

Involvement of Millennial Farmers in the Implementation of Integrated Agriculture in Trenggalek District, East Java, Indonesia

Envolvimento de Agricultores Milenares na Implementação da Agricultura Integrada no Distrito de Trenggalek, Java Oriental, Indonésia

Yudi Rustandi¹  & Abdul Farid² 

¹Agricultural Development Polytechnic Malang, Department of Animal Husbandry, Animal Husbandry and Animal Welfare Extension Study Program, Malang, Indonesia

²Agricultural Development Polytechnic Malang, Agriculture Department, Sustainable Agriculture Extension Study Program, Malang, Indonesia

E-mails: rustandiyudi64@gmail.com; farid.abdul@rocketmail.com

Corresponding author: Yudi ustandi; rustandiyudi64@gmail.com

Abstract

Millennial farmers are the future of farmer regeneration in Indonesia. The involvement of millennial farmers is expected to be a driver in sustainable agricultural development. A study analyzed the factors influencing millennial farmers' interest and the types of entrepreneurship prioritized in implementing integrated farming (IF) in the Trenggalek Regency. The sample selection method used was the Simple Randomized and Clustered Sampling method. The research respondents were 110 millennial farmers who are members of farmer groups aged 17-39. Data were collected using an ordinal scale questionnaire. Data were analyzed using descriptive statistics, ordinal logistic regression, and Analytical Hierarchy Process (AHP). To overcome the declining interest of millennials in agricultural entrepreneurship, subjective norms or psychological factors such as motive factors and expectation factors need to be considered. These factors can be used as a basis for millennial farmers in choosing priorities for agricultural entrepreneurship. Agro-processing is the leading choice of types of entrepreneurship for millennial farmers, namely Solid Organic Fertilizer, Liquid Organic Fertilizer, Biourine, Probiotics, Vegetable Pesticides, Trichoderma, Refugia, Straw Amofer, and Magot. The priority of agricultural entrepreneurship that has the opportunity to be developed by the millennial generation of agriculture in Trenggalek Regency is agro-industrial entrepreneurship.

Keywords: Agribusiness; Sustainable Agricultural; Young Farmers

Resumo

Os agricultores da geração do milênio são o futuro da regeneração dos agricultores na Indonésia. Espera-se que o envolvimento dos agricultores da geração do milênio seja um impulsionador do desenvolvimento agrícola sustentável. Foi realizado um estudo para analisar os fatores que influenciam o interesse dos agricultores da geração do milênio e os tipos de empreendedorismo priorizados na implementação da agricultura integrada (IF) na região de Trenggalek. O método de seleção da amostra utilizado foi o método de amostragem aleatória simples e agrupada. Os entrevistados da pesquisa foram 110 agricultores milenares membros de grupos de agricultores com idades entre 17 e 39 anos. Os dados foram coletados por meio de um questionário de escala ordinal. Os dados foram analisados por meio de estatísticas descritivas, regressão logística ordinal e Processo de Análise Hierárquica (AHP). Para superar o declínio do interesse da geração do milênio no empreendedorismo agrícola, é preciso considerar normas subjetivas ou fatores psicológicos, como fatores motivacionais e fatores de expectativa. Esses fatores podem ser usados como base para que os agricultores da geração do milênio escolham prioridades para o empreendedorismo agrícola. O agroprocessamento é a principal escolha de tipos de empreendedorismo para os agricultores da geração do milênio, a saber: fertilizante orgânico sólido, fertilizante orgânico líquido, biourina, probióticos, pesticidas vegetais, trichoderma, refúgio, amônia de palha e magot. A prioridade do empreendedorismo agrícola que tem a oportunidade de ser desenvolvida pela geração do milênio da agricultura em Trenggalek Regency é o empreendedorismo agroindustrial.

Palavras-chave: Agronegócios; Agricultura sustentável; Jovens agricultores

1 Introduction

Farmer regeneration is the most critical milestone for agricultural development in many countries (Kováč et al. 2022; Yuniarti et al. 2020). Similarly, in Indonesia, only 12% of farmers are under 35. The results of the 2018 agricultural survey showed that the number of agricultural business households by age group, namely heads of households over 54 years old, was 10,379,211, while young farmers aged 25–34 years were 2,722,446. Data from the Central Statistics Agency (BPS-Statistics Indonesia, 2020) shows a decrease in the number of workers in the agricultural sector from 2017 to 2018. In 2017, the number of workers amounted to 36,956,111 people, which decreased by 1,080,722 in 2018. The decline in the number of farmers and employees in the agricultural sector is undoubtedly very worrying because it will impact a country's food security in the future (Giller et al. 2021). According to him, food security is one of the supporting factors for the pillar of independence toward sustainable economic growth. It becomes a high risk if there is no anticipation of handling the continued decline in the number and quality of farmers' human resources. Based on predictions from the United Nations, if there is no significant change, especially anticipating the crisis of young farmers, including in Indonesia, the agricultural sector will continue to experience a decline in resources, production, agricultural

The problem of farmer regeneration is very worrying if government intervention programs do not address it to regenerate the younger generation as entrepreneurs (Lungkang 2018). Millennial farmers are part of the millennial generation, or Generation Y, owned by the Indonesian State, aged 18–38 years, born between 1980 and 1990. This generation has the most significant demographic bonus of around 34%, or 80 million people out of 237.6 people in Indonesia (Statistics Indonesia 2010). Millennials, called digital natives, can understand and use information technology well (Akbar et al. 2022; Nelson 2010). The millennial generation of farmers in rural areas is the foundation of agricultural development towards sustainable agricultural development and for the Ministry of Agriculture's Sustainable Agricultural Development Program (Leimona et al. 2015; Weston et al. 2015).

Sustainable agriculture ensures the right balance between sustainability, food security, and better utilization of food already produced (Vågsholm, Arzoomand & Boqvist 2020). Responding to the challenges of the problem of the regeneration of young farmers, the Indonesian Ministry of Agriculture, through Agricultural Development Polytechnic Malang, in collaboration with the Trenggalek Regency Agriculture Office, initiated an intervention in

the development of the Integrated Farming System (IFS) Program. The integrated agricultural system program is an agricultural management system that integrates several sub-sector activities of crops, livestock, plantations, and inland fisheries to increase the efficiency and productivity of resources (natural, human, and environmental), which are needed to support the efficiency and efficiency of production and agricultural productivity, economic improvement of farming families, preservation of natural resources, independence, and welfare of farmers in a sustainable manner (Kumar et al. 2012; Moraine et al. 2014). The purpose of implementing integrated agriculture is to utilize various potential resources available so that there is a direct reciprocal relationship between biotic and abiotic environments in agricultural land ecosystems. This interrelationship is the relationship between one cultivation's results and inputs from another (Martin, Martin-Clouaire & Duru 2013; Ngatindriatun & Adzim 2021; Veysset et al. 2014).

