, and high input costs (Akhtar et al., 2019). Other factors include limited labor, unavailability of standard superior seeds of commercial commodities, low fertilizer (Hermanto & Wahyuni, 2019), less supportive irrigation infrastructure, and low soil quality (Burchfield & Poterie, 2018; Qiu et al., 2019). These challenges have motivated rice farming households to explore non-agricultural employment opportunities. Empirical studies have shown that the integration of non-agricultural jobs provides benefits for these households in terms of food security (Rachman et al., 2006), increased income, and reduced poverty rates (Rahut et al., 2017; Loison, 2019; Gebretsadik et al., 2020). Engaging in agricultural, non-agricultural activities, or their combination has a positive impact on income and welfare (Abimbola O & Oluwakemi A, 2013). In developing countries, approximately 50% of income is derived from non-agricultural activities, money transfers, and pension payments (Ellis & Allison, 2004). A report in Indonesia revealed that non-agricultural enterprises contributed 68.91% of farming household income (Simatupang et al., 2016). Therefore, it is important for rice farmers, specifically those with limited farming areas to explore non-farm diversification as an opportunity to access non-farm opportunities and alleviate poverty.

Livelihood diversification varies among rice farming households, depending on how the available resources and abilities are minimized. According to (Ellis, 1999), the resources or assets owned by a household determined its ability to develop strategies to meet basic needs. In the context of livelihood approaches, these resources are often referred to as capital. Ellis & Allison (2004) and Ellis & Freeman (2005) stated that are five types of capital, including human (education, skills, and health), social (networks and associations), natural (water, land, trees, and others), physical (investment in the form of goods), and financial (money, savings, access to loans). A study by (Ding et al., 2018) revealed that household capital had a significant effect on livelihood strategies in Inner Mongolia, China. This is consistent with (Gebru et al., 2018; Salam & Bauer, 2020), where rural households used their free time to engage in non-agricultural activities in Bangladesh. Higher education, male labor, and infrastructure have been reported to have a positive and significant effect on the diversification of non-agricultural employment opportunities. Meanwhile, the age of the household head, the farming experience of the head, and the ownership of land have a negative and significant influence. This indicates that young workers have the opportunities to get wage jobs and entrepreneurship in non-agricultural activities.

These findings are inconsistent with (A. S. Loison, 2019), who stated that the age household head had a positive and significant effect on verified livelihoods. Based on this result, the elderly are expected to have enough wealth and experience to invest in non-agricultural activities. The level of job diversity of each rice farmer household in an area has a relationship with the capital. The livelihood diversification level (diversity of livelihoods in the household) has a negative insignificant association with farming area ownership and exploitation (Nuryanti & Swastika, 2016; Susilowati et al., 2002), as well as a positive relationship with the number of working household members (Nuryanti & Swastika, 2016; Susilowati et al., 2002). Furthermore, it has a negative and weak association with land tenure and land concession area (Nuryanti & Swastika, 2016).

Previous studies on livelihood diversification obtained different findings, but the variables were independent. Previous reports have also utilized household capital in determining livelihood diversification. The application of covariance-based and variance-based Structural Equation Modeling (SEM) in this context has been relatively rare. Analytical methods, such as logit regression models, multinomial logit, and SEM have been. reported to have several weaknesses, primarily requiring normal distribution and standardized units of measure. To address these limitations, livelihood diversification was facilitated by combining the five capitals owned by rice farming households (human, social, natural, physical, and financial) as material for exogenous variable constructs. This study used the *entropy index*, as well as the diversification of agricultural and non-agricultural jobs as materials for endogenous variable constructs of livelihood diversification. The analysis tool used was the SmartPLS software program due to its numerous advantages, namely, it did not require normal distribution, standardized units of measure (nominal, ordinal data, ratio data), and a high number of respondents compared to SEM-CB (Monecke & Leisch, 2012; Astrachan et al., 2014). Therefore, this study aims to analyze the effect of the household capital of rice farmers on livelihood diversification in Indramayu District. The empirical results predicted that household capital had a significant effect on livelihood diversification.

This study used a framework for determining the capital-based livelihood diversification of rice farmer households by compiling an econometric model. The capital from rice farmer households construct was first completed (human, social capital, physical, natural, and financial) based on the perception of the respondents. A livelihood diversion construct (the value of the level of livelihood distribution marked by the entropy index, diversification of agricultural livelihoods, and diversification of non-agricultural livelihoods) was also assessed based on their perception. Subsequently, the two constructs were connected and an analysis was carried out using the partial method of SmartPLS tools. In the next chapter, a discussion and conclusion were carried out.

RESEARCH METHOD

Study Area

Indramayu District was selected as the study location because it was the largest rice producer in West Java Province, Indonesia, and the location of the respondents was determined gradually. All sub-districts in the district were then grouped into several categories, including areas close to markets, cities, tourism, and industries. This categorization was carried out considering the fact that the livelihoods of households, particularly those engaged in farming could differ depending on their proximity to these areas (Canagarajah et al., 2001; Sharpley & Vass, 2006; Hariz et al., 2015). Furthermore, one sub-district was selected randomly using an excel program representative of the Eastern, Central, and Western regions, namely Juntinyuat, Indramayu, and Patrol Districts, respectively. One village was also selected randomly using an excel program representing the selected sub-districts, including Juntinyuat Village in Juntinyuat District, Teluk Agung Village in Indramayu District, and Patrol Village in Patrol District. The position of the study location is presented in the Map of Indramayu District, as shown in Figure 1.

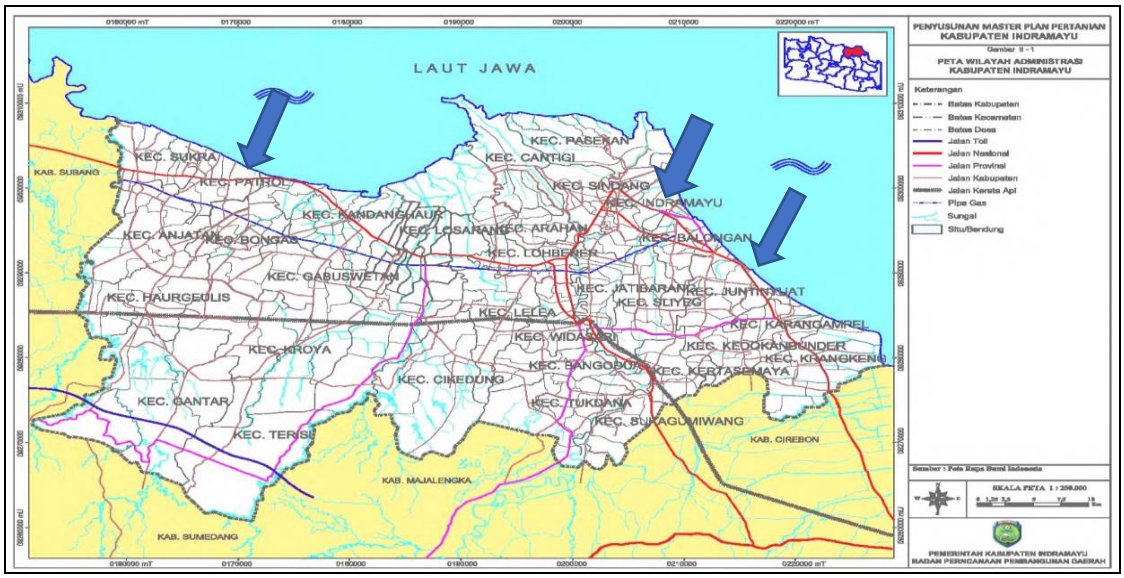

Figure 1. Map of Indramayu District Administration Area

Indramayu District was geographically located at 107°52' – 108°36' East Longitude and 6°15' – 6°40' South Latitude, with the shape of its topography being plain. The average slope of the soil was 0 – 2 percent, which caused waterlogging during high rainfall. The coastline was 147 km, and the high air temperature ranged from 22.9°C – 30°C. Furthermore, the climate conditions had 97 rainy days and a rainfall volume of 1,411 mm. The height of the district was 3 meters above sea level, and the total land area was 2,099.42 Km^2. The number of villages was 317, with a total of 31 sub-districts (Indonesia Central Bureau of Statistics, 2017).

Sampling Procedure and Data Collection

The respondents from rice farmer households were selected using proportional simple random sampling. One Farmer Group Association (FGA) was randomly selected using an Excel program from each village represented based on a location determination. FGA were represented by Junti Rahayu Association in Juntinyuat Village (Eastern region), Beberanjaya Association in Indramayu Village (Central), and Setia Karya Association (Western). The three farmer groups (FG) were randomly selected using an Excel program from each FGA. FGs were represented by FG Sejahtera, Srijunti, and Mawar in FGA Junti Rahayu (Eastern region). Jembulu, Kupu Jaya, and Karangasem FGs were representatives in Beberanjaya Association (Central region). Meanwhile, FG Tani Subur, Luwih Makmur, and Tani Makmur were found in FGA Setia Karya (Western region). The sample population of this study consisted of members of nine farmer groups. The sample size of respondents was determined proportionally from each number of farmer group members, and the calculation results produced 214 participants. The participants from the rice farming households had a minimum paddy field area of 0.5 hectares. Primary data were obtained with the survey method using structured questionnaires from rice farmer households. Other data were obtained from observations of respondents and their environmental conditions.

Household Capital of Rice Farmers

Capital was a resource that became a household livelihood asset. This study examined the utilization of household capital to achieve livelihood diversification using five types of capital (Ellis, 1998; Scoones, 2015), namely human, social, natural, physical, and financial.

- Human capital referred to the resources possessed by the head of the household and its members, which was expressed outwardly and could be cultivated. The role of humans was to facilitate the functioning of the other four capitals, including natural, physical, financial, and social. The human capital used in this study included age, experience, and skills.
- Social capital is a resource owned by households, which could be used to mobilize humans to optimize the other three household capital. The social problems in this study included trust (honest, orderly, and cooperative behavior) and social networks (bonding/homogeneous community with family/friends/neighbors, bridging/heterogeneous, and land tenure institutions).

