JASSU
Journal of Agrosociology and Sustainability
JASSU 3(1): 1–18
ISSN 3025-1362

Institute for Advanced Science, Social and Sustainable Future
MORALITY BEFORE KNOWLEDGE

Strategies to overcome the declining trend of young farmers: A comprehensive review of agricultural development issues

Md Baha Uddin[1,2], Ernoiz Antriyandarti[3,*]
[1] *Master Program of Agribusiness, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Central Java, 57126, Indonesia;*
[2] *Faculty of Agricultural Economics and Business Studies, Sylhet Agricultural University, Sylhet-3100, Bangladesh;*
[3] *Agribusiness Study Program, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Central Java 57126, Indonesia.*
*Correspondence: ernoiz_a@staff.uns.ac.id

Received Date: March 17, 2025 Revised Date: July 3, 2025 Accepted Date: July 21, 2025

ABSTRACT
Background: Agricultural production stands as the third-largest sector in Indonesia, yet the presence of young farmers, crucial for sustainable agricultural practices and food security, lags behind ideal proportions. Despite comprising 52% of the population, young people's engagement in farming falls short at approximately 30%. **Methods**: This paper delves into the underlying reasons behind this crisis, utilizing secondary data analysis from BPS Indonesia and employing documentary analysis methodology. **Findings:** The study reveals that the declining participation of Indonesian youth in agriculture is driven by intertwined structural, economic, and sociocultural barriers, necessitating a comprehensive, multi-stakeholder strategy to ensure generational renewal and long-term food security. **Conclusion**: The paper provides suggestions for further research to address this pressing issue and pave the way for a rejuvenated generation of farmers essential for Indonesia's agricultural future. **Novelty/Originality of this article:** This research offers a novel perspective by not only identifying challenges but also providing recommendations to revitalize youth engagement in agriculture, ensuring the sector's long-term sustainability.

KEYWORDS: crisis; employment; food security; regeneration; young farmers.

1. Introduction

The global population is projected to rise from its present level of 6.9 billion to 9.2 billion by 2050. An estimated 1 billion people already are going hungry, and young rural people are increasingly disillusioned about working in the agricultural sector, which in many countries is stagnant and unproductive. So the question must be asked: Who is going to feed this growing world population? Behind almost every plate of food is the work of perhaps a dozen or more farmers. Much of the food we eat is the result of work by a huge number of farmers, growers, and agricultural workers. The farmers may be working on different farms, countries, or even continents. But the future of farming, and farmers, is not as secure as we might expect (De Martinis et al., 2020). The odds are that the farmers who grew the food for your next meal have the majority of their careers behind them. When this generation of experienced farmers retires, who will carry on putting food on the table after them? Young people are increasingly seeking work in the cities, sidelining agriculture

Cite This Article:
Uddin, M. B., & Antriyandarti, E. (2025). Strategies to overcome the declining trend of young farmers: A comprehensive review of agricultural development issues. *Journal of Agrosociology and Sustainability, 3*(1), 1-18. https://doi.org/10.61511/jassu.v3i1.2025.1820

(Girdziute et al., 2022). Without a new generation to take on the job, the global food supply begins to look very uncertain.

Agriculture in Indonesia plays a crucial role in the country's economy, culture, and food security. Agriculture has historically been one of the most important sectors in Indonesia's economy, employing a significant portion of the population and contributing to GDP (Gross Domestic Product). Agriculture is crucial in Indonesia, providing food for 272 million people and serving as the primary source of employment. Agriculture accounts for approximately 28% of the entire workforce (34.6 million people) and 48% of the rural labor force (BPS, 2019).

Indonesia's diverse climate fosters the growth of a wide array of crops, including rice, palm oil, rubber, and spices, with rice being crucial for food security. However, the rapid expansion of palm oil plantations has raised environmental concerns (Murphy et al., 2021), while rubber cultivation, concentrated in certain regions, involves both smallholder farmers and large plantations. Indonesian agriculture development faces various challenges, including limited access to modern agricultural inputs and technologies, land degradation, drought, difficulty business capital, fair prices for farmers, climate change impacts, pest and disease outbreaks, and inadequate infrastructure. With these, the crisis of the young farmer generation is one of the leading problems (Eistrup et al., 2019).

The rate at which the country is losing farmers is a cause for concern. If it continues, Indonesia is likely to have no farmers left in 50 years. What will we eat? The country lost 5.1 million farmers between 2003 and 2013, with their numbers falling to 26 million, according to Statistics Indonesia (BPS, 2013). The trend is expected to continue in the next few years. At this rate, Indonesia would lose all its farmers by 2063. Agriculture is a huge contributor to Indonesia’s economy. Around 29 percent of the Indonesian workforce works in the agriculture, fisheries, and livestock sector, which contributes nearly 13 percent to the country’s GDP. It is the third-biggest contributor to the economy after manufacturing and trade, according to Statistics Indonesia (BPS, 2023a) data.

It is necessary to understand the crucial role is in participating as young agricultural farmers. Thus, the objectives of this study are to investigate the decline in young farmer participation by examining and analyzing statistical data to better understand the variables influencing young farmers' declining involvement in Indonesia's agricultural industry, and to identify the barriers to entry for young farmers by explaining the economic, cultural, and institutional constraints that prevent young people from considering farming as a viable career option. Furthermore, this study aims to determine the impact on food security and employment by evaluating the consequences of a scarcity of young farmers on food security, job opportunities in the agriculture sector, and the broader economy. In addition, it seeks to investigate strategies for attracting young farmers by exploring viable interventions and techniques, including governmental changes, educational efforts, and technological advancements, to rekindle young people's enthusiasm and participation in agricultural activities. Lastly, this study intends to provide recommendations for policy and future research by offering concrete ideas for policymakers, stakeholders, and academics to effectively address the young farmer dilemma, as well as identifying opportunities for future studies to expand understanding and develop long-term solutions.

2. Methods

In this case study examining the challenges faced by young farmers in Indonesia, we employ documentary analysis as our primary qualitative research method. This approach involves a systematic review and evaluation of both printed and electronic documents to extract meaningful information and insights relevant to our research focus.

Documentary analysis was selected for this study due to its methodological appropriateness and practical advantages in exploring the challenges faced by young farmers in Indonesia. As a qualitative research method, it involves the systematic review and evaluation of both printed and electronic documents to extract meaningful information and insights pertinent to the research focus. By analyzing existing materials such as policy

papers, academic articles, and reports, researchers can gain a comprehensive understanding of the socio-economic factors, policy impacts, and historical trends affecting young farmers. This approach is particularly beneficial when resources or time constraints limit the feasibility of extensive fieldwork, allowing for efficient data collection without direct interaction with subjects. Moreover, documentary analysis facilitates the triangulation of data sources, enhancing the credibility and validity of the research findings. Its flexibility and accessibility make it an appropriate choice for constructing a nuanced narrative grounded in documented evidence.