Opinions (Arvianti et al. 2019) There must be regulations to attract millennials to work as entrepreneurs in the agricultural sector. The regulation is an intensive policy for millennial farmers in the form of increased competition in agriculture, character growth activities for farming interest since childhood, land tenure, awareness of the importance of sustainable agriculture to parents, socialization appropriately and sustainably in attracting millennial farmers, initiation of sustainable agribusiness development in villages, and provision of business loans such as KUR and agricultural insurance to make it easier for millennial farmers to face risks (FAO, 2017). Regulatory interventions or programs, one of which is the IFS program that acts as a stimulant for the agricultural millennial generation, may be accepted or rejected. If they accept the program, the stimulant receives attention so that it continues in the following process: perception. IFS program recipients will process the stimulants they received so that they are willing to act based on their program interventions (Changyong & Posen 2013). If the support of internal and external factors (the environment) is met, then program interventions will affect the actions of individual IFS program recipients so that behavior change occurs (Elfahmi, Chandrarin & Manan 2021; Fink, Strassner & Ploeger 2021). Indicators of behavior change can be seen in these millennials' subjective or psychological norms, including factors such as perceptions, motives, and interests of the younger generation towards the program (Akintunde 2017; Thirlaway & Upton 2009).

Lack of Attractiveness of Agricultural Profession. Many young people find the agricultural profession less attractive for financial reasons, or because Agriculture does

not provide enough income for them, there is a lack of access to modern technology, working conditions are not ideal, access to land is minimal, market bargaining power and lack of support from the government lead to a low millennial interest in agricultural entrepreneurship (Borda, Sárvári & Balogh 2023). Based on the description and the phenomenon of millennial farmers working and managing agricultural entrepreneurship in Trenggalek Regency, the purpose of discussing this article is to analyze the psychological factors that influence the interest of agricultural millennials and find priorities for types of agricultural millennial entrepreneurship based on psychological factors.

2 Methodology and Data

The research activity was conducted over nine months, from April 2022 to December 2022, in the Trenggalek Regency. The area was chosen for its Integrated Farming System (IFS) development program, implemented by Agricultural Development Polytechnic Malang. The study is quantitative, using surveys as the research methodology. *Descriptive analysis* is the research method employed. The study population consisted of all participants in the IFS Program, specifically young agricultural millennials aged between 17–39 years in the Trenggalek Regency. The sample selection method used was the Simple Randomized and Clustered Sampling method, with cluster sampling being both geographic and single-stage. The number of respondents was determined using the Slovin formula (Adam 2020; Tejada, Raymond & Punzalan 2012), which resulted in a sample size of 110 people.

Primary data was collected through survey, observation, and direct and in-depth interviews, including Focus Group Discussions. The questionnaires were used as the survey instrument for the research respondents. Secondary data were obtained through various documentation techniques, such as copy-pasting, audio, photo, and video. The instrument's validity was tested through content validity, construction validity, and grain validity. The validity of each variable's instrument items was tested using product-moment correlation analysis and t-tests. The reliability coefficient was analyzed using the Cronbach Alpha reliability coefficient formula, with the r value being considered reliable when it is equal to or greater than 0.6.

The data analysis technique used was descriptive analysis, Ordinal Logistic Regression, and Analytical Hierarchy Process (AHP). The study analyzed the influential factors of subjective or psychological norms, namely X_1 = Perception, X_2 =Motive, X_3 =Hope, and X_4 =Self-Efficacy of (Y) Agricultural millennial generation towards agricultural

entrepreneurship. The mathematical model in this study is as follows in Equation 1:

$$Y = a + X1 + a2X2 + a3X3 + a4X4 + e \quad (1)$$

AHP was used for prioritization analysis to reveal people's perceptions and convert intangible factors into ordinary rules for comparison. The implementation of the data analysis stages was carried out through 1) system identification, 2) hierarchical structure feeding, 3) pairwise comparison, 4) individual opinion matrix, 5) combined opinion matrix, 6) horizontal processing, 7) vertical processing, and 8) opinion revision.

This research activity was carried out for nine months, from April 2022 to December 2022. The research area was chosen in Trenggalek Regency, considering that the location was the area of the Integrated Farming (IF) development program of Agricultural Development Polytechnic Malang.

The research is quantitative with surveys (Stockemer 2020). The research method is descriptive analysis (Cohen, Manion & Morrison 2018). The study population included all participants of the IF Program, the young generation of agricultural millennials aged between 17–39 years in Trenggalek Regency. The sample determination method is the *Simple Randomized and Clustered Sampling* method. Cluster sampling is geographic and single-stage sampling (Ruane 2016). The number of respondents was determined based on the calculation of the Slovin formula (Dhokhikah, Trihadiningrum & Sunaryo 2015; Susanto, Diani & Hafidz 2017) as many as 110 people. Primary data was collected by survey and observation and obtained through direct interviews, *in-depth interviews*, and focus group discussions. Surveys on research respondents use questionnaires as instruments (Taherdoost 2021).

Secondary data were obtained by *copy-paste*, audio, photo, video, and other documentation techniques (Baum & Sullivan 2013; De Gruyter 2017). The instrument validity test consists of a content validity test, construction validity, and grain validity test. Test the validity of the instrument items of each variable using *product moment correlation analysis* and t-test. Reliability is the confidence level in measurement results (Ruane 2016).

The reliability coefficient is analyzed using *the Cronbach Alpha* reliability coefficient formula. The r value is considered reliable when ≥ 0.6 . The data analysis used is a descriptive analysis technique, Ordinal Logistic Regression (Atinafu, Tarekegn & Kebede 2023; Bürkner & Vuorre 2019) and Process Hierarchy Analysis (AHP) (Mu & Pereyra-Rojas 2017; Saaty 2001).

Prioritization analysis is carried out through AHP rationally to reveal people’s perceptions (Janeš, Kadoić & Ređep 2018) and then convert intangible factors into ordinary rules to be compared (Hillier, Price & Austin 2012). The implementation of the data analysis stages is carried out through 1) system identification, 2) hierarchical structure feeding, 3) pairwise comparison, 4) individual opinion matrix, 5) combined opinion matrix, 6) horizontal processing, 7) vertical processing, and 8) opinion revision.

The operational definition of variables of influential factors from subjective or psychological norms can be seen in Table 1.

3 Priority Types of Agricultural Entrepreneurs for Millennial Farmers in Trenggalek Regency

Determination of priority scale Using the AHP system for priority analysis of the type of millennial generation agricultural entrepreneurs in IFS implementation aims to obtain priority trends for the kind of agricultural business that is in great demand by the millennial generation in Trenggalek Regency today (Canco, Kruja & Iancu 2021). The selected criteria are based on the psychological factors of the agricultural millennial generation, namely: 1) motives and 2) hope. These motives and expectations were established after analyzing psychological factors that influence the interest of the agricultural millennial generation in the type of agricultural entrepreneurship in Trenggalek Regency. At the same time, the choices

of agricultural entrepreneurs in Trenggalek Regency are 1) Agroproducts, 2) Agroinput, 3) Agroprocesses, 4) Agromarketing, and 5) Agroservices.