- Natural capital referred to a resource available in nature, which had direct and indirect benefits in nature sustainability. Furthermore, its benefits included providing nutrient cycling and protection from erosion and storms. This study employed different natural capital, including the availability of water and water sources, land tenure, climate change, environmental services, and biodiversities.
- Physical capital was a means of carrying out livelihood diversification activities and the aspects utilized in this study included infrastructure and its condition (roads, markets, and others), agricultural tools and machinery, as well as access to agricultural technology (communication networks).
- Financial capital was a household resource used to diversify livelihoods and the aspects examined included sources of income, access to credit, and sources of capital.

Characteristics of Rice Farmer Household Respondents

The characteristics of the respondents for the heads of rice farming households tend to be dominated by male sex (93.93 percent), elderly 60+ years (33.18 percent), low level of education (42.06 percent), very experienced in farming (>70 percent) causing livelihood diversification to tend towards agriculture. Advanced age (Akter et al., 2020; Yussuf & Mohamed, 2022) and male gender (Yussuf & Mohamed, 2022) have an influence positif on livelihood diversification sustainability. With household members working other than the head of the household, livelihoods can increase household income in meeting life's needs (Gebru, et al., 2018; Ma, et al., 2019; Loison, 2019). The characteristics of the respondents are presented in Table 1.

Table 1. Characteristics of Respondent Rice Farming Households

No	Characteristics of Rice Farming Households	Category	Number of Respondents of Rice Farming Households (Percent)
1	Age of Head of Household	1= aged 25-29 years	0,47
		2= aged 30-34 years	2,80
		3= aged 35-39 years	3,74
		4= aged 40-44 years	11,21
		5= aged 45-49 years	13,08
		6= aged 50-54 years	21,03
		7= aged 55-59 years	14,49
		8= aged 60+ years	33,18
2	Gender of Head of Household	1 = Male	93,93
		2 = Female	6,07
3	Marital Status of Head of Household	1= not married	0,93
		2= married	90,65
		3= widower	5,61
		4= widow	2,80
4	Education Level of Head of Household	1= no school	8,41
		2= did not finish elementary school	30,37
		3= graduated from elementary school	42,06
		4= Junior High School graduate	7,94
		5= graduated from high school	8,41
		6= graduated from university	2,80

Table 1. (*continue*)

No	Characteristics of Rice Farming Households	Category	Number of Respondents of Rice Farming Households (Percent)
5	Household Head Farming Experience	1=for 1-14.4 years (less experience)	19,16
		2=14.5-27.8 years (quite experienced)	21,50
		3=27.9-41.2 years (experienced)	28,04
		4=41.3-54.6 years (very experienced)	26,17
		5=54.7-68 years (very experienced)	5,14
6	Working rice farmer household members (WHM)	1 = category 1-2 WHM	75,23
		2 = category 3-4 WHM	24,30
		3 = category 5-6 WHM	0,47

A description of the exogenous variables and measuring indicators used in constructing the capital of rice farmer households is presented in Table 2.

Table 2. Description of Household Capital Measurement Indicators of Rice Farmers

Manifest Variables	Indicators	Definition	Parameters	Scale Unit	X and Y Relationship Hypothesis	Analysis Tools	Reference
Exogenous Latent Variables of Household Capital of Rice Farmers (X)							
Human Capital (X_1)	Age ($X_{1.1}$)	Life Duration of the Head of the Household	Year	Ratio	+-/Sig.	Binary logistic models; Multiple linear model-index entropy	(Ntwalle, 2019; Susilowati, 2017)
	Farming experience ($X_{1.2}$)	The length of time the head of the household has been in farming	Year	Ratio	+/Sig.	Multiple Regression -Index Simpson	(Khatun & Roy, 2012)
	Farming skills ($X_{1.3}$)	Types of skills mastered due to the training followed	Likert scale	Ordinal	+/Sig.	Tobit Models and Double-hurdle Models	(Weldegebriel, 2017)
Social Capital (X_2)	Belief ($X_{2.1.}$)	The level of honesty, order, and cooperation in groups	Likert scale	Ordinal	-	-	(Ellis, 1998; Serrat, 2017)
	Social networks ($X_{2.2}$)	Relationships between relatives and friends (*bonding* capital), social organizations (*bridging capital*), land tenure institutions	Likert scale	Ordinal	-	-	(Naithani & Saha, 2021)
Natural Capital (X_3)	Availability of water and water source ($X_{3.1}$)	The existence of a water source to ensure irrigation water for is always available for plants in each growing season	Likert scale	Ordinal	-	-	(Ellis & Allison, 2004)
	Soil ($X_{3.2}$)	Narrower paddy field land tenure and land topography	Likert scale	Ordinal	+/Sig.	Logit model; multinomial logit; Spearman's correlation analysis	(Demie & Zeray, 2016; Kassie et al., 2017; Qiu et al., 2019)(Musumba et al., 2022)

Table 2. (*continue*)

Manifest Variables	Indicators	Definition	Parameters	Scale Unit	X and Y Relationship Hypothesis	Analysis Tools	Reference
Exogenous Latent Variables of Household Capital of Rice Farmers (X)							
	Climate change ($X_{3.3}$)	Climate change conditions (temperature, rainy days, rainfall, solar intensity) affect crop production in the field	Likert scale	Ordinal	+/Sig.	Binary logistics	(Weldegebriel & Prowse, 2017);(Ponce, 2018;Ntwalle, 2019)
	Environmental services ($X_{3.4}$)	Environmental services are obtained from natural beauty, agricultural agrotourism.	Likert scale	Ordinal	-	-	(Ellis & Allison, 2004)
	Biodiversity ($X_{3.5}$)	Various living things that remained preserved in rice fields, such as ground snakes, eels, and microorganisms.	Likert scale	Ordinal	-	-	(Ellis & Allison, 2004)
Physical Capital (X_4)	Infrastructure and its condition ($X_{4.1}$)	Good physical condition on farm roads, irrigation networks, agricultural markets, and internet networks.	Likert scale	Ordinal	+/Sig	Multinomial logit; riview literature	(Davis & Pearce, 2000; S. A. Loison, 2015)(Musumba et al., 2022)
	Agricultural tools and machinery ($X_{4.2}$)	Agricultural equipment owned and its conditions for farming	Likert scale	Ordinal	-	-	-
	Access to agricultural technology ($X_{4.3}$)	Skills in using agricultural tools and machinery, post-harvest technology and its processing, communication tools, and the internet	Likert scale	Ordinal	+/Sig.	Treatment effects (TE) model	(Leng et al., 2020)
Financial Capital (X_5)	Sources of income ($X_{5.1}$)	Various sources of income come from on-farm (crops and livestock), off-farm (labor wages, rent of tools, machinery, and land), and *non-farm* (labor wages, pension funds, stalls, delivery)	Likert scale	Ordinal	+/Siq.	Multinomial logit; econometrics; regression model	(Davis & Pearce, 2000; Demie & Zeray, 2016; A. S. Loison, 2019)(Nguyen et al., 2019)
	Ease of credit access ($X_{5.2}$)	There is easy access to credit, such as: ownership of land certificates, status of arable land tenure, family relationships, friends, and participation in groups/institutions	Likert scale	Ordinal	+/Sig.	Mixed method;exploratory factor analysis; bivariate and multinomial probit	(Reardon, 2010; Bayu, 2018; Akhtar et al., 2019; Rehan, 2020)(Musumba et al., 2022)
	Sources of capital ($X_{5.3}$)	Working capital obtained from various sources, such as: personal capital, family loans / about a / friend, government assistance, banks, middlemen/entrepreneurs, and agricultural kiosks.	Likert scale	Ordinal	-	censored regression model	(Wulandari et al., 2021)

Livelihood Diversification

Diversification in livelihood approaches was a phenomenon of strategies for household survival. Livelihood diversification was crucial as it could improve job security and living standards (Ellis, 1998). Rural areas often had two types, including

diversification of agricultural and non-agricultural livelihoods. The diversity of each household was determined by the values obtained from the diversity index (entropy index). The value of the level of livelihood diversity mainly depended on the members of the working household and the type of livelihood performed (Susilowati et al., 2002: Nuryanti & Swastika, 2016; Susilowati, 2017).

Livelihood Diversification Index Analysis

Livelihood Diversification Index analysis was carried out to determine the degree of livelihood heterogeneity (on-farm, off-farm, and non-farm) of rice farmer household members. Furthermore, it was determined using the entropy index formula (Jacquemin & Berry, 1979; Gollop & Monahan, 1991; Thiele & Weiss, 2003), which was largely affected by the amount of labor working in a certain livelihood and the number of household members engaged in all types of jobs. The closer the value of the index entropy was to 1, the more diversified the livelihood of a rice farmer household. The closer the value was to 0, the more specialized the livelihood of the rice farmer household. Several studies on the entropy index in Indonesia had been carried out by (Susilowati et al., 2002; Nuryanti & Swastika, 2016; Susilowati, 2017). Mathematically, the entropy index (Jacquemin & Berry, 1979) could be written as follows:

$$\text{Ɛ} = -\sum_{i=t}^{n} \rho i \, Ln\rho i \qquad (1)$$

$$\rho i = \text{I/L} \qquad (2)$$

where:

Ɛ : Entropy index, $0 \leq \text{Ɛ} \leq 1$

ρi: the proportion of household members working on the n^{th} type of job to the number of household members working on all types of livelihood

I: the number of household members working on the i^{th} type of job

L: the number of household members working on all types of livelihood

n: the amount of job type done as a household livelihood (1, 2, …)

Entropy index value:

- If the value of Ɛ was 1, the diversification of household members was carried out on all types of livelihood in a balanced manner.
- If the value of Ɛ was 0, no diversification of household members was performed (the livelihood is specialized).

The result of the entropy index analysis of rice farmer household livelihood diversification in Indramayu District was used as the measurement indicator consisting of the endogenous variable construct of livelihood diversification, as shown in Table 3.