Documentary analysis is a qualitative research method characterized by its systematic and rigorous approach to evaluating documents as data sources. This method involves the careful selection, review, and interpretation of both printed and electronic materials to extract meaningful information pertinent to the research focus. A key feature of documentary analysis is its emphasis on contextual understanding; researchers consider the purpose, origin, and intended audience of each document to accurately interpret its content. Additionally, thematic coding is employed to identify patterns and categories within the data, facilitating a deeper analysis of the subject matter. The method's flexibility allows it to be used independently or alongside other research methods, enhancing the study's credibility through data triangulation. Furthermore, documentary analysis is particularly advantageous when direct data collection is impractical, offering an efficient means to gather comprehensive insights without the need for extensive fieldwork. Its adaptability and depth make it a valuable tool for constructing nuanced narratives grounded in existing literature and documented evidence.

3. Results and Discussion

Fewer young people are pursuing farming as a profession compared with previous generations. Only 23 percent of the country's 14.2 million people aged between 15 and 24 worked in the agriculture, forestry, and fishery sectors in 2019, data from the National Labor Force Survey showed. Between 2013 and 2019, Indonesia's agricultural land decreased to 7.46 million hectares from 7.75 million hectares, according to data collected by the Agrarian and Spatial Planning Ministry, BPS, and several other government institutions. In the table below, we have tried to see the average age of farmers in different countries of the world.

Table 1. The average age of farmers in some countries

Country name	The average age of the farmer
America	60
Canada	56
UK	59
European Union (EU)	60
Japan	66
Korea	62.3
Kenya	60
China	55
Thailand	54
Philippine	57
Bangladesh	48
India	50.1
South East Asian Nations	45-60

According to the data in the table above, the average age of farmers in most nations is relatively high; this aging trend raises concerns about future food security (Rozaki, 2021), with many approaching or having reached retirement age without successors. Countries with relatively high average ages, such as Japan (66) and Korea (62.3), face considerable issues as their farming population ages. Bangladesh (48) stands out for having a slightly younger average age of farmers, which may represent a greater involvement of young

people in agriculture, and it may reflect fewer urban job opportunities in Bangladesh. The high average ages also suggest limited adoption of modern farming technologies, which often require younger, tech-savvy workers. The disparities in average ages among regions reflect demography, agricultural techniques, and socioeconomic factors influencing the farming population.

In Ireland, there is a generational renewal crisis in Agriculture, with only 4.3% of farmers aged under 35. At a European level, this figure stands at 5.6%. Since 2013, the number of farmers over the age of 65 has increased by almost 10.8%, signifying a negative demographic trend in the sector. Varying farm systems experience the impacts of this trend in different ways, with factors such as location and income playing a role in how likely a farm is to attract a successor.

3.1 Indonesia - Employment in agriculture, services, and industry (% of total employment)

The data below is according to the World Bank compilation of development indicators, collected from official sources. Figure 1 illustrates the evolving structure of Indonesia's employment from 1976 to 2019, highlighting a pronounced decline in agricultural employment and a corresponding rise in services. This transition reflects the country's ongoing economic transformation, urbanization, and shift toward a modern, service-based economy.

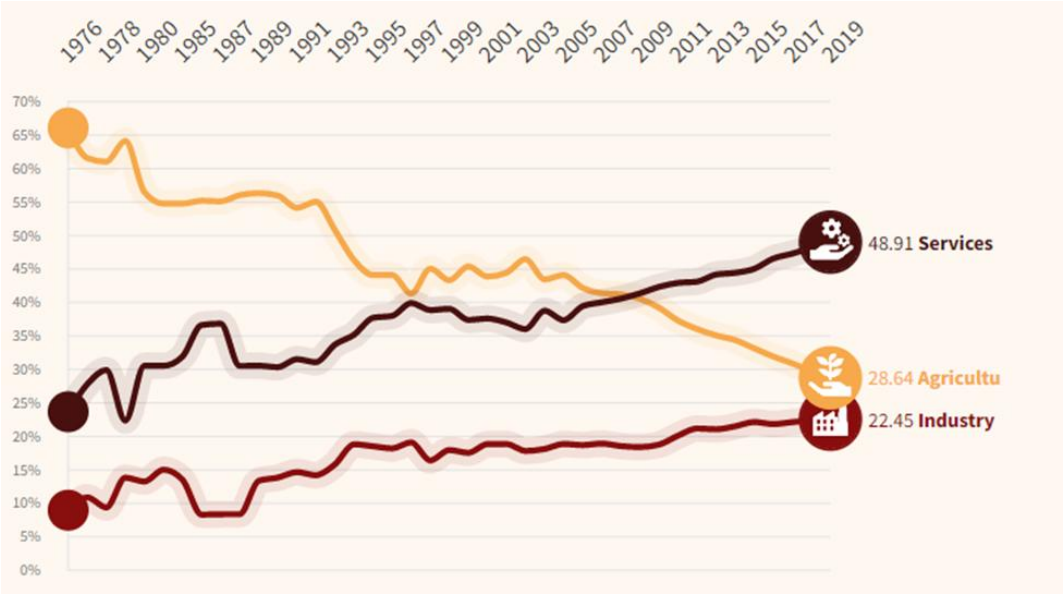

Fig. 1. Employment in agriculture, services, and industry (% of total employment) from 1976 to 2019

Figure 2 indicates that the average monthly net income in the agriculture sector showed a significant improvement, rising from 1,462.6 thousand rupiah in February 2024 to 1,648.2 thousand rupiah in August 2024. Although agriculture remained the sector with the lowest income compared to industry and services, this growth reflects a positive development in farmers' earnings within the observed period. In comparison, industry increased from 1,670.5 thousand rupiah to 1,821.8 thousand rupiah, and services, which consistently recorded the highest income, grew from 2,011.5 thousand rupiah to 2,333.4 thousand rupiah. Overall, the data highlight an upward trend in all sectors, with notable progress in agriculture despite its relatively lower income level.

The research aims to address several critical questions regarding the declining participation of young farmers in Indonesia's agricultural sector. Firstly, it seeks to identify the underlying causes of this crisis by examining the factors contributing to the decreasing interest of young individuals in pursuing farming as a profession. Secondly, it explores how social, cultural, and structural limitations influence young people's proclivity for farming,

considering the various barriers that may deter them from engaging in agricultural activities. Furthermore, the study investigates the strategies, policies, and interventions that can be implemented to reverse this trend, focusing on efforts to attract and retain young people in agricultural jobs. Lastly, it examines how these measures can be customized to not only ensure the resurgence of the agricultural workforce but also contribute to improved food security and the establishment of long-term job opportunities for Indonesia's growing youthful population.