Criteria, alternative data collection questionnaires, and data recapitulation results will be tested through consistency level (CR) values (Tavana, Soltanifar & Santos-Arteaga 2021) in the AHP analysis research using the help of *Expert Choice* software version 11. This application works according to the steps in the AHP method. The scale used is a *pairwise* comparison (Herdhiansyah et al. 2022)

3.1 Hierarchical Structure Model Stage

The design of the AHP hierarchical structure model is based on objects, criteria, and alternatives (Ahmad & Pirezada 2014; Bagheri et al. 2021). The discussion is formed into a decision position in the AHP system. In the case of the priority analysis of the priority of the agricultural millennial generation on the type of agricultural entrepreneurs in Trenggalek Regency, the relationship between these criteria and alternatives from sources or respondents can be seen in Figure 1.

3.2 Questionnaire for Resource Persons or Respondents

This study’s resource persons or respondents were 17 people, consisting of the chairman and management of the association, agricultural entrepreneurs, Field Agricultural Extension Workers (PPL), PPL coordinators, and the Trenggalek Regency Agriculture Office. The data obtained from the resource persons through questionnaires will also

Table 1 Operational Definition of Research Variables.

Variable	Variable Operational Definition	Indicator
Intention	Intention is millennials’ intention to act and a direct determinant of millennial agricultural entrepreneurial behavior in IF.	Behavioral Attitudes Subjective Norm Perceived Behavioral Control
Perception	Perception of agricultural millennials in the act of compiling, recognizing, and interpreting sensory information to provide a picture and understanding of agricultural millennial entrepreneurship in IF.	Entrepreneurial career Entrepreneurship motivation factors Characteristics of agricultural entrepreneurship Barriers to agricultural entrepreneurship careers.
Motive	Agricultural millennial motives are descriptions and explanations of the reasons behind agricultural millennial entrepreneurship in IF.	Individual driven motive Motive moral-cultural base Rational-structural base motive
Hope	Agricultural millennial expectations are a description of the ideas and basis of belief in something that millennial agricultural entrepreneurs want to get in IF	Goal or objective Pathway Thinking Agency Thinking
Self-efficacy	Millennial farmer self-efficacy is an evaluation of the ability to perform a task, achieve a goal, or overcome barriers to millennial farmer entrepreneurship in the IF environment.	Magnitude or Level Dimension Generalization dimension (generality) Dimension of Strength



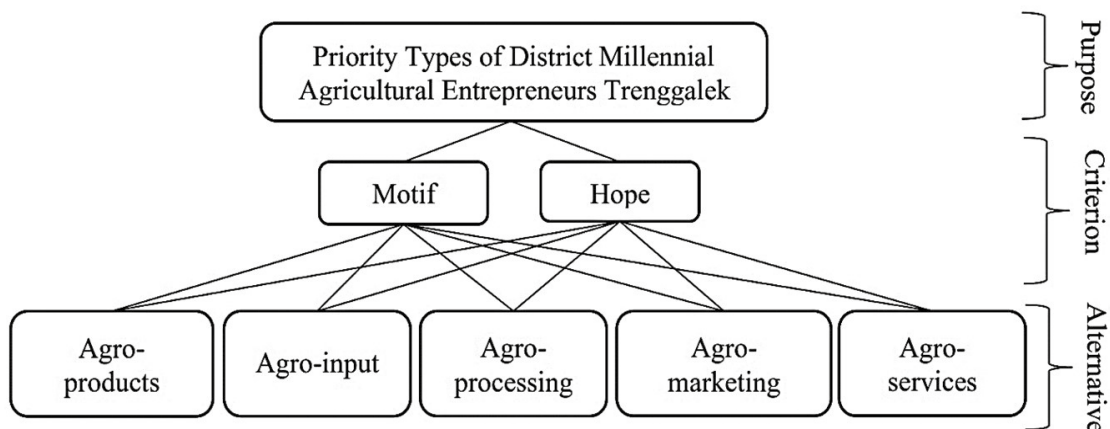


Figure 1 Prioritization hierarchy structure of millennial farmer entrepreneurship types in Trenggalek Regency.

be described based on the criteria determined from each need to choose in the case of the priority analysis of millennial generation agricultural itencies on types of agricultural entrepreneurs in Trenggalek Regency. Seventeen duplicate questionnaires were distributed to 17 resource persons or respondents.

3.3 Calculation of Questionnaire Results Data

Data processing starts with the recapitulation of the results of the questionnaire data, which is calculating the consistency ratio (CR) value. The source's answer is compatible if the CR value is lower than 0.10 (<0.10). The combined consistency test results for questionnaires calculated from as many as 17 resource persons show a combined CR value of ≤ 0.10 (Hassoun Nedjar, Djebbar & Djemili 2023). The results of this CR value can be used as a basis to proceed to priority decision analysis using the AHP Expert Choice application. The CR value of the analysis results can be seen in Figure 2.

3.4 Use of Expert Choice Application for AHP Analysis

At this choice stage, a comparison of each existing criterion and alternatives will be carried out using the expert choice application. Expert Choice AHP can be done with the help of Expert Choice Software 11 (Herdhiansyah et al. 2022). Expert Choice is a software widely used in AHP weighting testing (Yunus et al. 2013). The first stage is Pairwise Comparison, a comparative assessment in pairs. Each factor in objective/criteria, sub-objectives, and alternative decisions is determined by comparing pairs

(Ansah, Sorooshian & Mustafa 2015). That is, elements are compared in pairs against a predetermined criterion. Implementations using Expert Choice are generally called process assessments. This process begins by comparing in pairs, starting from all predetermined criteria. The assessment of process results using Expert Choice analysis in graphical form can be seen in Figure 3.

It can be concluded that the motive criterion is the most influential and most concerned on the condition of the psychological factors of the agricultural millennial generation because it has a priority weight of 0.609 or 60.9%, and the second is the expectation criterion with a weight of 0.391 or 39.1%. As for alternatives, the priority for the type of agricultural business in great demand by the millennial generation in Trenggalek Regency is currently 0.290 or 29.0% agro-processing and 0.212 or 21.2% agro-input. Dynamic Sensitivity Graph is a graph that displays the relationship between each alternative and criteria, as can be seen in Figure 4.

4 Results and Discussion

4.1 Characteristics of the Agricultural Millennial Generation

Millennials are another term for Generation Y, which describes people born between 1980 and 2000. Millennials are known to be more comfortable and very familiar with technology. The results showed that the characteristics of the millennial generation in Trenggalek Regency are demographically known to have characteristics as presented in Table 2.

Table 2 shows that the millennial generation's interest in agriculture is as much as 70% of the respondents. This is



Model Name: MILLENNIAL FARMER ENTREPRENEURSHIP PRIORITY 2022

Synthesis: Summary

Combined instance –Synthesis with respect to:
Goal: MILLENNIAL FARMER ENTREPRENEURSHIP PRIORITY 2022

Overall Inconsistency = 0,10



Figure 2 Consistency ratio (CR) value.