Diversification of Agricultural Livelihood

Diversification of agricultural livelihoods was carried out to provide new job opportunities in rural areas. Furthermore, *on-farm* diversification in the form of *crop diversification* was a livelihood strategy to adapt to climate shocks (Piedra-Bonilla et al., 2020). According to previous studies, there were various types of plant diversification,

including multiple cropping, *intercropping*, *relay cropping*, and *sequential planting* (Mu'min et al., 2014; Rosa-Schleich et al., 2019; Ho et al., 2021). Livestock potential had also been discovered in rice-based household economies. Intensive animal husbandry through diversification of crop-livestock systems provided additional income for farming households in rural areas (Ugwumba et al., 2010; Munandar et al., 2015; Asante et al., 2018). The diversification of livelihoods outside farming (*off-farm diversification*) involved wage labor and entrepreneurship (land rent, agricultural machinery rental, and others). Diversifying livelihoods beyond farming could be used to generate more income and addresses seasonal unemployment (Suratiyah, 1994). This study used the diversification of agricultural livelihoods to provide additional income through respondents' perceptions of rice farming households, as shown in Table 3.

Diversification of Non-Agricultural Livelihoods

The diversification of non-agricultural livelihoods was a new livelihood strategy to build better assets (investment) in rural areas (Gebru et al., 2018). Furthermore, it was aimed at minimizing household variability, mitigating the impact of losses from climate change, providing employment, generating additional income (Conway & Chambers, 1992; Barrett et al., 2001; Ellis & Freeman, 2005), guaranteeing consumption expenditure (Ellis & Freeman, 2005; Kassie et al., 2017), and reducing poverty rates (Rahut et al., 2017). Some types of *non-agricultural* livelihood integration included tailors, trades, restaurants and food vendors, basket weaving, ceramic pot makers, rope makers, GSM (*Global System for Mobile*) *airtime* voucher sales, hairdressers, poultry raising, and others (Bayu, 2018; Nneka & Rafiu, 2020; Van den Broeck & Kilic, 2019). Diversification of non-agricultural livelihoods was used in this study based on respondents' perceptions of rice farming households in terms of providing additional income and savings. The diversification as a part of endogenous variable constructs of livelihood diversification is presented in Table 3.

Table 3. Description of Livelihood Diversification Measurement Indicators

Endogenous latent variables	Manifest variables (Indicators)	Definition	Parameters	Scale Unit	X and Y Relationship Hypothesis	Analysis Tools	Reference
Livelihood Diversification (Y)	Value of Livelihood Diversification Level (Y_1)	The level of diversity of livelihoods based on the number of working household members and the number of types of work	Entropy Index	Ratio	+/Sig	(Multinomial logit; correlation coefficient; multiple linear models)	(Susilowati et al., 2002; Swastika et al., 2016; Susilowati, 2017)
	Diversification of Agricultural Livelihoods (Y_2)	The diversity of agricultural livelihoods provides additional income	Likert scale	Ordinal	-	-	-
	Diversification of Non-Agricultural Livelihoods (Y_3)	The diversity of non-agricultural livelihoods provides additional income and savings	Likert scale	Ordinal	-	-	-

Based on findings, empirical studies formed a theoretical concept model of diversification of rice farmer household livelihood. The conceptual model was formed from the constructed exogenous latent variable constructs of rice farmer household capital and endogenous latent variable constructs of livelihood diversification (Table 2 and 3). The theoretical concept of this model aimed to provide answers to the hypothesis of the study objectives, as shown in Figure 2. The provisional estimation was that the capital construct of rice farmer households had a significant influence on the construct of livelihood diversification.

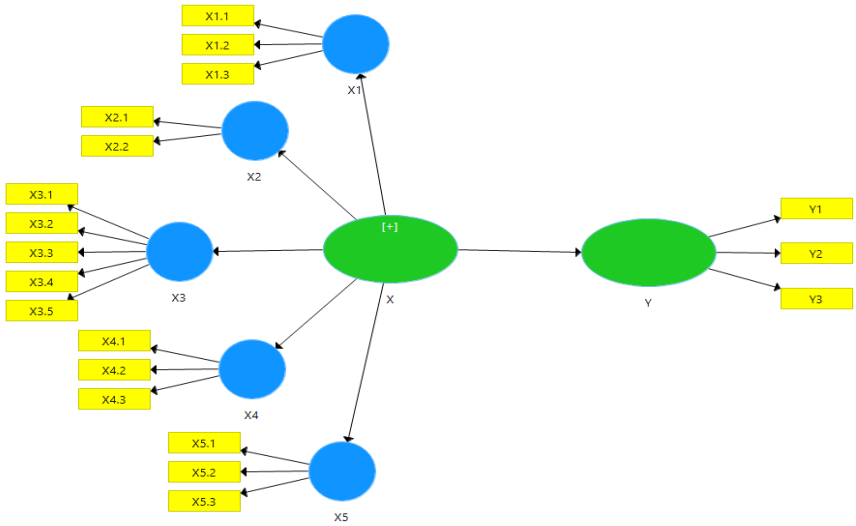

Figure 2. Conceptual Model of Household Livelihood Diversification

Partial Least Square

The data analysis was carried out using the *Structural Equation Modeling -Partial Least Squares* (SEM-PLS) SmartPLS program version 3.0. The program was used to test the relationships or predictive influences between constructs in high complexity, as well as to develop theories. The advantages of the SEM-PLS method SmartPLS program version 3.0 included being independent of the normality of the data measurement scales, the number of samples ranged from 30 to 100 (most the better), the relationship of indicators could be used in the form of reflective type and formative type, latent variable scores were explicitly estimated, and optimal implications for prediction accuracy. However, this method was limited by its ability to only read data in csv (*comma delimited*) form (Chin, 1998; Haryono, 2016).

The stages of analysis using the SmartPLS program version 3.0 included designing structural models (inner models), designing outer models, compiling path diagrams, converting path diagrams into equations, estimating parameters, evaluating models, and testing hypotheses. The formulation of the structural model could be specified(Chin, 1998; Haryono, 2016) as follows:

$$\eta_j = \sum_{ij} \gamma_{ji} \xi_i + \zeta_j \qquad (3)$$

Where (η_i) is an endogenous latent variable, along the index range i, γ_{ji} (gamma) is the coefficient of the pathway connecting the endogenous latent variable of livelihood diversification (η_i) with the latent variability of exogenous household capital of rice farmers (ξ_i). A parameter ζ_j is *the residual inner* variable. The reflective relationship in this study indicated that indicators were reflections or manifestations of their latent variables. Indicator assumptions X_{ij} and Y_{ij} were a linear function of its latent variable. The measurement model equation (outer model) (Chin, 1998) is written as follows:

$$X_{ij} = \lambda_{ij} \xi_i + \delta_{ij} \quad (4)$$

$$Y_{ij} = \lambda_{ij} \eta_i + \varepsilon_{ij} \quad (5)$$

Where Xij is a manifest/indicator variable on an exogenous latent variable (ξi), Yij is a manifest/indicator variable on an endogenous latent variable (ηi), λij is the loading factor coefficient for exogenous and endogenous latent variables, δij is the measurement error on the manifest variable/indicator for exogenous latent variables, and εij is the measurement error on the manifest/indicator variable for endogenous latent variables. Assumptions from measurement models where E(ε) = 0, E(δ) = 0, ε does not correlate with η, ξ, and δ. Similarly, δ does not relate with η, ξ, dan ε.

Evaluation of the Measurement Model (Outer Model)

The evaluation of the indicator measurement model involved three stages (Chin, 1998; Haryono, 2016), namely: 1) convergent validity (item reliability, internal consistency or composite reliability, average variance extracted), 2) discriminant validity, and 3) collinearity statistics. Convergent validity measured the magnitude of the correlation between constructs and latent variables or the extent to which the indicator could explain the dimensions. The greater the convergent validity value, the greater the ability of the indicator to carry out the latent variable. Convergent validity was tested based on three factors, including item reliability (validity of each indicator), composite reliability, and extracted average variance (AVE).

The reliability items were tested based on the value of goods from the standardized loading factor (SLF). The value of the loading factor referred to the magnitude of the correlation between each measurement item (indicator) and its construct. Furthermore, the SLF value of ≥ 0.7 was considered to be ideal, where the indicator was declared valid to measure the construct formed. SLF values of ≥ 0.5, < 0.5, and < 0.4 were declared acceptable, excluded from the model (Chin, 1998), and unsuitable, respectively (Wold et al., 2010). The squared value of the loading factor was known as commonalities. The value of commonalities indicated the percentage e construct and described the variance present in the indicator.

Composite reliability was carried out to assess the internal consistency, and the construct was measured using the specified indicator. The statistics used to assess composite reliability included Cronbach's alpha and D.G. rho (PCA) (Hult et al., 2022) [79]. Cronbach's alpha and D.G rho (PCA) limit values of ≥ 7.0 indicated the presence of high reliability of the measuring instrument. The limit value of composite reliability (C.R) ≥ 0.8 was declared very satisfactory (Haryono, 2016). The Composite Reliability (CR) formula was:

$$CR = \frac{(\sum \lambda i)^2}{(\sum \lambda i)^2 + (\varepsilon i)} \quad (6)$$

Where CR is composite reliability, ∑λi is the sum of the loading factors to-i, and εi is the residual measurement indicator for variable to-i.

Average Variance Extracted (AVE) was the average value of variance described by the construct items. AVE standard value of at least 0.5 indicated that the construct had good convergent validity. A good convergent validity showed that the latent variables could account for more than half of the variance of the indicators (Wold et al., 2010). Furthermore, the AVE value was obtained from the sum of the squares of the loading factor divided by the error. The formula of Average Variance Extracted (AVE) is:

$$AVE = \frac{\sum \lambda i^2}{\sum \lambda i^2 + \sum \varepsilon i} \quad (7)$$

Discriminant validity was carried out to ensure that each indicator in the latent variable construct had a higher loading factor compared to other constructs. Furthermore, the value was calculated for each indicator of the contract. The measure of discriminant validity was that the root value of AVE must be higher compared to the correlation between the constructs. The value of AVE must be higher than the square of the correlation between constructs (Chin, 1998).