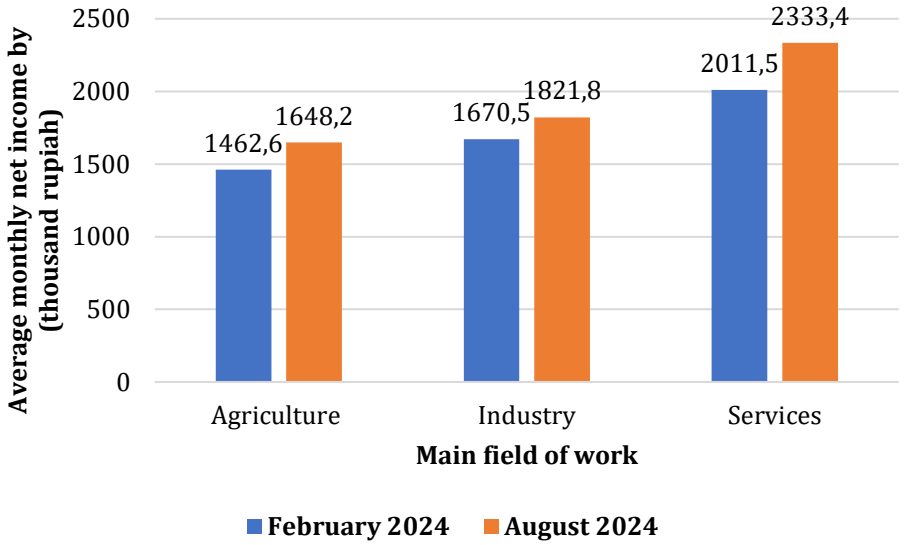

Fig. 2. Comparative earnings of farmers and others

This extended research question highlights the need for comprehensive strategies that address the short-term difficulties as well as the long-term sustainability of Indonesia's agricultural sector and workforce. It also digs deeper into the underlying causes of the decline in young farmer engagement and looks at the various barriers that young people face.

3.2 Review of theory and previous research

A reduction in farmer numbers could jeopardize Indonesia's food security. Agriculture and food play an important role in development, and without farmer support, food needs will not be met. A farmer's success is heavily influenced by the variables that assist them, particularly the contributions of young people to the agricultural sector. Young workers' attitudes toward agriculture are shaped by both internal and external factors (Nugroho et al., 2023). Internal elements include situations or circumstances at the individual or sector level, such as limited land, low wages, incompatibility with education, and the underdevelopment of the agricultural industry. Meanwhile, external factors include young workers' perceptions of the non-agricultural sector in cities as a more appealing option, even though such jobs may no longer exist. Therefore, farmer regeneration needs attention, particularly from the government. The government's efforts should be responsive by implementing appropriate policies, including the development of modern agriculture, providing incentives to novice farmers, organizing training to increase capacity, and empowering young farmers to maintain stable food production (Priani et al., 2023).

The declining number of young human resources in agriculture indicates that the younger generation is less interested in pursuing careers in this field. If this trend continues, it may significantly impact food production due to a shortage of individuals willing to work in agriculture. The findings revealed that family encouragement, support from educational institutions, farming skills, and employment characteristics in agriculture all substantially influence the agricultural competence of vocational students. Similarly, environmental

considerations, support from educational institutions, farming skills, agricultural job qualities, and a sense of moral duty significantly affect vocational high school students' interest in working in agriculture. Competence in agriculture affects motivation to pursue careers in this field. Collaboration among families, schools, and communities is essential to foster the younger generation's engagement in the agricultural industry (Fahrurozi et al., 2021).

Over 20 years, from 1993 to 2013, Indonesia observed a decline in the number of working farmers under 35. In 1993, 25.8 percent of all farmers were 35 or younger; by 2003, that figure had dropped to 20 percent, before decreasing sharply to 12.9 percent in the 2013 Agricultural Census. Today, younger generations continue to avoid the agriculture industry in favor of more "modern" employment. This generation is increasingly interested in promising careers with decent salaries, a pleasant working environment, and prestigious positions. Indonesian paddy labor is gradually aging out of the fields. Although approximately half of Indonesia's working population is employed in agriculture, several surveys estimate that 60 to 80 percent of rice farmers are over the age of 45. Indonesia's Central Bureau of Statistics documented a significant increase in the number of elderly individuals working in the fields over the 10 years from 2003 to 2013, a proportion that is sure to rise in the future. McGovern (2018) stated that Fewer young people want to labor in the paddies, endangering Indonesia's aim of rice self-sufficiency.

Young people preferred to study other topics since, given their opportunities, they could not foresee having enough land and capital to learn about farming. Furthermore, researching other areas would bring more job chances in the future, allowing students to extend their options. However, this adds to 'deskilling,' or the loss of agricultural knowledge among younger generations in rural regions. Those who grew up on farms understand the importance of profitability. Their parents' farms have an impact on both their perception of farming and their aspirations.

To encourage more youth participation in agriculture across Asia's newly industrialized countries, public policies must extend beyond supporting those already committed to farming. They must also engage young people who might consider farming if given broader opportunities. Importantly, the aspirations of youth and their reasons for leaving agriculture should not be overlooked. As Faturohman et al. (2023) note, the absence of support systems for young people in farming communities has limited their consideration of farming as a viable future, particularly because they have not been offered the means to envision or access the types of farms they might be interested in developing.

Indonesia is at risk of facing a farming crisis if decisive steps are not taken to attract young people into agriculture. According to Siswoyo et al. (2020), external support in the form of active farmer organizations, adequate infrastructure, government assistance, accessible information, continuous extension services, and reliable market access is crucial for developing young farming capacity. The study underlines the importance of local extension workers in forming youth farmer groups and encouraging rural youth to join existing ones. Furthermore, promoting agriculture to young people through focused programs and early exposure is critical for developing future generations of farmers.

As agriculture develops to meet current challenges, millennial farmers play a crucial role in advancing food self-sufficiency. Millennials are known for their energy, innovation, and forward-thinking outlook, and they bring new ideas that have the potential to alter the sector. When empowered with access to technology, they have the potential to significantly boost agricultural productivity and sustainability, making them key agents in shaping the future of food systems (Huang & Wang, 2024). Millennial farmers represent a transformative force in agriculture. As noted by Novisma & Iskandar (2023), they tend to be more educated, socially connected, and open to leveraging technology and information to grow their enterprises. Their strong motivation for agricultural transformation, combined with a focus on quality and innovation, positions them as key drivers of change. Their eagerness to learn not only enhances their technical capabilities but also boosts overall farm performance. Engaging millennials in agricultural production has enormous potential for creating more innovative, efficient, and sustainable farming practices.

The challenge of farmer regeneration is not unique to Indonesia—it is a global concern. Across the world, agriculture is struggling to attract and retain younger generations. In Indonesia, this issue is especially urgent, as the sector remains dominated by elderly farmers, and youth participation continues to decline. A combination of structural and perceptual barriers contributes to this trend, including limited access to land, markets, and financial services; exposure to climate change and price volatility; and the perception that farming is a low-income, unappealing occupation.

To counter this trend, the Indonesian government has introduced targeted programs aimed at revitalizing youth engagement in agriculture. Among them are the Millennial Agricultural Entrepreneur Development initiative and the Youth Business and Employment Support Services (YESS) program. These initiatives aim to empower rural youth by providing access to training, capital, and opportunities for entrepreneurship and employment. Early outcomes have shown encouraging impacts, particularly in improving youth participation, income generation, and rural job creation.

However, as Rafani & Arsanti (2023) argue, youth empowerment in agriculture must be tailored to the diverse socio-economic conditions of each region. A one-size-fits-all approach will not address the unique needs and aspirations of young people in various local contexts. Instead, policies and programs must be flexible, responsive, and grounded in the realities faced by rural youth.