**Dynamic Sensitivity for nodes below:
Goal: MILLENNIAL FARMER ENTREPRENEURSHIP PRIORITY 2022**

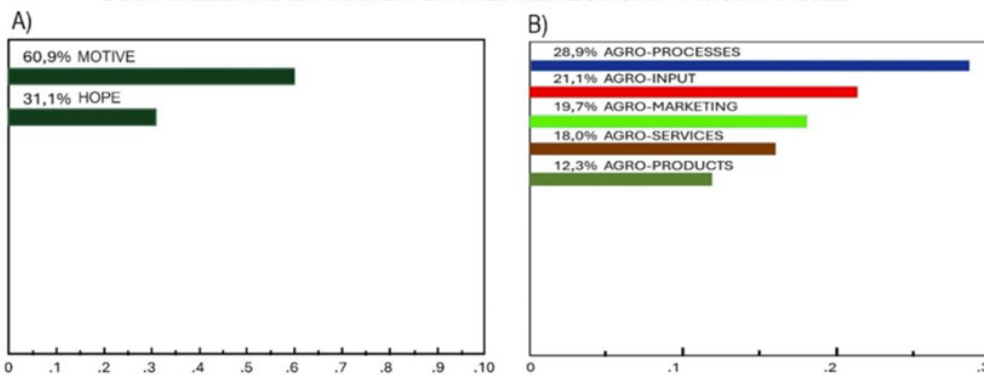


Figure 3 Prioritizing types of millennial farmer entrepreneurship in Trenggalek Regency.

Model Name: MILLENNIAL FARMER ENTREPRENEURSHIP PRIORITY 2022

Treeview



Alternatives

AGRO-PRODUCTS	,126
AGRO-INPUT	,212
AGRO-PROCESSES	,290
AGRO-MARKETING	,193
AGRO-SERVICES	,179

Figure 4 A dynamic Sensitivity Graph is a graph that displays the relationship between each alternative and criteria: A. This diagram shows that the motive factor plays the most important role as a factor influencing the psychology of the millennial generation of agriculture, which is 60.9%; B. Entrepreneurship in the agro-processing sector is the best choice for prioritizing the type of agricultural business for millennials in Trenggalek Regency at this time, which is 29.0%.



an opportunity to change the younger generation’s mindset to want to work in the field of agricultural entrepreneurship, thus allowing for the process of farmer regeneration. This opinion states that farmer regeneration is a process of transferring agricultural activities from old farmers to the next generation/young farmers (Kontogeorgos et al. 2014).

Farmer regeneration/agricultural succession is essential because determining agricultural productivity and competitiveness due to ageing farmers hinders changes in social structure and rural modernization. The process of farmer regeneration is considered ideal by farming families through the scheme of transferring agricultural activities from parents to their children.

The results of identifying the characteristics of the agricultural millennial generation are observed from non-psychological aspects. Psychological aspects are as follows: a) Non-psychological aspects: High school education reached 62.7%; the desired career of agricultural entrepreneurs was 69.1%. Access to information from the Internet or social media is 86.4%. Skills possessed by non-agricultural 77.3%, and 2) Aspects of Psychology; Millennial perceptions in the medium category (71.8%), motives in the medium category (70.9%), expectations in the medium category (60%), and self-efficacy in the medium category (58.2%).

The decision to carry out agricultural succession (transfer of farming) intergenerationally or in one family by the farming family to the next generation (children) is influenced by the farmer’s age, education level, income from other non-agricultural sector jobs (off-farm), both the farmer and his wife, income from farming, experience in farming, and location of the farm. Land tenure, the initial cost of entering farming, and capital also influence farm families’ decisions to undertake farm succession/regeneration processes (Pessotto et al. 2019). Millennials today are accustomed to thinking critically, willing to continue to innovate, and finding something unique and beneficial for society and the environment to develop something better (Godelnik 2017).

4.2 Factors Influencing the Millennial Generation’s Interest in Agricultural Entrepreneurship in Trenggalek Regency

Intention is a high inclination towards something, passion, desire for something, or desire to become an entrepreneur in the IF area. In this study, the analysis of factors that influence the millennial generation’s interest

Table 2 Characteristics of the Agricultural Millennial Generation in Tugu District and Krangan District, Trenggalek Regency.

Variable	Category	N	Percentage
Intention	Medium	77	70.0
	High	33	30.0
	SD/SMP	12	10.9
Education	SMA	69	62.7
	College	29	26.4
Desired Career	Agricultural Entrepreneurship	76	69.1
	Non-Agricultural Entrepreneurship	34	30.9
Access Resources	Friends/Relatives	15	13.6
	Internet/Medsos	95	86.4
Skills	Agriculture	25	22.7
	Non-Agricultural	85	77.3
Perception	Medium	79	71.8
	High	31	28.2
Motif	Medium	78	70.9
	High	32	29.1
Hope	Medium	66	60.0
	High	44	40.0
Self-efficacy	Medium	75	68.2
	High	35	31.8
Total		110	

in implementing an integrated agricultural system is measured based on the factors of perception, motives, hope, and self-efficacy of millennial farmers in carrying out entrepreneurship in the IF environment, is presented in Table 3.

Table 3 shows that the interest of agricultural millennials in agricultural entrepreneurship is influenced by the motive factor (X_2) with a sig. Value of 0.011, and the expectation factor sig value. 0,042 (X_3). Motives are the human reasons behind them to make a will. Motive significantly affects the interest of the millennial generation of agriculture in agricultural entrepreneurship, meaning that the millennial generation of agriculture in Trenggalek Regency already has the will to entrepreneurship in integrated agricultural businesses, daily habits have led to integrated agricultural businesses, and the millennial generation wants a career in integrated agricultural businesses. Thus, the millennial generation’s interest in integrated farming is increasing. Millennial farmers must be ready to become millennial agricultural entrepreneurs who are creative, innovative, professional, competitive, and, of course, able to absorb as many agricultural sector jobs as possible. Hope or hope is a basic belief that something desired will be obtained or that an event will bear good fruit in the future.

The analysis results (Table 3) show that hope really affects the millennial generation’s interest in agricultural entrepreneurship. The millennial generation’s desire to work in integrated agricultural businesses is quite high. Observations show that the millennial generation still needs to understand the passion for business and ideas for the success of integrated agricultural businesses, solve problems faced in integrated agricultural businesses, and feel confident in integrated agricultural businesses.

To overcome the shortcomings faced by the millennial generation in implementing integrated agricultural businesses, assistance and empowerment are needed by Agricultural Extension and Mentors who have successful businesses in integrated agricultural businesses. This is the opinion stating that, thus, the millennial generation must continue to compete to produce agricultural products and

be able to meet market demand (Naik & Suresh 2018). This challenge must be done by empowering farmers to become farmers who can compete in this era so that farmers can process and produce their agricultural products by combining technology and the internet.

4.3 Involvement of Motive Factors in Agricultural Entrepreneurship Millennial Agriculture

Entrepreneurs with great opportunities to develop in Trenggalek Regency are in the agro-processing sub-sector. Agroprocess entrepreneurship is an entrepreneur who focuses on processing agricultural products involving various stages, from post-harvest to making final products. Its activities include processing agricultural raw materials into products that are ready to be packaged, producing semi-finished goods from industrial and technological processing, and manufacturing final products from the agricultural sector.