Inspection of the assumption of collinearity statistics was performed to assess whether there were symptoms of multicollinearity. Furthermore, multicollinearity was a symptom of two or more exogenous constructs having a high relationship (correlation), leading to low model predictability. The multicollinearity in SmartPLS referred to the collinearity statistic, measured by Variance Inflated Factor (VIF). A VIF standard value of at least 10.0 was considered ideal (Hult et al., 2022).

Structural Model Evaluation (Inner Model)

Structural model evaluation (inner model) aimed to evaluate the relationship between latent variables. Furthermore, could evaluate from the path coefficient, R-square, and Goodness of Fit (GoF) Index.

Structural models had evaluated for feasibility by looking at the significance of relationships between constructs. The magnitude of the strength of the relationship between constructs could be seen in the path coefficient value. The t-test value or critical ratio was obtained from the path coefficient through the bootstrapping process (resampling method). The advantage of the bootstrapping process from the path coefficient could be used for freely distributed data (Wold et al., 2010). The study hypothesis on structural models had missed path coefficients. The significance of the study hypothesis could be seen from the effects between exogenous latent variables and endogenous latent variables marked by H_0: $\gamma i = 0$ (receive H_0) or H_1: $\gamma i \neq 0$ (accept H_1).

The coefficient of determination (R-square) or R^2 was used to determine the magnitude of the endogenous construct described by the exogenous construct. Criteria R-square values ranged from 0.67 (strong), 0.33 (moderate/moderate), to 0.19 (weak) (Chin, 1998)**.** The higher the R^2 value, the better the prediction model.

The Goodness of Fit (GoF) index was a single measure for validating measurement and structural models. The GoF value was obtained from the root of the average communalities index value multiplied by the average R^2 value of the model. Furthermore, the value of commonalities was determined from the square of the loading factor. Communalities referred to the percentage of constructs used to explain the variance in the indicators. The GoF index formula (Wold et al., 2010) was:

$$\text{GoF} = \sqrt{Average\ COM\ x\ Average\ R^2} \qquad (8)$$

RESULT

Evaluation of the Inner Model

Evaluation of measurement models on indicators included checking individual item reliability, internal consistency or composite reliability, average variance extracted, and discriminant validity.

Reliability Item

Figure 3 showed that all loading factors were above 0.5, indicating that there was no need for allowance (Table A in Appendix A). Apart from showing the validity of the items of each indicator, the loading factor also indicated the number of contributions of each variable manifest to its variables. The variable capital of rice farmer households was described in 5 dimensions, including human, social, natural, physical, and financial capital.

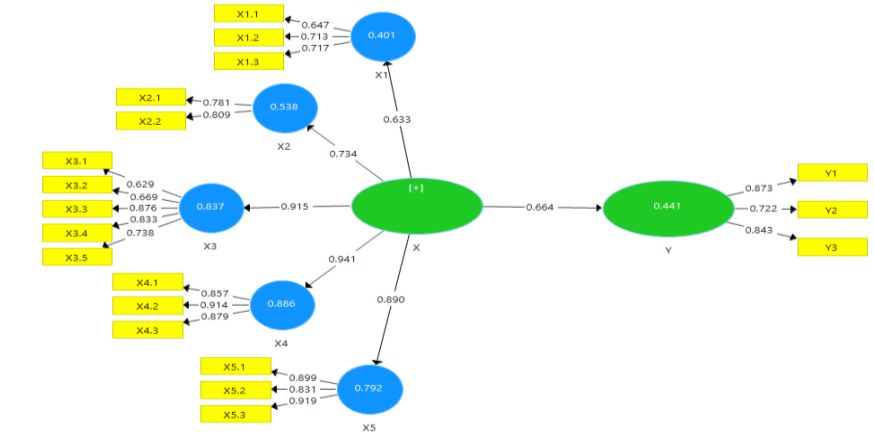

Figure 3. Standardized Loading Factor Inner and Outer Model

The indicator in the human, social, natural, physical, and financial capital dimensions with the highest loading factor was farming skills ($X_{1.3}$) (0.717), social networking ($X_{2.2}$) (0.809), climate change ($X_{3.3}$) (0.0876), agricultural equipment and machinery ($X_{4.2}$) (914), and source of capital ($X_{5.3}$) (0.919), respectively. Among the five dimensions, the loading factor of physical capital (X_4) (0.941) and natural capital (X_3) (0.915) had more contribution to the household capital of rice farmers. The variable of

livelihood diversification in the indicator that was greater than the loading factor was the value of livelihood diversification level (Y_1), namely 0.873.

Composite Reliability and Average Variance Extracted (AVE)

All dimensions of both the exogenous latent variable of household capital and the endogenous latent variable of livelihood diversification obtained *a composite reliability* value above 0.7, as shown in Table 4. This indicated that all factors had good reliability as a measuring instrument. Furthermore, the *average variance extracted* (AVE) was above 0.5 for all dimensions in the exogenous latent variable of household capital and endogenous latent variable of livelihood diversification (Table 4). Both constructs had good *convergent validity, and the* latent variable could explain more than half of the *variance* of its indicators.

Table 4. Composite Reliability and AVE Results

Code	Dimensions/Variables	AVE	Composite Reliability
X_1	Human capital	0.560	0.734
X_2	Social Capital	0.632	0.774
X_3	Natural Capital	0.570	0.867
X_4	Physical Capital	0.781	0.915
X_5	Financial Capital	0.781	0.914
Y	Livelihood Diversification	0.664	0.855

Discriminant Validity

The reflective measurement was evaluated through *a discriminant validity* test based on *cross-loading* values. Based on Table 5, the *discriminant validity or loading factor* for age ($X_{1.1}$) was 0.647.

Table 5. Discriminant Validity Results

Code	X1	X2	X3	X4	X5	Y
X1.1	**0.647**	0.191	0.293	0.275	0.233	0.384
X1.2	**0.713**	0.181	0.214	0.272	0.277	0.444
X1.3	**0.717**	0.341	0.441	0.499	0.471	0.408
X2.1	0.149	**0.781**	0.522	0.576	0.383	0.315
X2.2	0.425	**0.809**	0.389	0.494	0.596	0.541
X3.1	0.246	0.378	**0.629**	0.510	0.463	0.324
X3.2	0.353	0.320	**0.669**	0.536	0.567	0.456
X3.3	0.435	0.548	**0.876**	0.726	0.665	0.442
X3.4	0.393	0.449	**0.833**	0.655	0.579	0.384
X3.5	0.376	0.430	**0.738**	0.743	0.462	0.282
X4.1	0.469	0.668	0.699	**0.857**	0.659	0.558
X4.2	0.513	0.585	0.726	**0.914**	0.649	0.543
X4.3	0.443	0.530	0.817	**0.879**	0.741	0.485
X5.1	0.397	0.497	0.722	0.688	**0.899**	0.511
X5.2	0.394	0.566	0.457	0.550	**0.831**	0.548
X5.3	0.534	0.585	0.723	0.789	**0.919**	0.623
Y1	0.527	0.504	0.477	0.572	0.582	**0.873**
Y2	0.462	0.376	0.333	0.434	0.455	**0.722**
Y3	0.451	0.436	0.398	0.440	0.506	**0.843**

The correlation of age indicators ($X_{1.1}$) was higher on human capital (X_1) compared to social (X_2), natural (X_3), physical (X_4), financial capital (X_5), and degree of diversification (Y), with a correlation of 0,191, 0,293, 0,275, 0,233, and 0,384, respectively. The correlation of trust indicators ($X_{2.1}$) was higher on social capital (X_2) (0.781) compared to human (X_1), natural (X_3), physical (X_4), financial capital (X_5), and degree of diversification (Y), with a correlation of 0,149, 0,522, 0,576, 0,383, and 0,315, respectively. All indicators had a higher correlation with their latent variables compared to other variables. This indicated that the indicator placed on each variable was correct.

Structural Model Evaluation

Path Coefficient

The t-test was generated from *the bootstrapped path coefficient*. Uji t was used to determine the significance of the effect of farmer household capital on livelihood diversification in Indramayu District, as presented in Figure 4 and Table 6, based on the findings, there was no need for allowance (Table A in Appendix A).

The results of the t-test analysis in Table 6 showed that the t-statistics was 12.636, which was less than the t-table of 1.96 at a significance level of 5 percent. *The p-value was* 0.000 < a confidence level of 5 percent (α=0.05), indicating the rejection of H_0 and acceptance of H_1.

Based on this finding, there was a significant influence of the household capital of rice farmers on the diversification of livelihoods. A positive path coefficient indicated that the higher the household capital of rice farmers, the higher the livelihood diversification.

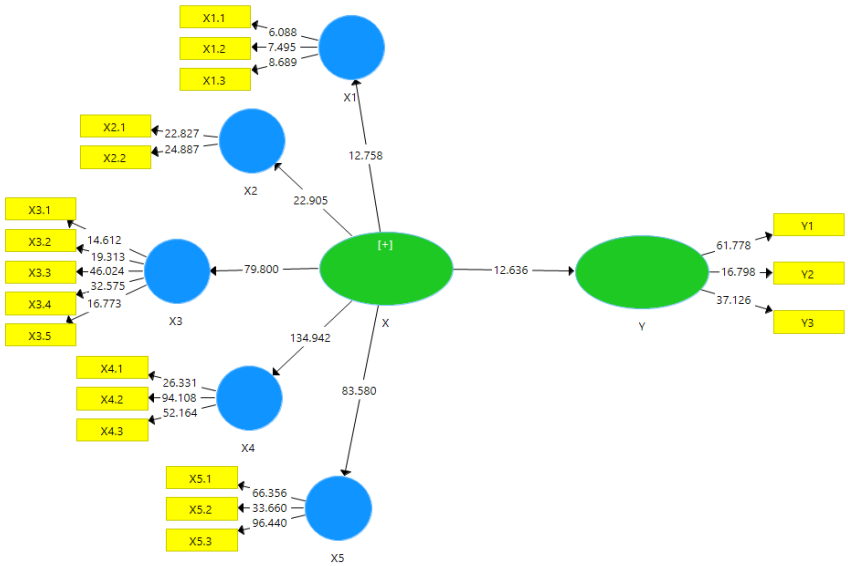

Figure 4. T-Value Inner and Outer Model

Table 6. Results of Path Coefficient of Direct Influence

	Original Sample (O)	Standard Error (STERR)	T-Statistics (|O/STERR)	P-Value	R-Square
X → Y	0.664	0.053	12.636	0.000	0.441

R-Square

The R-square value of 0.441 in this study was moderate, indicating that the model was good, as shown in Table 6. The effect of the household capital of rice farmers on livelihood diversification was 44.1 percent, while the remaining 55.9 percent could be attributed to factors outside the model.