Sustaining youth involvement in agriculture requires more than just financial or technical support. Young farmers must be continuously motivated and encouraged to innovate, adopt modern technologies, and build resilient agricultural enterprises. This includes strengthening their access to digital tools, providing market incentives, and creating pathways for long-term career growth within the agricultural sector.

To ensure the success and sustainability of these efforts, a Penta Helix collaboration model is recommended, bringing together government, local communities, private businesses, academic institutions, and media. Each stakeholder plays a vital role: governments in policy-making and resource allocation, communities in support and mobilization, businesses in value chain development, academia in capacity-building and research, and media in shaping public perception.

By fostering this collaborative ecosystem, programs like YESS can be implemented more effectively and inclusively, with greater reach and long-term impact. Empowering youth to lead in agriculture is not just a solution to rural unemployment—it is a strategic investment in food security, innovation, and sustainable development.

Indonesia's agricultural sector—contributing 12.4% to GDP (World Bank, 2023)—faces a demographic crisis as fewer than 15% of farmers are under 40 (BPS, 2023a), risking food security and rural livelihoods. However, a transformative shift is emerging: millennial farmers are harnessing precision agriculture, AI-driven tools, and digital marketplaces to boost yields by 23% (IFAD, 2022) and slash post-harvest losses. This tech-enabled revival aligns with Indonesia's Industry 4.0 ambitions, turning a looming decline into an opportunity for leadership in sustainable agri-food systems. By bridging traditional knowledge with cutting-edge innovation, these young agriculturists are not merely preserving the sector—they're redefining its role in Society 5.0, where agriculture becomes a nexus of economic resilience, climate adaptation, and inclusive growth (Zulpardiasyah & Eko, 2022; Nugroho et al., 2024). With strategic investments in agritech and youth empowerment, Indonesia can transition from vulnerability to global exemplar, proving that agriculture's future lies not in nostalgia but in reinvention.

Realizing the farming aspirations of young people requires more than just recognizing their interest in agriculture—it demands an understanding of how they emotionally experience being a farmer, and how their choices are influenced by family ties and community relationships. As youth become increasingly conscious of their aspirations, they navigate their futures with what Lungkang (2018) refers to as "restricted agency"—strategically weighing what is possible within the limitations they face. Their pursuit of farming is not merely individual but embedded in broader social contexts that either support or constrain their ambitions. However, this exploration remains incomplete

without considering the perspectives of those closest to them. One limitation in current research is the exclusion of key voices, such as spouses for those who have formed families, or parents for those still living at home. These omissions highlight the need for more holistic approaches that capture the full spectrum of social influences shaping young farmers' pathways.

Students hold the potential to shape the future, yet they often underestimate the significance of the agricultural sector. Various factors—such as attitude, motivation, interest, experience, and expectations—play a critical role in shaping the trajectory of a future career in farming. Research by Fitra et al. (2022) highlights a strong correlation between students' perceptions of agriculture and their interest in pursuing it as a profession. The findings suggest that the more positively students perceive agriculture, the greater their inclination to consider it a viable and meaningful career path.

One of the key factors behind young people's reluctance to pursue careers in agriculture is the issue of identity. As educational attainment rises and employment opportunities in non-agricultural sectors expand, millennial attitudes toward farming have shifted, challenging traditional concepts of intergenerational succession in agriculture. The Communication Theory of Identity (CTI) offers a useful framework for understanding how young farmers navigate the identity conflicts that arise when considering whether to continue or leave the family farming tradition. Widiyanti et al. (2020) emphasize the presence of identification disparities among young farmers, shaped by diverse experiences and perceptions of agriculture. However, further research is needed to explore these experiences across different social, economic, and cultural contexts. As agriculture evolves, modern technology is reducing the reliance on physical labor and enabling more collaborative and inclusive practices. Digital innovations are also creating new opportunities for individuals with access to land and technology, regardless of gender, to participate in and contribute to the agricultural sector.

As the farming population continues to age and many farmers lack a designated successor, youth interest in dairy cooperatives remains minimal. Yet, the active participation of young farmers is essential to ensuring the long-term sustainability and growth of agricultural cooperatives (Andhani, 2017). In Indonesia, both state and non-state actors increasingly frame the declining involvement of youth in agriculture as a threat to national food security, advocating for policy interventions centered on the promotion of 'modern' farming techniques. However, these narratives often overlook the structural barriers that hinder young people's entry into agriculture, such as limited access to land and capital, as well as unfavorable market and trading conditions (Toumbourou et al., 2023). Addressing these systemic challenges is crucial to fostering genuine youth engagement and revitalizing the agricultural sector.

Education and parental influence play a pivotal role in shaping millennial farmers' perceptions. Millennial farmer ambassadors, in particular, demonstrate strong support for programs and initiatives aimed at empowering young farmers. According to Ningsih et al. (2023), the perceptions held by these ambassadors have a direct positive influence on the success of millennial farmer programs and related business activities. Moreover, while business activities indirectly contribute to the effectiveness of such programs, the programs themselves have a direct and significant impact on enhancing the entrepreneurial ventures of millennial farmers. These findings underscore the importance of fostering supportive environments through education, family influence, and ambassador-led advocacy to drive sustainable growth in youth-led agricultural enterprises.

The agricultural labor crisis is intensifying worldwide, particularly in developing nations such as Indonesia. As this trend persists, the status of agriculture continues to diminish. For many young people, especially those in rural areas, pursuing a career in agriculture or agribusiness is no longer a primary aspiration. Concurrently, the rapid expansion of information technology, including social media and digital platforms, has profoundly influenced career preferences. Young individuals have become key participants in the digital sphere, increasingly shaping their identities and futures around online opportunities rather than traditional agricultural work.

By strategically utilizing existing natural resources, capitalizing on their unique interests, and fostering a culture of innovation, millennial farmers in Malang Raya can emerge as key contributors to the advancement of sustainable and economically viable agricultural practices. These findings suggest that resource optimization, aligned with individual specialization and supported by technological integration, will be critical determinants of success for Indonesia's millennial farmers (Ardyanti et al., 2024).

Young people exhibit significantly higher migration rates compared to older age cohorts. Moreover, they are more likely to secure employment in manufacturing and service sectors rather than agriculture. This trend has significant implications for workforce demographics, particularly the notable increase in agricultural workers aged 60 and above—a demographic that has grown from 7.6% in 1971 to 21.2% by 2020. To enhance the appeal of agriculture among younger generations in Indonesia, strategic sectoral development is imperative. This includes improving productivity and integrating digital technologies to modernize farming practices (Ngadi et al., 2023).

Survey respondents generally perceive the pace of farmer regeneration, along with youth engagement levels, business capacities, and external support factors, to be moderately developed. The sampled young farmers have an average age of 31.47 years, typically possess only elementary-level education, and lack a substantial agricultural background. While organizationally active young farmers demonstrate cosmopolitan attitudes, their practical exposure remains limited, with minimal participation in internships, vocational courses, or skills training programs. The study reveals that farmer regeneration rates exhibit negative correlations with three key factors: advancing age, organizational participation, and the waning agricultural interests among youth (Effendy et al., 2020).