The agro-food subsector can include 1) products of root plant origin, 2) food of grain origin, 3) coffee, cocoa, tea, and legume products, 4) animal protein food products such as dairy products, oil, and animal feed, and food products of meat origin such as red meat, pork, and poultry both for domestic and export markets, 5) fresh products of fruits, vegetables, flowers, seafood/cultivation, and 6) diversified products such as organic and other products (Wilkinson & Rocha 2008).

Interest triggers a motivational process in which people become driven by what they want rather than what they should do (Schunk & DiBenedetto 2021). The theory of the theoretical relationship between interest, motivation, goal-oriented behavior, and goal achievement outcomes in Figure 5, that can explain interest and motivation.

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Table 3 Results of Ordinal Regression Analysis for Factors Affecting the Interest of Millennial Farmers

Variable X	Sig. (p-Value)
Perception (X_1)	0,341
Motif (X_2)	0.011*
Hope (X_3)	0.042*
Self-efficacy (X_4)	0,254

products such as organic and other products (Wilkinson & Rocha 2008).

It is important to understand that motivational processes can lead people to become more focused on what to achieve rather than what to do (Schunk & DiBenedetto 2021; Ryan & Deci 2020; Urhahne & Wijnia 2023). The theoretical relationship between motivation, goal orientation, interest, and goal achievement can be explained by Figure 6.

Motives are the basis for the agricultural millennial generation to do a will, which is in the form of encouragement that can influence the interest of the agricultural millennial generation in agricultural entrepreneurship. In this study, the agricultural millennial generation in Trenggalek Regency has the will to be entrepreneurial in integrated agricultural businesses, daily habits have led to integrated agricultural businesses, and the millennial generation wants to have a career in integrated agricultural businesses. With these conditions, facility, and activity intervention is needed to drive greater interest in entrepreneurship.

The implementation of extension activities with the IFS program in Trenggalek Regency can adapt to the needs of the millennial generation, where the extension materials and methods selected and applied lead to meeting the millennial generation’s interest in integrated agricultural businesses, innovations, and technologies that can increase the interest and desire of the millennial generation of agriculture in appropriate agricultural entrepreneurship and innovative and competitive agriculture. Thus, the millennial generation’s interest in striving for integrated agricultural businesses increases.

An explanation of the role and factors of motives, such as individual-driven motives, moral-cultural primary motives, and rational-structural basic motives, play an essential role in shaping the priorities of agricultural millennials in Trenggalek Regency for agro-processing entrepreneurship types. First, Motivations driven by individual factors are personal and unique to each agricultural millennial, such as personal goals, aspirations, and values related to agriculture and entrepreneurship. Agricultural

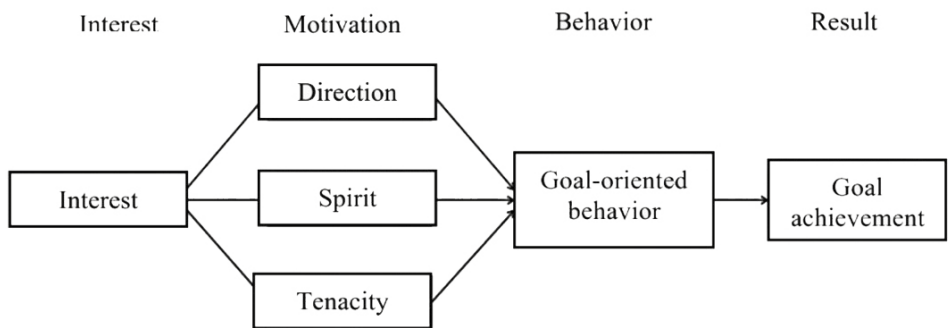


Figure 5 Theory of the theoretical relationship between interest, motivation, goal-oriented behavior, and goal achievement outcomes (Rounds & Su 2014).

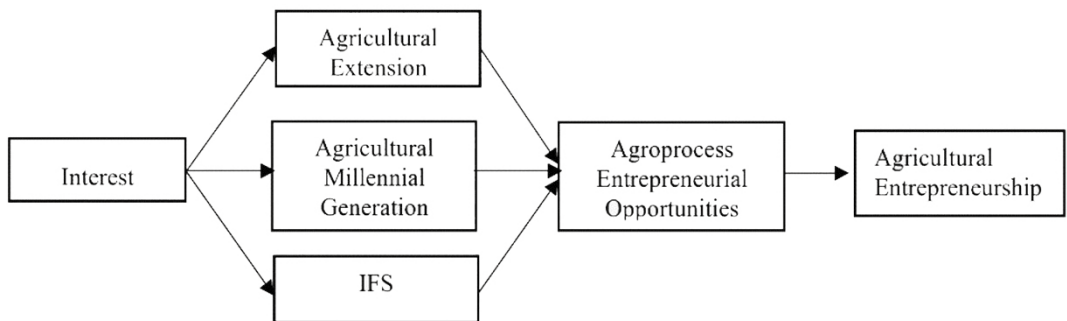


Figure 6 Motive Implementation on millennial farmers’ interest in agricultural entrepreneurship.



millennials in Trenggalek Regency are motivated by the desire to innovate sustainable agricultural practices or to contribute to the local economy through agro-processing entrepreneurship. Second, moral-cultural underlying motives are influenced by cultural values, ethics, and a sense of responsibility towards the environment, society, and future generations that are important to agricultural millennials in Trenggalek Regency. Cultural traditions, environmental stewardship, and community welfare may influence the choice of agro-industrial agricultural entrepreneurship. Factors such as commitment to environmental sustainability, social responsibility, and ethical business practices or promoting organic and environmentally friendly practices could be critical cultural motives of agricultural millennials in Trenggalek District. Third, Rational-structural primary motives are based on practical and rational considerations, such as economic feasibility, market demand, and resource availability. Agricultural Millennials may prioritize agro-processing entrepreneurship based on market trends, financial viability, and access to land, technology, and infrastructure.

These motive factors collectively shape the priorities of agricultural millennials in the Trenggalek district and influence the decision-making process when choosing the

type of agro-processing entrepreneurship. Agricultural millennials in the Trenggalek district can prioritize types of agro-processing entrepreneurship based on a combination of these motive factors. Thus, agricultural millennials can make informed decisions that align with their values, contribute to sustainable development, and create economically viable agricultural businesses (Effendy, Widyaastuti & Lastri 2022).

4.4 Application of Agroprocessing by Millennial Farmers in Integrated Agriculture in Trenggalek Regency

Integrated agriculture in Trenggalek Regency, especially in Tugu Sub-district, has several agricultural business options, including agro-products, agro-inputs, agro-processes, agro-marketing, and agro-services. After assessing the interests of millennial farmers in the area, they chose agro-processes as the priority and flagship of their agricultural entrepreneurial activities. How these millennial farmers implement their agricultural entrepreneurial integration activities in an agricultural area based on one sub-district area can be seen in Figure 7.