Good of Fit (GoF)

The Goodness of Fit (GoF) was used to validate the model as a whole. The calculation results in Table 6 showed that the GoF value was 0.541, which was obtained through the square root of the mean multiplication of R-Square with the mean commonalities value as shown in Table 7. GoF values above 0.33 were categorized as moderate or moderately good, indicating that the model had conformed to empirical data.

Table 7. GoF Results

	R Square	The Value of Communality
Y	0.441	0.644*
GoF		0.541

Note: * (Table B in Appendix A)

After the measurement and structural models were declared valid, the reliability equation of the structural model with the magnitude of the R-Square influence of 44.1 percent is presented below:

$$Y = 0{,}664X + \zeta \qquad (9)$$

This equation had interpreted as livelihood diversification is a life strategy in Indramayu District, which it had influenced by the household capital of rice farmers.

DISCUSSION

The analysis results of the livelihood diversification model of rice farmers in Indramayu District showed that household capital had a positive and significant impact on livelihood diversification. This finding was consistent with (Illu et al., 2021) that all household capital (human, social, natural, physical, and financial capital) positively and significantly impacted living strategies. Another study by (Ellis, 1998, 1999) stated that to reach livelihood diversification, the ability to combine the available household capital was essential. The more complete capital components combined, the higher the value given by the capital, leading to higher livelihood diversification.

This discussion focused more on the loading factor result as an indicator of the highest contribution in all capital dimensions of latent exogenous variables in this study, hence it is statistically recommended to be prioritized. The order of capital dimension with the highest contribution to rice farmer household capital as the exogenous latent variable (X) was physical (X_4), natural (X_3), financial (X_5), social (X_2), and human capital (X_1). The livelihood diversification index (Y_1) was the best indicator of diversification as an endogenous latent variable (Y). Based on this finding, to fix the livelihood diversification, the improvement of the index must be prioritized.

The physical capital dimension value (X_4) on household capital of rice farmers (X) could be improved by alternatively prioritizing farming tools and machinery indicators ($X_{4.2}$) due to their ability to give the highest contribution. The repair of farming tools and machinery as physical capital to increase the household capital variable was effective in increasing the livelihood diversification variable. Rice farmers in Indramayu District only had simple farming tools and machinery, such as hoes, sickles, choppers, *kenca* (rice spacing tool), handsprayers, *gebotan* (simple grain and straw separator), pumping machines, tractors, and *grabagan* (grain and straw separator machine), to increase their farm production. According to (Sushma et al., 2022), the adoption of machinery was the determinant factor of rice production. (Vortia et al., 2019) also stated that the use of machines in mechanizing production could save time, increase production, decrease unemployment, increase income, as well as increase consumption and food safety. The simplicity of owned farming tools led to the utilization of leisure time for off-farm activities, such as renting farming tools and machinery or freelance farming, aside from on-farm diversification for additional income. As studied by (McCarthy & Sun, 2009), female participation in off-farm activities was more dominant compared to males who tended to participate in on-farm activities to decrease labor scarcity. Therefore, it was crucial to improve and increase the ownership of farming tools and machinery to reach livelihood diversification for additional income.

Climate change indicator ($X_{3.2}$) had the highest contribution to the natural capital dimension (X_3) in increasing rice farmer household capital variable (X). Rice farmer households, in facing the impact of extreme climate, carried out non-farm part-time jobs around Indramayu District to survive and improve household welfare. Furthermore, they depended on skills and experiences, such as construction, trading, and carpentry. This was consistent with (Lopez-Ridaura et al., 2018), that part-time farmers and poor farm laborers tended to be resilient in facing extreme climate change due to their vast source of income, and ability to migrate to non-farm jobs. Rice farmer households also harvested horticultural products with high economical value, such as cauliflower, red onion, chili, watermelon, and melon in Indramayu District. This was supported by (Paut et al., 2019), that harvesting these products could lower the risk in production. According to (van Zonneveld et al., 2020), farming diversification in the form of crops and commercial plants could become a safety net during uncertain weather conditions, which caused fluctuation in price. Therefore, it was important to improve the skills and knowledge of rice farmer households in facing fluctuating climate through farming instructors.

Financial capital dimension (X_5) could increase rice farmer household capital variable (X) in Indramayu District by prioritizing the increase in capital source indicator ($X_{5.3}$). Loans that were easy, fast, and based on agreement, were one of the main capital sources. Furthermore, loans were often obtained from family, relatives, neighbors,

friends, wholesalers, loan sharks, or farm stalls. Apart from loans, government aid was another source in the form of nature, such as rice seeds, liquid organic medicines, and fertilizer subsidies. As stated by (Akhtar et al., 2019), farm credit or loans positively and significantly impacted farm livelihood diversification towards off-farm activities, such as working as farm laborers, or entrepreneurs by renting farming tools and machinery. Rice farmer households in Indramayu District tended not to take loans from banks due to their belief that these institutions had complicated terms and conditions, prolonged processes, one-sided payment methods, and low compliance with the agreement. Furthermore, the interest and liabilities required were considered rather arduous. This kind of loan was often obtained by rice farmer households to diversify their livelihood towards non-farm activities, such as gravestone making, selling in the market, selling phone credits, or engaging in game rentals. Weldegebriel (2017) stated that formal credits positively and significantly affected non-farm livelihood diversification in rural areas. This indicated that it was important for banks to adjust their loan system based on the conditions and ability of rice farmer households in these rural areas, such as adjusting the amount of loan to the real-time cost and input needs or agreeing to repayments at the end of each harvest period.

Prioritizing the increase of social networking indicator in social capital (X_2) was required, as it had the highest contribution ($X_{2.2}$) in increasing rice farmer household capital (X) in Indramayu District and livelihood diversification. This was carried out by maintaining good relationships with family, neighbors, friends, and land tenure agencies. This good association was built from acquaintance and trust between individuals and social institutions, thereby strengthening humans to reach other capitals. Yuliastuti et al., (2018) stated that social infrastructures, such as trust, joint actions, as well as social networking could strengthen the society as a social capital. As maintained by rice farmer households in Indramayu District, the good relationship opened access to trust, information, as well as capital for livelihood diversification, both for farming and non-farming activities. Farming land tenure agencies showed trust by giving leases, profit sharing, mortgages, and labor as forms of continuity guarantee of on-farm livelihood diversification. This was consistent with (Yamin & Dartanto, 2016) finding that social capital, through bonding and bridging had been empirically proven to decrease the severity of poverty.

Donation of human capital dimension (X_1), by prioritizing farming skills ($X_{1.3}$) could increase rice farmer household capital (X). Human labor was one of the resources that supported the agribusiness model (Djuwendah et al., 2018). The increase in farming skills of the head of the family could increase the capital, and facilitate diversification (Weldegebriel, 2017). Over the years, farming skills were often inherited by the head of the household, either from parents, friends, instructors, or even self-obtained. The farming skills implemented to diversify farming livelihood included utilization of an on-farm crop rotation system (rice-rice-other crops), intercropping on the same land (tomato, red onion, cucumber), as well as integrating rice and cows as crops and cattle. Off-farm activities using farming tools and machinery were also carried out by rice farmers in their spare time to diversify livelihood. Professional operators could get high wages by having the skill to operate farming tools and machinery. According to (Huffman & El-Osta, 1997), off-farm operators were highly demanded in America with promising wages. Farming skills must be improved through the use of the internet, technology, and communication

innovations. This was aimed at broadening their insights regarding several issues, from the quality and price of seeds, fertilizer, and pesticides, cultivation techniques for each type of plant, to the target market and its marketing. Therefore, these skills need to be improved through technical guidance by farming instructors from government programs regarding commercial plant diversification, training on the usage of modern farming tools and machinery, as well as the provision of internet facilities in rural areas.

The indicator of the livelihood diversification index (Y_1) provided the best information on the endogenous latent variable of livelihood diversification (Y). The index was the value of the entropy index, which measured the distribution of household members working on various livelihoods (on-farm, off-farm, and non-farm). The diversification index of rice farmer households in Indramayu District was about 1,00 showing equal distribution of members working in various professions. However, the mean index was relatively quite low in all households, being approximately 0.33. The higher the value obtained in a family, the better their welfare (Gebretsadik et al., 2020). Based on these findings, it was essential to increase the index to achieve better welfare. The role of both central and local government was important, by opening new jobs in the non-farm sector or giving technical guidance to households having small businesses until they succeed in the market.

The aforementioned issues in increasing rice farmer household capital must be prioritized by the government of Indramayu District in making policies. Livelihood sustainability in rice farmer households will continue, so support and attention from the central and local governments were needed, specifically in the local government's commitment to aiding access to livelihood diversification of the household of rice farmers. The implementation priority in this study was to (1) give proper farming tools and machinery based on location as well as technical guidance until success was achieved during usage, (2) train households to diversify crops and cattle to anticipate climate change, (3) aid financial capital through government banks by giving easy terms and conditions as well as adjusting loan based on real-time annual production input cost and the size of cultivated land, (4) aid social networking to land tenure agencies by giving access to governmental land as usable land, and (5) improve farming skills holistically by providing technical guidance, such as training in governmental programs, and facilitate internet network.

This study had several limitations, such as rice farmer household capital affecting livelihood diversification by only 44,1 percent, while numerous other factors could also affect the variable in this structural model. Furthermore, supportive institution variable could be added to help and support rice farmer households to increase their capital. This indicated that a more holistic explanation regarding livelihood diversification could be provided in the next structural model of study.