The diminishing agricultural workforce presents a significant obstacle to Indonesia's national food security and sovereignty objectives. For decades, food self-sufficiency has constituted a cornerstone of Indonesia's strategic development agenda. Nevertheless, recent reductions in farming households underscore the urgent necessity for localized intervention strategies to address this critical issue.

Governments must critically examine the mechanisms and significance of farmer regeneration as a fundamental component of achieving agricultural self-sufficiency. This ethnographic case study identifies key socioeconomic drivers of agricultural workforce decline, particularly demographic aging, that necessitate comprehensive policy interventions. Focusing on Sawarna village, the research provides empirical insights into farmer attrition while contributing to broader discourse on sustainable food security strategies (Riswanda et al., 2018).

Contemporary youth acknowledge the imperative for specialized training to pursue agricultural careers, while simultaneously expressing normative support for youth engagement in the sector. However, research in Lithuania reveals that persistent negative stereotypes significantly deter agricultural participation among young people. These include perceptions of constrained social opportunities in rural communities and limited prospects for professional self-actualization (Girdziute et al., 2022).

Socioeconomic (exogenous) forces exerted significant influence on intergenerational farm transitions. While successful generational succession occurs more frequently in regions with robust labor markets, it proves less common in areas experiencing rapid urbanization. The study revealed that endogenous factors—particularly those related to farm economic viability—played a more substantial role in facilitating generational change than external conditions. Specifically, farm characteristics (including land area and economic scale) and managerial attributes (such as education level) emerged as stronger predictors of succession outcomes than exogenous elements. Notably, larger-scale operations with highly educated managers demonstrated more rapid generational transitions compared to other settings (Sroka et al., 2019).

Despite increasing scholarly focus on the decline of young farmers in Indonesia, critical gaps persist in the literature, hindering comprehensive solutions. First, while socioeconomic and structural barriers, such as low profitability, land scarcity, and the

perception of farming as low status, are well documented, there is limited exploration of identity-related conflicts influencing rural youth career choices. The Communication Theory of Identity (CTI) remains underutilized, despite its potential to illuminate how young people navigate tensions between modern professional aspirations and traditional agrarian roles, especially given the strong influence of familial and societal expectations.

Second, existing studies often overlook regional disparities, treating Indonesia's agrarian transition uniformly. Yet, challenges vary significantly: youth in Java's peri-urban areas face acute land fragmentation and industrial job competition, while those in Eastern Indonesia contend with poor infrastructure and limited market access. Such regional nuances are crucial for designing effective, context-specific interventions but remain underexplored.

Third, there is a lack of integrative frameworks that combine policy, education, and community-based support. While multi-stakeholder models like the Penta Helix have been proposed, their real-world application and effectiveness across Indonesia's diverse regions are insufficiently studied. Current youth-focused programs, such as YESS and Millennial Agricultural Entrepreneur Development, often operate in isolation, with scant empirical evaluation of their integration with local education or cultural norms. Additionally, the transformative role of digital platforms in reshaping youth perceptions of agriculture is rarely incorporated into these frameworks.

Addressing these gaps requires interdisciplinary research that applies identity theories, conducts comparative regional analyses, and develops scalable, multi-stakeholder models integrating technology and grassroots empowerment. Only through such holistic approaches can Indonesia reverse its aging farmer trend and make agriculture an appealing, viable career for its youth.

Table 2. Farmers' age level and obtained position with their number of farmers

Age level (years)	Number of farmers (persons)	Position
45-54	73,25,544	1st
35-44	68,85,100	2nd
55-64	52,29,903	3rd
Above 65	32,32,038	4th
25-35	31,29,644	5th (also decreasing)
15-24	2,29,643	6th
Under 15	32,997	7th

(BPS, 2023b)

This research demonstrates significant novelty by integrating the Communication Theory of Identity (CTI) to explore how young Indonesian farmers navigate career choices amid conflicting societal expectations, while introducing the concept of "restricted agency" to explain how structural constraints shape youth decisions. Unlike previous studies that isolate factors such as wages or technology, this study adopts a systemic approach, analyzing the interplay of economic (land access, capital scarcity), cultural (stigmatization of farming), and institutional (policy fragmentation, weak extension services) barriers that collectively deter youth participation in agriculture. Advancing the field further, it proposes a Penta Helix collaboration uniting government, private sector, academia, media, and communities to generate scalable, context-sensitive solutions. The Penta Helix model, widely recognized for facilitating sustainable development and innovation, has proven effective in various Indonesian contexts by fostering synergy among stakeholders and supporting sustainable agricultural practices. The research empirically evaluates the YESS program's effectiveness, focusing on youth participation and retention, and provides both longitudinal (1993–2023) and regional analyses to highlight generational shifts and disparities between Java and the outer islands, enabling more targeted interventions. Finally, the study assesses the transformative role of digital platforms and Industry 4.0 technologies in reshaping youth perceptions of agriculture and advancing Indonesia's food sovereignty. This comprehensive, interdisciplinary approach addresses persistent gaps in the literature and offers a robust roadmap for revitalizing youth engagement and

sustainability in Indonesian agriculture. From the BPS (Central Bureau of Statistics) published Agricultural Census Report 2023, Indonesia has a total number of 26135469 farmers. Based on the latest data from the 2023 Agricultural Census released by the Central Statistics Agency (BPS), there has been a significant change in the age distribution of Indonesian farmers compared to previous data in 1983 and 2013. The 2023 Agricultural Census data shows that 21.93% of farmers are aged 19–39 years, often referred to as "millennial farmers," Central Bureau of Statistics Indonesia.

Table 3. A rapid change of Indonesian farmers in a few decades with their age

Age level	1983	2013
Under 35	25%	13%
35-54	57%	54%
55 and above	18%	33%

(BPS, 1983, 2013)

The 2023 Agricultural Census conducted by Indonesia's Central Bureau of Statistics (BPS) indicates that approximately 42% of Indonesian farmers are between the ages of 43 and 58. This demographic represents a significant portion of the agricultural workforce, highlighting the aging trend within the sector. Further studies on farmer regeneration reveal concerning patterns. For instance, research indicates that 96.45% of food crop farmers are over 30 years old, with only 3.55% under 30. Moreover, 47.57% of farmers are over 50 years old, underscoring the sector's aging population.

Table 4. Changing age of smallholder farm heads, 1983-2018

Age group	1983	2013	2018
<25	3	1	1
25-34	22	12	10
35-44	31	26	24
45-54	25	28	28
≥55	18	33	36
Total	100	100	100

(BPS, 1983, 2013, 2018)

Additionally, surveys among farmers' children present a bleak outlook for the future of farming. Only 54% express a willingness to continue in agriculture, while 46% are determined not to pursue it. The horticultural sector faces an even steeper decline, with 63% of the younger generation unwilling to inherit their parents' farming activities, and only 36.7% willing to continue the horticultural business. These statistics underscore the urgent need for policies and programs that encourage younger generations to engage in agriculture, ensuring the sustainability and vitality of Indonesia's farming communities.