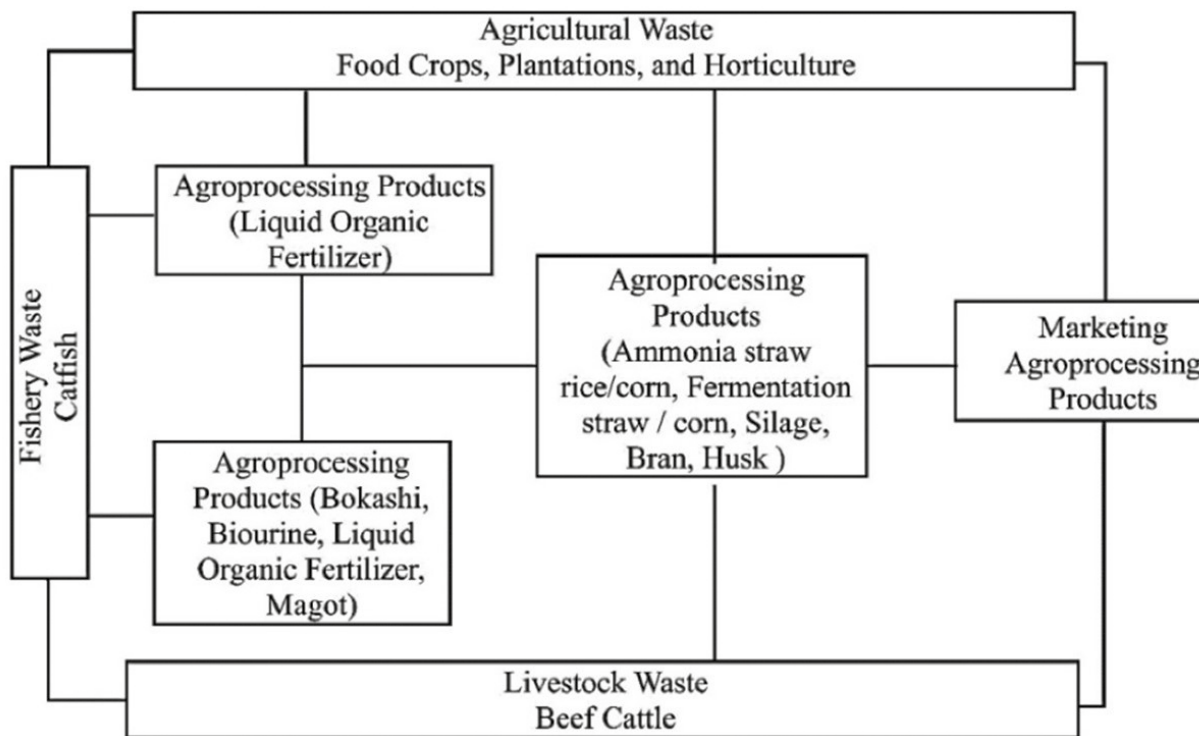


Figure 7 Agroprocessing-Based IF (integrated Farming) Implementation Model.



The Tugu District area in Trenggalek Regency produces waste from rice plants in the form of biomass or straw, livestock waste from beef cattle in the form of urine and feces, and catfish waste. Rice plants have a planting area in one growing season, 424 ha. From the planting area, the amount of biomass (rice straw) based on the level of productivity is relatively high, around 1,828 tons. Livestock waste from 138 beef cattle produced urine of as much as 138,000 liters daily and feces of 2,070 kg daily. The Tugu District area in Trenggalek Regency produces waste from rice plants in the form of biomass or straw, livestock waste from beef cattle in the form of urine and feces, and catfish waste. Rice plants have a planting area in one growing season, 424 ha. From the planting area, the amount of biomass (rice straw) based on the level of productivity is relatively high, around 1,828 tons. Livestock waste from 138 beef cattle produced urine of as much as 138,000 liters daily and feces of 2,070 kg daily.

At the same time, catfish fisheries can produce as much as 40,000 liters of waste per season. With the waste produced, it is necessary to have biomass processing techniques, livestock waste, and catfish farm waste. Based on the potential conditions in the region, it is possible to initiate an agro-processing-based IF (integrated Farming) implementation model (Figure 6). The relationship between rice plants, cattle breeding, and catfish fisheries can produce several products with high economic value. These agro-processing products include Solid Organic Fertilizer, Liquid Organic Fertilizer, Biourine, Probiotics, Vegetable Pesticides, Trichoderma, Refugia, Straw Amofer, and Magot. Economic value These products: 1) in the production system can reduce the use and dependence on external production inputs. Whether in the form of fertilizers, medicines, or seeds, more specifically, dependence on inorganic (chemical) inputs, which tend to increase in exchange value compared to the exchange value of the leading agricultural products of food crops. Utilization of by-products produced from the IF program in addition to the main product, including forage plant silage, vegetable pesticides, processed corn tortillas, NPK plus), and 2) overproduction of agro-processing products can be marketed through joint business units owned by the Farmer Group Association (Gapoktan) in the region.

5 Conclusion

The results of the millennial generation agricultural analysis study in the IFS implementation area in Trenggalek Regency: Anticipating the decline in the millennial generation's interest in agricultural entrepreneurship can be done by paying attention to subjective norms or

psychological factors, namely motive factors and hope factors. Subjective norms or psychological factors can be used as a basis for millennial farmers in choosing agricultural entrepreneurship priorities. Agro-process entrepreneurship is the priority type of agricultural entrepreneurship that has the opportunity to be developed by the agricultural millennial generation in Trenggalek Regency.

The agro-processed products are integrated agricultural by-products from crops, animal husbandry, plantations, horticulture, and fisheries. These products include Solid Organic Fertilizer, Liquid Organic Fertilizer, Biourine, Probiotics, Vegetable Pesticides, Trichoderma, Refugia, Straw Amofer, and Magot. The products are intended to meet the needs of millennial farmers in the Tugu Trenggalek District area and can be marketed to farmers around the region.

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7 References

- Adam, A.M. 2020, 'Sample size determination in survey research', *Journal of Scientific Research and Reports*, vol. 26, no. 5, pp. 90-7, DOI:10.9734/jsrr/2020/v26i530263.
- Ahmad, Y. & Pirzada, D.S. 2014, 'Using analytic hierarchy process for exploring prioritization of functional strategies in auto parts manufacturing SMEs of Pakistan', *Sage Open*, vol. 4, no. 4, DOI:10.1177/2158244014553560.
- Akbar, A., Hidayah, N., Oktaviani, R.C. & Ramadyanti, F. 2022, 'Ministry of Agriculture's Public Relations Strategy Through the Millennial Farmer Program', *Communicare: Journal of Communication Studies*, vol. 9, no. 2, pp. 97-107, DOI:10.37535/101009220222.
- Akintunde, E. 2017, 'Theories and concepts for human behavior in environmental preservation', *Journal of Environmental Science and Public Health*, vol. 1, no. 2, pp. 120-33, DOI:10.26502/jesph.96120012.
- Ansah, R.H., Sorooshian, S. & Mustafa, S.B. 2015, 'Analytic hierarchy process decision making algorithm', *Global Journal of Pure and Applied Mathematics*, vol. 11, no. 4, pp. 2393-400.
- Arvianti, E.Y., Masyhuri, M., Waluyati, L.R. & Darwanto, D.H. 2019, 'Gambaran Krisis Petani Muda Indonesia', *Agriekonomika*, vol. 8, no. 2, pp. 168-80, DOI:10.21107/agriekonomika.v8i2.5429.
- Atinafu, B.T., Tarekegn, F.N. & Kebede, W.M. 2023, 'Assessment of the level of social support and associated factors among cancer patients in the comprehensive cancer center at Ethiopia:

- Ordinal logistic regression analysis level of social support and associated factors among cancer patients', *Heliyon*, vol. 9, no. 5, e15688, DOI:10.1016/j.heliyon.2023.e15688.
- Bagheri, M., Zaiton Ibrahim, Z., Mansor, S., Abd Manaf, L., Akhir, M.F., Talaat, W.I.A.W. & Beiranvand Pour, A. 2021, 'Application of multi-criteria decision-making model and expert choice software for coastal city vulnerability evaluation', *Urban Science*, vol. 5, no. 4, 84, DOI:10.3390/urbansci5040084.
- Baum, M.B. & Sullivan, K. 2013, *Service business costing: Cost accounting approach for the service industry*, Springer, DOI:10.1007/978-3-8349-4444-3.
- Borda, Á.J., Sárvári, B. & Balogh, J.M. 2023, 'Generation change in agriculture: A systematic review of the literature', *Economies*, vol. 11, no. 5, 129, DOI:10.3390/economies11050129.
- BPS-Statistics Indonesia 2020, *Statistical Yearbook of Indonesia 2020*, BPS, Indonesia.
- Bürkner, P.C. & Vuorre, M. 2019, 'Ordinal regression models in psychology: A tutorial', *Advances in Methods and Practices in Psychological Science*, vol. 2, no. 1, pp. 77-101, DOI:10.1177/2515245918823199.
- Canco, I., Kruja, D. & Iancu, T. 2021, 'Ahp, a reliable method for quality decision making: A case study in business', *Sustainability (Switzerland)*, vol. 13, no. 24, 13932, DOI:10.3390/su132413932.
- Changyong, R. & Posen, S.A. 2013, *Responding to financial crisis lessons from Asia then, The United States and Europe now*, Peterson Institute for International Economics, Washington, DC.
- Cohen, L., Manion, L. & Morrison, K. 2018, *Research methods in education this routledge*, vol. 8, Routledge, New York.
- De Gruyter, C. 2017, *Travel plans for new residential developments: Insights from theory and practice*, Taylor & Francis Group, DOI:10.1007/978-981-10-2092-6.
- Dhokhikah, Y., Trihadiningrum, Y. & Sunaryo, S. 2015, 'Community participation in household solid waste reduction in Surabaya, Indonesia', *Resources, Conservation and Recycling*, vol. 102, pp. 153-62, DOI:10.1016/j.resconrec.2015.06.013.
- Effendy, L., Widyaausti, N. & Lastri, H. 2022, 'The Millennial Farmers' interest in succeeding the family agriculture for hydroponic application in Garut District, West Java Indonesia', *Universal Journal of Agricultural Research*, vol. 10, no. 3, pp. 266-74, DOI:10.13189/ujar.2022.100308.
- Elfahmi, S., Chandrarin, G. & Manan, A. 2021, 'The influence of external environment, internal environment, and motivation on competitiveness through the product innovation of Lasem Batik Tulis SMEs in Indonesia', *International Journal of Business Innovation and Research*, vol. 24, no. 4, pp. 514-34, DOI:10.1504/IJBIR.2021.114051.
- FAO – Food and Agriculture Organization 2017, *The future of food and agriculture: trends and challenges: The future of food and agriculture: Trends and challenges*, vol. 4, FAO.
- Fink, L., Strassner, C. & Ploeger, A. 2021, 'Exploring external factors affecting the intention-behavior gap when trying to adopt a sustainable diet: A think aloud study', *Frontiers in Nutrition*, vol. 8, pp. 1-20, DOI:10.3389/fnut.2021.511412.
- Giller, K.E., Delaune, T., Silva, J.V., Descheemaeker, K., van de Ven, G., Schut, A.G.T., van Wijk, M., Hammond, J., Hochman, Z., Taulya, G., Chikowo, R., Narayanan, S., Kishore, A., Bresciani, F., Teixeira, H.M., Andersson, J.A. & van Ittersum, M.K. 2021, 'The future of farming: Who will produce our food?' *Food Security*, vol. 13, no. 5, pp. 1073-99, DOI:10.1007/s12571-021-01184-6.
- Godelnik, R. 2017, 'Millennials and the sharing economy: Lessons from a 'buy nothing new, share everything month' project', *Environmental Innovation and Societal Transitions*, vol. 23, pp. 40-52, DOI:10.1016/j.eist.2017.02.002.
- Hassoun Nedjar, N., Djebbar, Y. & Djemili, L. 2023, 'Application of the analytical hierarchy process for planning the rehabilitation of water distribution networks', *Arab Gulf Journal of Scientific Research*, vol. 41, no. 4, pp. 518-38, DOI:10.1108/AGJSR-07-2022-0110.
- Herdhiansyah, D., Sudarmi, Sakir, S., Asriani & Midi, L.O. 2022, 'Analytical hierarchy process (AHP) in Expert Choice for determining superior plantation commodities: A case in East Kolaka Regency', Indonesia, *Songklanakarin Journal of Science and Technology*, vol. 44, no. 4, pp. 923-8, DOI:10.14456/sjst-psu.2022.123.
- Hillier, F.S., Price, C.C. & Austin, S.F. 2012, *Models, methods, concepts & applications of the analytic hierarchy process*, 2nd edn, vol. 175, Springer, New York.
- Janeš, A., Kadoić, N. & Redep, N.B. 2018, 'Differences in prioritization of the BSC's strategic goals using AHP and ANP methods', *Journal of Information and Organizational Sciences*, vol. 42, no. 2, pp. 193-217, DOI:10.31341/jios.42.2.3.
- Kontogeorgos, A., Michailidis, A., Chatzitheodoridis, F. & Loizou, E. 2014, "'New Farmers" a crucial parameter for the greek primary sector: Assessments and perceptions', *Procedia Economics and Finance*, vol. 14, no. 14, pp. 333-41, DOI:10.1016/s2212-5671(14)00721-7.
- Kováč, I., Megyesi, B.G., Bai, A. & Balogh, P. 2022, 'Sustainability and agricultural regeneration in hungarian agriculture'. *Sustainability (Switzerland)*, vol. 14, no. 2, 969, DOI:10.3390/su14020969.
- Kumar, S., Dey, A., Kumar, U., Chandra, N. & Bhatt, B.P. 2012, 'Integrated Farming System for Improving Agricultural Productivity', in B.P. Bhatt, A.K. Sikka, J. Mukherjee, A. Islam & A. Dey (eds), *Status of Agricultural Development in Eastern India*, ICAR Research Complex for Eastern Region, Patna-800 014, Bihar., pp. 205-30.
- Leimona, B., Amaruzaman, S., Arifin, B., Yasmin, F., Hasan, F., Augusta, H., Sprang, P., Jaffee, S. & Frias, J. 2015, Indonesia's 'Green Agriculture' strategies and policies: Closing the gap between aspirations and application, The World Agroforestry Centre United Nations Avenue, Nairobi, viewed 11/2023, <<http://www.worldagroforestry.org/sea/Publications/files/occasionalpaper/OP0003-15.pdf>>.
- Lunggang, D.M. 2018, *Shaping aspirations: Insights of young farmers life trajectory in pinrang regency*, AFES, International Institute of Social Studies.
- Martin, G., Martin-Clouaire, R. & Duru, M. 2013, 'Farming system design to feed the changing world: A review', *Agronomy*