CONCLUSION AND RECOMMENDATION

This study showed that rice farmer household capital positively and significantly affected livelihood diversification in Indramayu District. The indicators that must be prioritized from each capital to facilitate diversification in descending order included farming tools and machinery (physical), climate change (natural), capital source (financial), social networking (social), and farming skills (human). The livelihood

diversification index was also prioritized for improvement to increase the rate at which the household diversified. Thus, the role of government is needed in the sustainability of rice farming household livelihoods. Future studies related to supportive institution variables were encouraged to support rice farmer household capital in affecting livelihood diversification, thereby leading to a bigger effect in the model. Habib et al., (2023) confirmed the findings that the five capitals in poor households have a good influence on livelihood diversification and the contribution of livelihood diversification to alleviating rural poverty in developing countries. This study shows that increasing the livelihood capital of rice farming households is very important as a policy recommendation for the government in increasing livelihood diversification to achieve prosperity in rural areas for developing countries. In addition, it is essential for the government, business actors, academics, media, and farmer households to promote livelihood diversification in the survival of rice farming households.

Apendix A

Table A. Results of SmartPLS analysis of measurement models and structural models

Variable manifest/Indicator	Description	Original Sampel (O)	Standard Deviation (Stdev)	T-Value (O/Stdev)	VIF (outer model)
Rice Farmers' Household Capital (X)					
X_1	**Human Capital**	**0.633**	**0.050**	**12.758**	**-**
$X_{1.1}$	Age of household head	0.647	0.106	6.088	1.417
$X_{1.2}$	Experience of household head	0.713	0.095	7.495	1.449
$X_{1.3}$	Skills of household head	0.717	0.083	8.689	1.027
X_2	**Social Capital**	**0.734**	**0.032**	**22.905**	**-**
$X_{2.1}$	Trust	0.781	0.034	22.827	1.075
$X_{2.2}$	Social network	0.809	0.033	24.887	1.075
X_3	**Natural Capital**	**0.915**	**0.011**	**79.800**	**-**
$X_{3.1}$	Water and water sources	0.629	0.043	14.612	1.355
$X_{3.2}$	Land	0.669	0.035	19.313	1.447
$X_{3.3}$	**Climate change**	**0.876**	0.019	46.024	2.431
$X_{3.4}$	Environmental services	0.833	0.026	32.575	2.286
$X_{3.5}$	Biodiversity	0.738	0.044	16.773	1.741
X_4	**Physical Capital**	**0.941**	**0.007**	**134.942**	**-**
$X_{4.1}$	Infrastructure and its condition	0.857	0.033	26.331	1.984
$X_{4.2}$	Agricultural tools and machines	0.914	0.010	94.108	2.780
$X_{4.3}$	Access to Agricultural technology	0.879	0.017	52.164	2.208
X_5	**Financial Capital**	**0.890**	**0.011**	**83.580**	**-**
$X_{5.1}$	Sources of income	0.899	0.014	66.356	2.461
$X_{5.2}$	Credit access	0.831	0.025	33.660	1.841
$X_{5.3}$	Sources of capital	0.919	0.010	94.440	2.658

Table A. *(continue)*

Variable manifest/Indicator	Description	Original Sampel (O)	Standard Deviation (Stdev)	T-Value (O/Stdev)	VIF (outer model)
Livelihood Diversification (Y) (Original Sampel=0.664; Standard Deviasi=0.053; T-statistik=12.636; R-Square=0.441)					
Y_1	Assess the degree of diversification of livelihoods	0.873	0.014	61.778	1.776
Y_2	Diversification of agricultural livelihoods	0.722	0.043	16.798	1.276
Y_3	Diversification of non-agricultural livelihoods	0.843	0.023	37.126	1.769

Statement (perception): the household capital owned by lowland rice farmers can affect the diversification of livelihoods. Scale 1 to 5, namely: 1=strongly bad, 2=bad, 3=quite good, 4=good, and 5=strongly good.
The value of the level of livelihood diversification (entropy index) (Y_1), a scale of 1 to 4, namely: 1=does not occur until diversification occurs very low, 2=low diversification, 3=moderate diversification, and 4=high diversification.
Statement (perception): how much influence does the lowland rice farmer's household capital have on the diversification of agricultural (Y_2) and non-agricultural (Y_3) livelihoods carried out? Scale 1 to 5, namely: 1=very low, 2=low, 3=high enough, 4=high, and 5=very high

Table B. Average Score of Communality

Variabel Manifest	X1	X2	X3	X4	X5	Y	Square
X1.1	0.647						0.418609
X1.2	0.713						0.508369
X1.3	0.717						0.514089
X2.1		0.781					0.609961
X2.2		0.809					0.654481
X3.1			0.629				0.395641
X3.2			0.669				0.447561
X3.3			0.876				0.767376
X3.4			0.833				0.693889
X3.5			0.738				0.544644
X4.1				0.857			0.734449
X4.2				0.914			0.835396
X4.3				0.879			0.772641
X5.1					0.899		0.808201
X5.2					0.831		0.690561
X5.3					0.919		0.844561
Y1						0.873	0.762129
Y2						0.722	0.521284
Y3						0.843	0.710649
Jumlah							12.2.3449
Rata-rata Communality Index							0.643921

REFERENCES

Abimbola O, A., & Oluwakemi A, O. (2013). Livelihood diversification and welfare of rural households in Ondo State, Nigeria. *Journal of Development and Agricultural Economics*, *5*(12), 482–489. https://doi.org/10.5897/jdae2013.0497

Akhtar, S., LI, G. cheng, Nazir, A., Razzaq, A., Ullah, R., Faisal, M., Naseer, M. A. U. R., & Raza, M. H. (2019). Maize production under risk: The simultaneous adoption of off-farm income diversification and agricultural credit to manage risk. *Journal of Integrative Agriculture*, *18*(2), 460–470. https://doi.org/10.1016/S2095-3119(18)61968-9

Akter, M., Ahmed, J. U., Fatema, K., Datta, T., & Akter, K. (2020). Factors Affecting Extent of Haor Livelihood Diversification in Sunamganj District, Bangladesh. In *Asian Journal of Agricultural Extension, Economics & Sociology* (pp. 43–51). Sciencedomain International. https://doi.org/10.9734/ajaees/2020/v38i1030429

Anani, K. (1999). Sustainable Governance of Livelihoods in Rural Africa: A place-based response to globalism in Africa. *Development*, *42*(2), 57–63. https://doi.org/10.1057/palgrave.development.1110037

Asante, B. O., Villano, R. A., Patrick, I. W., & Battese, G. E. (2018). Determinants of farm diversification in integrated crop-livestock farming systems in Ghana. *Renewable Agriculture and Food Systems*, *33*(2), 131–149. https://doi.org/10.1017/S1742170516000545

Astrachan, C. B., Patel, V. K., & Wanzenried, G. (2014). A comparative study of CB-SEM and PLS-SEM for theory development in family firm research. *Journal of Family Business Strategy*, *5*(1), 116–128. https://doi.org/10.1016/j.jfbs.2013.12.002

Barrett, C. B., Reardon, T., & Webb, P. (2001). Nonfarm Income Diversification and Household Livelihood Strategies in Rural Africa: concepts, dynamics, and policy implications. *Food Policy*, *26*, 315–331. www.elsevier.com/locate/foodpol

Bayu, E. K. (2018). *Gender and Livelihood Diversification in Rural Ethiopia. Women's Participation in Non - farm Activities : The Case of Shebel Berenta Woreda , East Gojjam Zone , Amhara National Regional State*. https://www.amazon.com/Gender-Livelihood-Diversification-Rural-Ethiopia/dp/6139989515

Burchfield, E. K., & Poterie, A. T. de la. (2018). Determinants of crop diversification in rice-dominated Sri Lankan agricultural systems. *Journal of Rural Studies*, *xx*(x), 1–10. https://doi.org/10.1016/j.jrurstud.2018.05.010

Canagarajah, S., Newman, C., & Bhattamishra, R. (2001). Non-farm income, gender, and inequality: evidence from rural Ghana and Uganda. *Food Policy*, *26*(4), 405–420. https://doi.org/10.1016/S0306-9192(01)00011-2

Chin, W. W. (1998). *The partial least squares approach to structural equation modelling* (G. A. Marcoulides (ed.); Vol. 295, Issue 2). Lawrence Erlbaum Associates, Publisher, Mahwah, New Jersey, London. https://www.researchgate.net/publication/311766005_The_Partial_Least_Squares_Approach_to_Structural_Equation_Modeling

Conway, G. R., & Chambers, R. (1992). Sustainable rural livelihoods: practical concepts for the 21st century. *IDS Discussion Paper*, *296*(January 1992), 1–28. https://www.researchgate.net/publication/248535825%0ASustainable

Damanhuri, Muspita, M., & Setyohadi, D. (2017). Pengembangan Diversifikasi Usaha tani sebagai Penguatan Ekonomi di Kabupaten Bojonegoro, Tulungagung, dan Ponorogo. *Jurnal Cakrawala*, *11*(1), 33–47.

Davis, J., & Pearce, D. (2000). *The rural non-farm economy in Central and Eastern Europe*. 42.

Demie, A., & Zeray, N. (2016). Determinants of Participation and Earnings in the rural non farm economy in Eastern Ethiopia. *African Journal of Rural Development*, *1*(1), 61–74.