Table 5. Age and gender of farm heads in smallholder farming, 2013 and 2018

Age group	2013				2018			
	% of all farm heads	% male	% female	Total (millions)	% of all farm heads	% male	% female	Total (millions)
≤24	1	90	10	0.2	1	89	11	0.3
25-34	12	94	6	3.1	10	94	6	2.9
35-44	26	93	7	6.9	24	91	9	6.7
45-54	28	89	11	7.3	28	88	12	7.8
55-64	20	85	15	5.2	22	86	14	6.1
65+	13	79	21	3.3	14	79	21	3.8
Total	100	89	11	26.1	100	87	13	27.7

(BPS, 2013, 2018)

The regeneration crisis among young farmers in Indonesia is influenced by a confluence of socio-cultural, economic, and structural factors. A significant contributor is the lack of familial support, where parents often dissuade their children from pursuing

agriculture due to its perceived hardships and limited financial returns. This familial discouragement is compounded by the sector's low social prestige, making it less appealing to the younger generation.

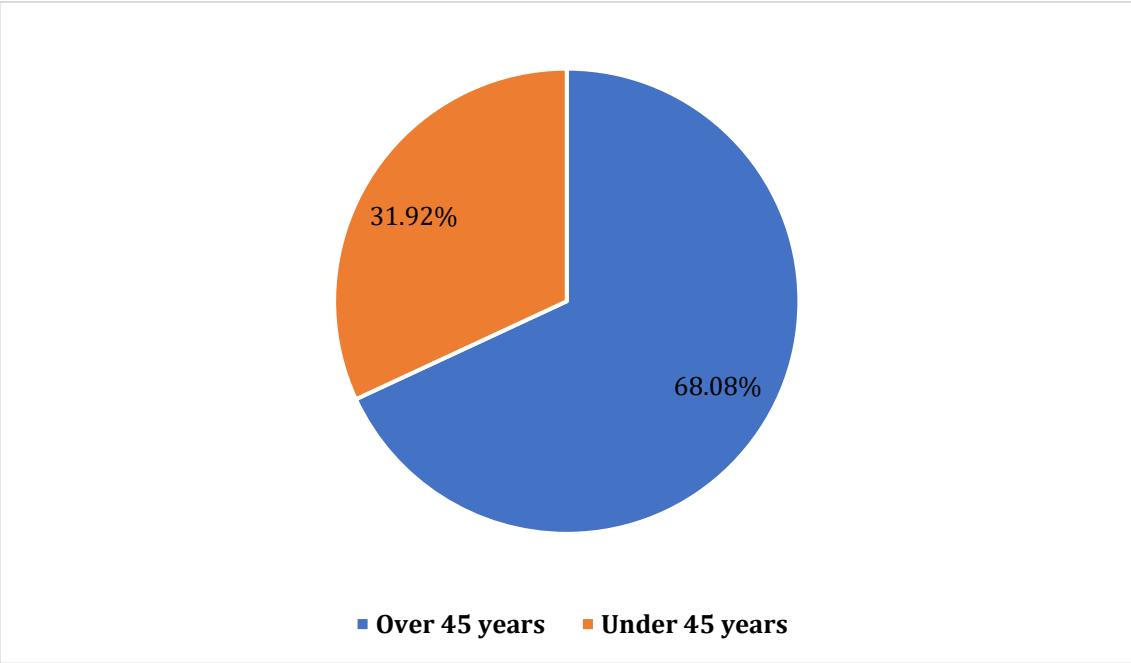

Fig. 3. Percentage of farmers aged 45 years and above

Additionally, many graduates from agricultural faculties opt for non-agricultural careers, favoring office environments over fieldwork. This preference stems from a desire for stable incomes and aversion to the physical demands and uncertainties inherent in farming. The allure of urban employment opportunities, coupled with the perception of agriculture as a less prestigious profession, further drives youth away from farming.

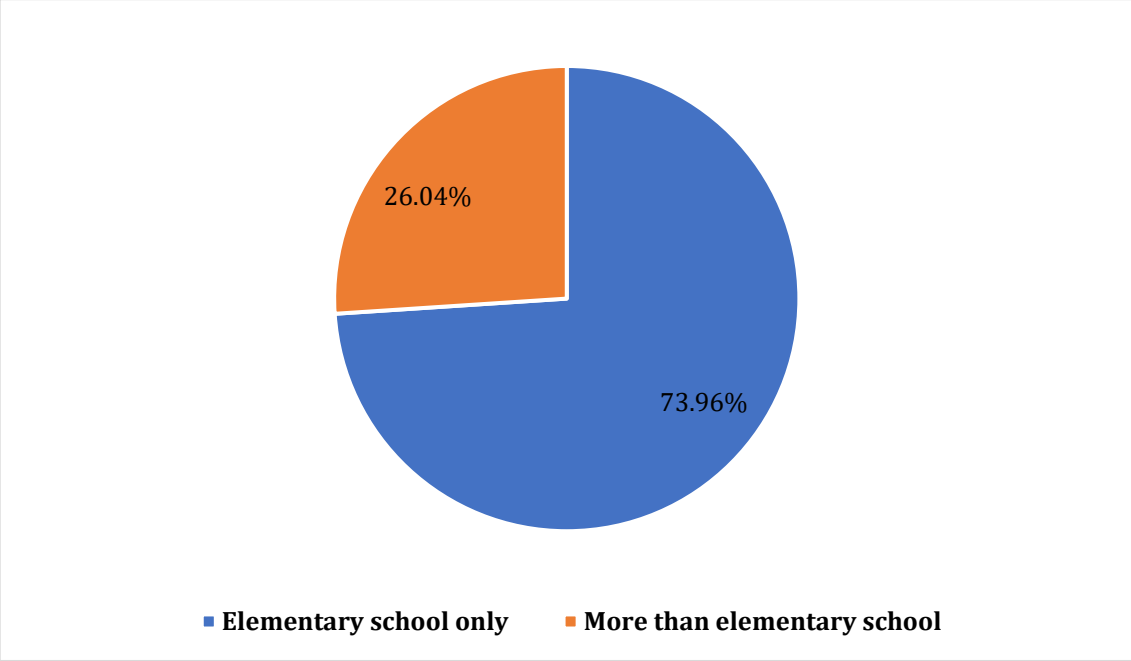

Fig. 4. Percentage of literacy level of farmers

Moreover, structural challenges such as limited access to land, capital, and markets hinder young individuals from entering the agricultural sector. The scarcity of arable land

and the high costs associated with farming deter potential young farmers. Consequently, the reluctance of Indonesian youth to engage in agriculture has escalated into a national concern, prompting the government to implement programs aimed at revitalizing youth participation in farming.