- for Sustainable Development, vol. 33, no. 1, pp. 131-49, DOI:10.1007/s13593-011-0075-4.
- Moraine, M., Duru, M., Nicholas, P., Leterme, P. & Therond, O. 2014, 'Farming system design for innovative crop-livestock integration in Europe', *Animal*, vol. 8, no. 8, 1 pp. 1204-17, DOI:10.1017/S1751731114001189.
- Mu, E. & Pereyra-Rojas, M. 2017, *Practical decision making: An introduction to the Analytic Hierarchy Process (AHP) using super decisions V2*, Springer, DOI:10.1007/978-3-319-33861-3.
- Naik, G. & Suresh, D.N. 2018, 'Challenges of creating sustainable agri-retail supply chains', *IIMB Management Review*, vol. 30, no. 3, pp. 270-82, DOI:10.1016/j.iimb.2018.04.001.
- Nelson, G.C. 2010, *Food Security, Farming, and Climate Change to 2050: Scenarios, Results, Policy Options*. Publisher: International Food Policy Research Institute (IFPRI) 2033 K Street, NW, Washington, D.C. 20006-1002, U.S.A.. DOI: 10.2499/9780896291867
- Ngatindriatun & Adzim, F. 2021, 'Agribusiness-based farmer empowerment model with a sustainable integrated farming system approach to increase income multiplier effect', *ABAC Journal*, vol. 42, no. 2, pp. 267-92, DOI:10.14456/abacj.2022.13.
- Pessotto, A.P., Costa, C., Schwingamer, T., Colle, G. & Corte, V.F.D. 2019, 'Factors influencing intergenerational succession in family farm businesses in Brazil', *Land Use Policy*, vol. 87, 104045, DOI:10.1016/j.landusepol.2019.104045.
- Rounds, J. & Su, R. 2014, 'The nature and power of interests', *Current Directions in Psychological Science*, vol. 23, no. 2, pp. 98-103, DOI:10.1177/0963721414522812.
- Ruane, J.M. 2016, *Introducing social research methods*, John Wiley & Sons Ltd, The Atrium.
- Ryan, R.M. & Deci, E.L. 2020, 'Intrinsic and extrinsic motivation from a self-determination theory perspective: Definitions, theory, practices, and future directions', *Contemporary Educational Psychology*, vol. 61, 101860, DOI:10.1016/j.cedpsych.2020.101860.
- Saaty, T.L. 2001, 'Fundamentals of the analytic hierarchy process', in D.L. Schmoldt, J. Kangas, G.A. Mendonza & M. Pesonen (eds), *The analytic hierarchy process in natural resource and environmental decision making: Managing forest ecosystems*, vol. 3, Springer, Dordrecht, pp. 15-35, DOI:10.1007/978-94-015-9799-9_2.
- Schunk, D.H. & DiBenedetto, M.K. 2021, 'Self-efficacy and human motivation', in *Advances in motivation science*, Elsevier, Greensboro, pp. 153-79, DOI:10.1016/bs.adms.2020.10.001.
- Statistics Indonesia 2010, *Statistical Yearbook of Indonesia*, Jakarta.
- Stockemer, D. 2019, 'Quantitative methods in the social sciences. A Practical Introduction with Examples in SPSS and Stata. University of Ottawa School of Political Studies Ottawa, Ontario, Canada. (eBook) @Springer International Publishing AG 2019. <https://doi.org/10.1007/978-3-319-99118-4>
- Susanto, T.D., Diani, M.M. & Hafidz, I. 2017, 'User Acceptance of e-Government Citizen Report System (a Case Study of City113 App)', *Procedia Computer Science*, vol. 124, pp. 560-8, DOI:10.1016/j.procs.2017.12.190.
- Taherdoost, H. 2021, 'Data collection methods and tools for research; A step-by-step guide to choose data collection technique for academic and business research projects', *International Journal of Academic Research in Management*, vol. 10, no. 1, pp. 10-38.
- Tavana, M., Soltanifar, M. & Santos-Arteaga, F.J. 2021, 'Analytical hierarchy process: Revolution and evolution', *Annals of Operations Research*, vol. 326, pp. 879-907, DOI:10.1007/s10479-021-04432-2.
- Tejada, J.J., Raymond, J. & Punzalan, B. 2012, 'On the misuse of slovin's formula', *The Philippine Statistician*, vol. 61, no. 1, pp. 129-36.
- Thirlaway, K. & Upton, D. 2009, *The psychology of lifestyle*, Routledge, London, DOI:10.4324/9780203870952.
- Urhahne, D. & Wijnia, L. 2023, 'Theories of motivation in education: An integrative framework', *Educational Psychology Review*, vol. 35, 45, DOI:10.1007/s10648-023-09767-9.
- Vågsholm, I., Arzoomand, N.S. & Boqvist, S. 2020, 'Food security, safety, and sustainability—Getting the trade-offs right', *Frontiers in Sustainable Food Systems*, vol. 4, pp. 1-14, DOI:10.3389/fsufs.2020.00016.
- Veysset, P., Lherm, M., Bébin, D. & Roulenc, M. 2014, 'Mixed crop-livestock farming systems: A sustainable way to produce beef? Commercial farms results, questions and perspectives', *Animal*, vol. 8, no. 8, pp. 1218-28, DOI:10.1017/S1751731114000378.
- Weston, P., Hong, R., Kaboré, C. & Kull, C.A. 2015, 'Farmer-Managed Natural Regeneration Enhances Rural Livelihoods in Dryland West Africa', *Environmental Management*, vol. 55, no. 6, pp. 1402-17, DOI:10.1007/s00267-015-0469-1.
- Wilkinson, J. & Rocha, R. 2008, 'The agro-processing sector: Empirical overview, recent trends and development impacts', Global Agro-industries Forum, April, FAO/UNIDO/IFAD/Indian Government.
- Yuniarti, W., Sumardjo, W. & Wibawa, W.D. 2020, 'Brain gain actors: Farmers' regeneration in Indonesia', *Journal of Human Ecology*, vol. 71, no. 1-3, pp. 139-46, DOI:10.31901/24566608.2020/71.1-3.3253.
- Yunus, R.M., Samadi, Z., Yusop, N.M. & Omar, D. 2013, 'Expert Choice for Ranking Heritage Streets', *Procedia - Social and Behavioral Sciences*, vol. 101, pp. 465-75, DOI:10.1016/j.sbspro.2013.07.220.

Author contributions

Yudi Rustandi: conceptualization; formal analysis; methodology; validation; writing – original draft; writing review and editing; visualization. Abdul Farid: methodology; validation; writing – original draft; supervision.

Conflict of interest

The authors declare no conflict of interest.

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