Ding, W., Jimoh, S. O., Hou, Y., Hou, X., & Zhang, W. (2018). Influence of livelihood capitals on livelihood strategies of herdsmen in inner Mongolia, China. *Sustainability (Switzerland)*, *10*(9), 1–17. https://doi.org/10.3390/su10093325

Djuwendah, E., Priyatna, T., Kusno, K., Deliana, Y., & Wulandari, E. (2018). Building agribusiness model of LEISA to achieve sustainable agriculture in Surian Subdistrict of Sumedang Regency West Java Indonesia. *IOP Conference Series: Earth and Environmental Science*, *142*(1), 1–8. https://doi.org/10.1088/1755-1315/142/1/012062

Ellis, F. (1998). Household strategies and rural livelihood diversification. *The Journal of Development Studies*, *35*(1), 1–38. https://doi.org/10.1080/00220389808422553

Ellis, F. (1999). Rural Livelihood Diversity in Developing Countries: Evidence and Policy Implications. *Oxford University Press*, *40*, 1–10. https://www.researchgate.net/publication/42765249_Rural_Livelihood_Diversity_in_Developing_Countries_Evidence_and_Policy_Implications

Ellis, F., & Allison, E. (2004). *Livelihood diversification and natural resource access. FAO, LSP WP 9, Access to Natural Resources Sub-Programme, Livelihood Diversification and Enterprise Development Sub-Programme.* (9, Issue January). http://www.fao.org/3/a-ad689e.pdf

Ellis, F., & Freeman, H. A. (2005). Rural Livelihoods and Poverty Reduction Policies. In F. Ellis & H. A. Freeman (Eds.), *Routledge Taylor & Francis Group*. Routledge 270 Madison Ave, New York 10016.

Fanchone, A., Alexandre, G., Chia, E., Diman, J. L., Ozier-Lafontaine, H., & Angeon, V. (2020). A typology to understand the diversity of strategies of implementation of agroecological practices in the French West Indies. *European Journal of Agronomy*, *117*(April), 126058. https://doi.org/10.1016/j.eja.2020.126058

Gebretsadik, Y. H., Teklemariam, B. T., & Gebru, H. N. (2020). *Effect of livelihood diversification on rural households' poverty reduction in Central Zone of Tigray regional state, Ethiopia*. 1–17.

Gebru, G. W., Ichoku, H. E., & Phil-Eze, P. O. (2018). Determinants of livelihood diversification strategies in Eastern Tigray Region of Ethiopia. *Agriculture and Food Security*, *7*(1), 1–9. https://doi.org/10.1186/s40066-018-0214-0

Gollop, F. M., & Monahan, J. L. (1991). A Generalized Index of Diversification: Trends in U.S. Manufacturing. *The Review of Economics and Statistics*, *73*(2), 318. https://doi.org/10.2307/2109523

Habib, N., Ariyawardana, A., & Aziz, A. A. (2023). The influence and impact of livelihood capitals on livelihood diversification strategies in developing countries: a systematic literature review. *Environmental Science and Pollution Research*, *30*(27), 69882–69898. https://doi.org/10.1007/s11356-023-27638-2

Hariz, A. R., Purwanto, & Suherman. (2015). Kajian Pengembangan Kawasan Industri Konvensional Menjadi Eco-Industrial Park. *Prossiding Seminar Nasional Innovation In Environemtal Management Diponegoro University and Queensland University*, VI-1-VI–6. https://adoc.pub/queue/kajian-pengembangan-kawasan-industri-konvensional-menjadi-ec.html

Haryono, S. (2016). *Metode SEM Untuk Penelitian Manajemen dengan AMOS-LISREL-PLS*. Badan Penerbit PT. Intermedia Personalia Utama. www.ptipu.blogspot.com

Hermanto, B., & Wahyuni, S. (2019). Model Pertanian Berkelanjutan Terhadap Peningkatan Kesejahteraan Petani Kubis (Brassica oleraciae) Dataran Tinggi Pada Kawasan Agropolitan di Kabupaten Simalungun Provinsi Sumatera Utara. *Prosiding Seminar Nasional & Expo II Hasil Penelitian Dan Pengabdian 2019*, 893–900. https://e-prosiding.umnaw.ac.id/index.php/penelitian/article/view/297/297

Ho, T. D. N., Tsusaka, T. W., Kuwornu, J. K. M., Datta, A., & Nguyen, L. T. (2021). Do rice varieties matter? Climate change adaptation and livelihood diversification among rural smallholder households in the Mekong Delta region of Vietnam. *Mitigation and Adaptation Strategies for Global Change*, *27*(1), 8. https://doi.org/10.1007/s11027-021-09978-x

Huffman, W. E., & El-Osta, H. (1997). *Off-Farm Work Participation, Off-Farm Labor Supply and On-Farm Labor Demand of U.S. Farm Operators* (Economic Staff Paper Series). http://lib.dr.iastate.edu/econ_las_staffpapers%0Ahttp://lib.dr.iastate.edu/econ_las_staffpapers/276

Hufnagel, J., Reckling, M., & Ewert, F. (2020). Diverse approaches to crop diversification in agricultural research. A review. *Agronomy for Sustainable Development*, *40*(2), 1–17. https://doi.org/10.1007/s13593-020-00617-4

Hult, G. T. M., Sarstedt, M., & Ringle, C. M. (2022). A primer on partial least squares structural equation modeling (PLS-SEM). In *SAGE*. https://doi.org/10.1080/1743727X.2015.1005806

Illu, A. R., Muhaimin, A. W., & Setiawan, B. (2021). The Effect of Livelihood Assets on Living Strategies: An Empirical Study of Farmer Household Characteristics. *International Journal of Business, Technology and Organizational Behavior (IJBTOB)*, *1*(3), 241–252. https://doi.org/10.52218/ijbtob.v1i3.87

Indonesia Central Bureau of Statistics. (2017). *Statistical Yearbook of Indonesia 2017* (S. of S. C. and Publication (ed.)). BPS-Statistics Indonesia. https://www.bps.go.id/publication/2017/07/26/b598fa587f5112432533a656/statistik-indonesia-2017.html

Indonesia Central Bureau of Statistics. (2020). *Statistical Yearbook of Indonesia 2020*. BPS-Statistics Indonesia. https://www.bps.go.id/publication/2020/04/29/e9011b3155d45d70823c141f/statistik-indonesia-2020.html

Indramayu Regency Central Bureau of Statistics. (2021). *Indramayu Regency in Figures 2021*. BPS-Statistik Indramayu Regency. https://indramayukab.bps.go.id/publication/2021/02/26/399667831f12287ee670c9df/kabupaten-indramayu-dalam-angka-2021.html

Jacquemin, A. P., & Berry, C. H. (1979). Entropy Measure of Diversification and Corporate Growth. *The Journal of Industrial Economics*, *27*(4), 359. https://doi.org/10.2307/2097958

Kassie, G. W., Kim, S., & Fellizar, F. P. (2017). Determinant factors of livelihood diversification: Evidence from Ethiopia. *Cogent Social Sciences*, *3*(1), 1–16. https://doi.org/10.1080/23311886.2017.1369490

Khatun, D., & Roy, B. C. (2012). Rural Livelihood Diversification in West Bengal : Determinants. *Agricultural Economics Research Review*, *25*(1), 115–124.

Leng, C., Ma, W., Tang, J., & Zhu, Z. (2020). ICT adoption and income diversification among rural households in China. *Applied Economics*, 1–15. https://doi.org/10.1080/00036846.2020.1715338

Loison, A. S. (2019). Household livelihood diversification and gender: Panel evidence from rural Kenya. *Journal of Rural Studies*, *69*(February), 156–172. https://doi.org/10.1016/j.jrurstud.2019.03.001

Loison, S. A. (2015). Rural Livelihood Diversification in Sub-Saharan Africa: A Literature Review. *The Journal of Development Studies*, *51*(9), 1125–1138. https://doi.org/10.1080/00220388.2015.1046445

Lopez-Ridaura, S., Frelat, R., van Wijk, M. T., Valbuena, D., Krupnik, T. J., & Jat, M. L. (2018). Climate smart agriculture, farm household typologies and food security: An ex-ante assessment from Eastern India. *Agricultural Systems*, *159*(September 2017), 57–68. https://doi.org/10.1016/j.agsy.2017.09.007

McCarthy, N., & Sun, Y. (2009). Participation by Men and Women in Off-Farm Activities: an Empirical Analysis in Rural Northern Ghana. In *IFPRI Discussion Paper 00852* (Issue March). http://ideas.repec.org/p/ags/iaae09/51040.html

Ministry of Agriculture. (2020). *Rencana Strategis Kementerian Pertanian Tahun 2020-2024* (pp. 1–176). http://perencanaan.setjen.pertanian.go.id

Monecke, A., & Leisch, F. (2012). semPLS: Structural Equation Modeling Using Partial Least Squares Armin. *Journal of Statistical Software*, *48*(3), 1–32. https://doi.org/https://doi.org/10.18637/jss.v048.i03

Mu'min, A., Hastuti, K., & Angriani, P. (2014). Pengaruh Diversifikasi Pertanian Terhadap Pendapatan Masyarakat di Desa Belawang Kecamatan Belawang Kabupaten Barito Kuala. *Jurnal Pendidikan Geografi*, *1*(3), 8–20. http://ppjp.unlam.ac.id/journal/index.php/jpg

Munandar, M., Gustiar, F., Yakup, Y., Hayati, R., & Munawar, A. I. (2015). Crop-Cattle Integrated Farming System: An Alternative of Climatic Change Mitigation. *Media Peternakan*, *38*(2), 95–103. https://doi.org/10.5398/medpet.2015.38.2.95

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. https://doi.org/10.1111/agec.12694

Naithani, S., & Saha, A. K. (2021). Social capital and livelihood strategies in response after 2013 Kedarnath disaster (India). *Disaster Prevention and Management: An International Journal*, *30*(2), 179–193. https://doi.org/10.1108/DPM-07-2019-0221

Nguyen, D. L., Grote, U., & Nguyen, T. T. (2019). Migration, crop production and non-farm labor diversification in rural Vietnam. *Economic Analysis and Policy*, *63*(February 2019), 175–187. https://doi.org/10.1016/j.eap.2019.06.003

Nneka, O., & Rafiu, Y. O. (2020). Managing the Nigerian Rural Environment through Women Empowerment in Non-Farm Activities in Kajuru Local Government Area of Kaduna State. *Journal of Materials Science Research and Reviews*, *5*(1), 31–41. http://www.sdiarticle4.com/review-history/55020

Ntwalle, J. A. (2019). *Determinants of Tanzania Rural Households' Income Diversification and its Impact on Food security* [Swedish]. http://stud.epsilon.slu.se