Addressing the regeneration crisis among young farmers in Indonesia necessitates a multifaceted approach that tackles structural, economic, and social barriers. A primary concern is the limited access to land, which can be mitigated through policies promoting land redistribution, leasing arrangements, and support for youth-led cooperatives. Programs like the Millennial Agricultural Entrepreneur Development initiative aim to empower young farmers by facilitating land access and providing necessary resources. Financial assistance is equally crucial (Gong et al., 2024; Yi et al., 2024). Expanding access to affordable credit, such as through the People's Business Credit scheme, and offering subsidies for agricultural inputs can lower entry barriers for young farmers. Moreover, enhancing agricultural education and training programs, including farmer field schools, can equip youth with the skills needed for modern farming practices.

Promoting technology adoption is vital for making agriculture more appealing to the younger generation. Integrating digital tools and precision farming techniques can increase efficiency and profitability. Improving market access through digital platforms can also help young farmers reach broader markets. Ensuring gender equality by providing equal opportunities and resources to young women in agriculture is essential for inclusive growth. Additionally, establishing social support networks and mentorship programs can foster a supportive environment, encouraging youth to pursue and sustain careers in agriculture.

To contextualize the findings and elucidate their broader implications, it is essential to compare the current data with historical trends and international experiences. The 2023 Agricultural Census indicates that only 21.93% of Indonesian farmers are aged 19–39, reflecting a significant decline from previous decades. In 1983, 25% of farmers were under 35, which decreased to 13% by 2013, highlighting a persistent aging trend within the sector. This demographic shift is not unique to Indonesia; many countries face similar challenges in attracting youth to agriculture, often due to perceptions of farming as labor-intensive and less lucrative compared to urban employment opportunities. Studies have shown that factors such as limited access to land, capital, and markets, along with inadequate support systems, deter young individuals from pursuing agricultural careers. For instance, research in East Lombok indicates that while some youth remain engaged in agriculture due to cultural and familial influences, broader structural barriers continue to impede widespread youth participation. Addressing these challenges requires comprehensive policies that not only provide financial and educational support but also work to elevate the social status of farming. By learning from both domestic and international experiences, Indonesia can develop targeted interventions to rejuvenate its agricultural workforce and ensure long-term food security.

4. Conclusions

The multifaceted challenges deterring Indonesian youth from pursuing careers in agriculture have profound implications for the nation's food security and economic stability. Demographically, the agricultural workforce is aging, with a significant portion nearing retirement, while younger generations increasingly gravitate toward urban employment opportunities. This shift is exacerbated by socio-cultural factors, including limited parental encouragement, a societal preference for white-collar jobs, and an aversion to the physical demands of farming. Economically, the perceived instability and lower profitability of agricultural work, compared to the consistent income of urban professions, further dissuade youth engagement. Educationally, despite the presence of agricultural programs, a disconnect persists between academic curricula and the practical realities of farming, leading graduates to seek alternative careers. Technologically, inadequate access to modern farming tools and practices diminishes productivity and the sector's appeal. Addressing

these issues necessitates comprehensive strategies that encompass policy reforms, educational enhancements, and technological investments to revitalize youth interest and participation in agriculture.

To effectively address the declining interest of Indonesian youth in agriculture, a comprehensive strategy must be implemented. Firstly, improving access to land is crucial; this can be achieved through land redistribution, leasing arrangements, and financial assistance for land acquisition, thereby reducing entry barriers for young aspiring farmers. Secondly, enhancing education and training programs is essential to bridge the gap between theoretical knowledge and practical farming skills. Incorporating modern agricultural practices and technologies into curricula can better prepare youth for the realities of contemporary farming. Thirdly, promoting the adoption of innovative agricultural technologies can increase productivity and efficiency, making farming a more attractive and viable profession for young people. By integrating digital tools and precision farming techniques, agriculture can be transformed into a modern and appealing career path. These measures, supported by policy reforms and investments, are vital to rejuvenate the agricultural sector and ensure its sustainability for future generations**.**

To revitalize youth participation in Indonesian agriculture, it is imperative to enhance market access and implement supportive policies that ensure fair pricing and provide financial incentives for young farmers. Strengthening gender equality by granting women equal access to agricultural resources and opportunities is crucial, alongside establishing mentorship networks to support aspiring young farmers. Promoting sustainable farming practices will safeguard environmental resources and ensure the long-term viability of agricultural livelihoods. Government intervention remains essential, necessitating policies and support systems tailored to the aspirations of the younger generation. Collectively, these measures can rejuvenate Indonesia's agricultural workforce and secure future food security.

Acknowledgement
The authors sincerely thank BPS Indonesia for providing valuable secondary data and extend gratitude to colleagues and institutions whose insights and support significantly contributed to the completion of this research.

Author Contribution
Both authors collaboratively designed the study, analyzed data, conducted the literature review, and prepared the manuscript, discussing results together and approving the final version for publication.

Funding
This research received no external funding.

Ethical Review Board Statement
Not available.

Informed Consent Statement
Not available.

Data Availability Statement
Not available.

Conflicts of Interest
The authors declare no conflict of interest.

Open Access

References

Andhani, P. R. (2017). *Young farmers' participation in Indonesian and Kenyan dairy cooperatives*. Master's thesis, Wageningen University & Research. https://edepot.wur.nl/440329

Ardyanti, R. K., Purnomo, M., & Kustanti, A. (2024). Driving factors of the rapid development of millennial farmers in Malang Raya. *Universal Journal of Agricultural Research, 12*(1), 159–168. https://doi.org/10.13189/ujar.2024.120115

BPS. (1983). *Statistik pertanian Indonesia 1983*. Badan Pusat Statistik.

BPS. (2013). *Statistik Indonesia 2013*. Badan Pusat Statistik. https://www.bps.go.id/publication/2013/07/01/46da2dc5e7d5481b2d5a932c/statistik-indonesia-2013.html

BPS. (2018). *Statistik pertanian Indonesia 2018*. Badan Pusat Statistik. https://www.bps.go.id/publication/2018/07/03/6f7f53f7e8b30d50707e5636/statistik-pertanian-indonesia-2018.html

BPS. (2019). *Statistik Indonesia 2019*. Badan Pusat Statistik. https://www.bps.go.id/en/publication/2019/07/04/daac1ba18cae1e90706ee58a/statistik-indonesia-2019.html

BPS. (2023a). *Statistik Indonesia 2023*. Badan Pusat Statistik. https://www.bps.go.id/publication/2023/07/04/daac1ba18cae1e90706ee58a/statistik-indonesia-2023.html

BPS. (2023b). *Hasil Pencacahan Lengkap Sensus Pertanian 2023 – Tahap I*. Badan Pusat Statistik. https://www.bps.go.id/id/publication/2023/12/15/def0edfb13a6b16411ec8c80/hasil-pencacahan-lengkap-sensus-pertanian-2023---tahap-i.html

De Martinis, D., Rybicki, E. P., Colonna, N., Benvenuto, E., & Llorente, B. (2020). Editorial: Next generation agriculture: Understanding plant life for food, health and energy. *Frontiers in Plant Science, 11*, 1238. https://doi.org/10.3389/fpls.2020.01238