Nuryanti, S., & Swastika, D. K. S. (2016). Peran Kelompok Tani dalam Penerapan Teknologi Pertanian. *Forum Penelit. Agroecon*, *29*(2), 115. https://doi.org/10.21082/fae.v29n2.2011.115-128

Otundo Richard, M. (2019). Provisional Findings on Linking Climate Information to Livelihood Strategies through ICTs among Rural Women in Marginalized Kenya. *SSRN Electronic Journal*. https://doi.org/10.2139/ssrn.3449502

Paut, R., Sabatier, R., & Tchamitchian, M. (2019). Reducing risk through crop diversification: An application of portfolio theory to diversified horticultural systems. *Agricultural Systems*, *168*(July 2018), 123–130. https://doi.org/10.1016/j.agsy.2018.11.002

Piedra-Bonilla, E. B., da Cunha, D. A., & Braga, M. J. (2020). Climate variability and crop diversification in Brazil: An ordered probit analysis. *Journal of Cleaner Production*, *256*(January), 120252. https://doi.org/10.1016/j.jclepro.2020.120252

Ponce, C. (2018). Revisiting the determinants of non-farm income in the Peruvian Andes in a context of intraseasonal climate variability and spatially widespread family networks. In *GRADE, Group for the Analysis of Development Av. Almirante Grau 915, Barranco, Lima, Peru*. http://biblioteca.clacso.edu.ar/Peru/grade/20181123070128/GRADEai34.pdf

Qiu, L., Zhu, J., Pan, Y., Wu, S., Dang, Y., Xu, B., & Yang, H. (2019). The positive impacts of landscape fragmentation on the diversification of agricultural production in Zhejiang Province, China. *Journal of Cleaner Production*, *5*(12), 1–24. https://doi.org/10.1016/j.jclepro.2019.119722

Rachman, H. P. S., Purwantini, T. B., & Marisa, Y. (2006). Prospek Diversifikasi Usaha Rumah Tangga dalam Mendukung Ketahanan Pangan dan Penanggulangan Kemiskinan. *Forum Penelitian Agro Ekonomi*, *24*(1), 1–13. http://ejurnal.litbang.pertanian.go.id/index.php/fae/article/view/4050

Rahut, D. B., Mottaleb, K. A., & Ali, A. (2017). Rural Livelihood Diversification Strategies and Household Welfare in Bhutan. *The European Journal of Development Research*, *30*(4), 718–748. https://doi.org/10.1057/s41287-017-0120-5

Reardon, R. F. (2010). The impact of learning culture on worker response to new technology. *Journal of Workplace Learning*, *22*(4), 201–211. https://doi.org/10.1108/13665621011040662

Rehan, S. F. (2020). *Diversification in Bangladesh: From on-farm, income and food consumption perspectives*. https://helda.helsinki.fi/handle/10138/315730

Rosa-Schleich, J., Loos, J., Mußhoff, O., & Tscharntke, T. (2019). Ecological-economic trade-offs of Diversified Farming Systems – A review. *Ecological Economics*, *160*(January 2018), 251–263. https://doi.org/10.1016/j.ecolecon.2019.03.002

Salam, S., & Bauer, S. (2020). Rural non-farm economy and livelihood diversification strategies: evidence from Bangladesh. *GeoJournal*, *2*(Hies 2016). https://doi.org/10.1007/s10708-020-10269-2

Scoones, I. (2015). *Sustainable livelihoods and rural development*. opendocs.ids.ac.uk. https://opendocs.ids.ac.uk/opendocs/handle/20.500.12413/13895

Serrat, O. (2017). The Sustainable Livelihoods Approach. *Assian Development Bank*, 22–26. https://link.springer.com/chapter/10.1007/978-981-10-0983-9_5#:~:text=The sustainable livelihoods approach is,formulate development activities that are.

Sharpley, R., & Vass, A. (2006). Tourism, farming and diversification: An attitudinal study. *Tourism Management*, *27*(5), 1040–1052. https://doi.org/10.1016/j.tourman.2005.10.025

Simatupang, P., Rahmat, M., Supriyati, & Maulana, M. (2016). *Laporan Akhir Kajian Isu-Isu Kebijakan Pembangunan Pertanian Tahun Anggaran 2016 (Review dan Perumusan Indikator Kesejahteraan Petani)*. http://pse.litbang.pertanian.go.id/ind/pdffiles/anjak_2016_04.pdf

Suratiyah, K. (1994). Konsep-Konsep Kegiatan Off-Farm. *Populasi*, *5*(1), 1–14. https://doi.org/10.22146/jp.11348

Sushma, K. N., Thilagavathi, M., Parimalarangan, S., & Vasanthi, R. (2022). Adoption Pattern of Mechanization of Paddy Farms in West Godavari District of Andhra Pradesh, India. *Asian Journal of Agricultural Extension, Economics & Sociology*, *40*(10), 653–658. https://doi.org/10.9734/ajaees/2022/v40i1031125

Susilowati, S. H. (2017). Dinamika Diversifikasi Sumber Pendapatan Rumah Tangga Perdesaan di Berbagai Agroekosistem. *Jurnal Agro Ekonomi*, *35*(2), 105. https://doi.org/10.21082/jae.v35n2.2017.105-126

Susilowati, S. H., Supadi, & Saleh, C. (2002). Diversifikasi Sumber Pendapatan Rumah Tangga di Pedesaan Jawa Barat. *JAE*, *20*(1), 85–109. https://doi.org/10.21082/jae.v20n1.2002.85-109

Swastika, D. K. ., Elizabeth, R., & Hestina, J. (2016). Analisis Keberagaman Usaha Rumah Tangga Pertanian di Lahan Msrjinal. *Agro Ekonomi*, *14*(1), 1–16. https://doi.org/10.22146/agroekonomi.16737

Thiele, S., & Weiss, C. (2003). Consumer demand for food diversity: Evidence for Germany. *Food Policy*, *28*(2), 99–115. https://doi.org/10.1016/S0306-9192(02)00068-4

Ugwumba, C. O. A., Okoh, R. N., Ike, P. C., Nnabuife, E. L. C., & Orji, E. C. (2010). Integrated Farming System and its Effect on Farm Cash Income in Awka South Agricultural Zone of Anambra State, Nigeria. *J. Agric. & Environ. Sci*, *8*(1), 1–06.

Van den Broeck, G., & Kilic, T. (2019). Dynamics of off-farm employment in Sub-Saharan Africa: A gender perspective. *World Development*, *119*, 81–99. https://doi.org/10.1016/j.worlddev.2019.03.008

van Zonneveld, M., Turmel, M.-S., & Hellin, J. (2020). Decision-Making to Diversify Farm Systems for Climate Change Adaptation. *Frontiers in Sustainable Food Systems*, *4*(April), 1–20. https://doi.org/10.3389/fsufs.2020.00032

Vortia, P., Nasrin, M., Bipasha, S. K., & Islam, M. M. (2019). Extent of farm mechanization and technical efficiency of rice production in some selected areas of Bangladesh. *GeoJournal*. https://doi.org/10.1007/s10708-019-10095-1

Weldegebriel, Z. B. (2017). *Non-Farm Diversification in Ethiopia : What Determines Participation and Returns ? March*, 1–65. https://www.researchgate.net/publication/315715783%0ANon-Farm

Weldegebriel, Z. B., & Prowse, M. (2017). Climate variability and livelihood diversification in northern Ethiopia: a case study of Lasta and Beyeda districts. *The Geographical Journal*, *183*(1), 84–96. https://doi.org/10.1111/geoj.12178

Wold, S., Eriksson, L., & Kettaneh, N. (2010). *PLS in Data Mining anda Data integration. In Handbook of Partial Least Squares Concept, Methods, and Applications* (V. E. Vinzi, W. W. Chin, J. Henseler, & H. Wang (eds.)). Springer Heidelberg Dordrecht, London, New York. https://doi.org/10.1007/978-3-540-32827-8_16

Wulandari, E., Meuwissen, M. P. M., Karmana, M. H., & Oude Lansink, A. G. J. M. (2021). The role of access to finance from different finance providers in production risks of horticulture in Indonesia. *PLoS ONE*, *16*(9 September), 1–12. https://doi.org/10.1371/journal.pone.0257812

Yamin, S., & Dartanto, T. (2016). Pengentasan Orang Miskin di Indonesia: Peran Modal Sosial yang Terlupakan. *Jurnal Ekonomi Dan Pembangunan Indonesia*, *17*(1), 88–102. https://doi.org/10.21002/jepi.v17i1.656

Yuliastuti, N., Sukmawati, A. M., & Purwoningsih, P. (2018). Utiliztion of Social Facilities to Reinforce Social Interaction in Formal Housing. *International Journal of Architectural Research: ArchNet-IJAR*, *12*(1), 134–151. https://doi.org/10.26687/archnet-ijar.v12i1.1295

Yussuf, B. A., & Mohamed, A. A. (2022). Factors Influencing Household Livelihood Diversification: The Case of Kebri Dahar District, Korahey Zone of Somali Region, Ethiopia. *Advances in Agriculture*, *2022*. https://doi.org/10.1155/2022/7868248

ISSN: 0067-3064

ABOUT THE AUTHORS

Wiwik Ambarsari, email: wiwik19001@mail.unpad.ac.id
Wiwik Ambarsari is a doctoral student in the Agricultural Science Program, Faculty of Agriculture, Universitas Padjadjaran, Sumedang. She is a lecturer in the Department of Agribusiness, Faculty of Agriculture, Universitas Wiralodra, Indramayu.
Lies Sulistyowati is a Professor at the Department of Agricultural Socio-Economics, Faculty of Agriculture, Universitas Padjadjaran, Sumedang. She is a lecturer and researcher in the field of Agricultural Development.
Trisna Insan Noor is an Associate Professor at the Department of Agricultural Socio-Economics, Faculty of Agriculture, Universitas Padjadjaran, Sumedang. He is a lecturer and researcher in the field of Agricultural Development.
Eliana Wulandari is an Associate Professor at the Department of Agricultural Socio-Economics, Faculty of Agriculture, Universitas Padjadjaran, Sumedang. Lecturer and researcher in the field of Agribusiness, Agricultural economics, Agricultural finance, and risk.