Effendy, L., Kusnady, D. M., & Pradiana, W. (2020). Accelerating farmers' regeneration of chili farmers in Garut District, West Java, Indonesia. *The International Journal of Humanities & Social Studies, 8*(5), 373–383. https://doi.org/10.24940/theijhss/2020/v8/i5/HS2005-111

Eistrup, M., Sanches, A. R., Muñoz-Rojas, J., & Pinto Correia, T. (2019). A "young farmer problem"? Opportunities and constraints for generational renewal in farm management: An example from southern Europe. *Land, 8*(4), 70. https://doi.org/10.3390/land8040070

Fahrurozi, M. T., Mukson, & Sumekar, W. (2021). Analysis of factors affecting the motivation of the young generation to work in agriculture at Semarang Regency Agricultural Vocational School. *Agrisocionomics: Jurnal Sosial Ekonomi Pertanian, 6*(1), 33–49. https://doi.org/10.14710/agrisocionomics.v6i1.9680

Faturohman, T., Megananda, T. B., Wiryono, S. K., Rahadi, R. A., Afgani, K. F., & Yulianti, Y. (2023). Perspective of the young generation towards the agricultural sector in Indonesia. *Review of Integrative Business and Economics Research, 12*(1), 166–174. https://sibresearch.org/journal/riber

Fitra, C. R., Harpowo, & Bakhtiar, A. (2022). Perceptions of students of Faculty of Agriculture and Animal Husbandry University of Muhammadiyah Malang on the future of farmers in Indonesia. *Journal of Agri Socio Economics and Business, 4*(2), 119–126. https://doi.org/10.31186/jaseb.04.2.119-126

Gong, M., Xi, R., Qi, Y., Wang, X., Sun, P., & Che, L. (2024). Agricultural land management and rural financial development: Coupling and coordinated relationship and temporal–spatial disparities in China. *Scientific Reports, 14*(1), 6523. https://doi.org/10.1038/s41598-024-57091-1

Girdziute, L., Besuspariene, E., Nausediene, A., Novikova, A., Leppala, J., & Jakob, M. (2022). Youth's (un)willingness to work in agriculture sector. *Frontiers in Public Health, 10*, 937657. https://doi.org/10.3389/fpubh.2022.937657

Huang, W., & Wang, X. (2024). The impact of technological innovations on agricultural productivity and environmental sustainability in China. *Sustainability, 16*(19), 8480. https://doi.org/10.3390/su16198480

IFAD. (2022). *Rural development report 2022: Digital transformation for rural prosperity*. International Fund for Agricultural Development. https://www.ifad.org/en/web/knowledge/publication/asset/42074653

Lungkang, D. M. (2018). *Shaping aspirations: Insights of young farmers life trajectory in Pinrang Regency*. Master's thesis, International Institute of Social Studies.

McGovern, G. (2018, July 18). Indonesia's aging farmers. *The Diplomat*. https://thediplomat.com/2018/07/indonesias-aging-farmers/

Murphy, D. J., Goggin, K., & Paterson, R. R. M. (2021). Oil palm in the 2020s and beyond: challenges and solutions. *CABI agriculture and bioscience*, *2*(1), 39. https://doi.org/10.1186/s43170-021-00058-3

Ngadi, N., Zaelany, A. A., Latifa, A., Harfina, D., Asiati, D., Setiawan, B., ... & Rajagukguk, Z. (2023). Challenge of agriculture development in Indonesia: rural youth mobility and aging workers in agriculture sector. *Sustainability*, *15*(2), 922. https://doi.org/10.3390/su15020922

Ningsih, D. H., Romdhon, M. M., & Utama, S. P. (2023). Perceptions of Indonesian young farmers toward the Ministry of Agriculture's Millennial Farmers Program and business activities (Case study on Indonesian Millennial Farmer Ambassadors). *Journal of Agri Socio Economics and Business, 5*(2), 169–190. https://doi.org/10.31186/jaseb.5.2.169-190

Novisma, A., & Iskandar, E. (2023). The study of millennial farmers behavior in agricultural. *IOP Conference Series: Earth and Environmental Science, 1183*(1), 012112. https://doi.org/10.1088/1755-1315/1183/1/012112

Nugroho, C. B. T., Sugihardjo, Permatasari, P., & Anantanyu, S. (2023). Analisis faktor dan persepsi pemuda desa terhadap pekerjaan petani. *Journal of Agrosociology and Sustainability, 1*(1). https://doi.org/10.61511/jassu.v1i1.2023.58

Nugroho, C. B. T., Sugihardjo, Permatasari, P., & Anantanyu, S. (2024). Farmer regeneration crisis in villages: Case study of youth in Sragen, Indonesia. *Journal of Agrosociology and Sustainability, 2*(1), 45–59. https://doi.org/10.61511/jassu.v2i1.2024.775

Priani, G. W., Rozaki, Z., Wulandari, R., & Azzahra, I. (2023). Challenges and opportunities for the young generation in sustainable agricultural development. *Universitas Muhammadiyah Yogyakarta Undergraduate Conference, 3*(2), 256–260. https://doi.org/10.18196/umygrace.v3i2.642

Rafani, I., & Arsanti, I. W. (2023). Empowering Indonesian young farmers through youth entrepreneurship and employment support services program. *Agricultural Policy Platform*, 1–11. https://ap.fftc.org.tw/article/3398

Riswanda, Hamid, A., & Widyastuti, Y. (2018). The degeneration of farmers: A critical ethnographic case study in Sawarna Banten. *Journal of Asian Research, 2*(2), 102–122. https://doi.org/10.22158/jar.v2n2p102

Rozaki, Z. (2021). Food security challenges and opportunities in Indonesia post COVID-19. *Advances in Food Security and Sustainability, 6*, 119–168. https://doi.org/10.1016/bs.af2s.2021.07.002

Siswoyo, L., Effendy, L., & Hartono, R. (2020). Model pengembangan kapasitas pemuda perdesaan pada komunitas usahatani cabai di Kabupaten Garut, Jawa Barat, Indonesia. *Journal of The Social Sciences, 48*(4), 1709–1728. https://doi.org/10.18415/jss.2020.484.1709

Sroka, W., Dudek, M., Wojewodzic, T., & Krol, K. (2019). Generational changes in agriculture: The influence of farm characteristics and socio-economic factors. *Agriculture, 9*(12), 264. https://doi.org/10.3390/agriculture9120264

Toumbourou, T. D., Dressler, W. H., Sanders, A., Liu, E., Brown, T., & Utomo, A. (2023). Who are the future farmers? Media representations of youth in agriculture, food security and 'modern' farming in Indonesia. *Asia Pacific Viewpoint, 64*(2), 188–208. https://doi.org/10.1111/apv.12374

Widiyanti, E., Karsidi, R., Wijaya, M., & Utari, P. (2020). Identity gaps and negotiations among layers of young farmers: Case study in Indonesia. *Open Agriculture, 5*(1), 361–374. https://doi.org/10.1515/opag-2020-0041

World Bank. (2023). *Indonesia overview*. https://www.worldbank.org/en/country/indonesia/overview

Yi, H., Guo, D., Wang, H., Yi, G., & Min, L. (2024). Money for operator: The impact of linked agricultural subsidy on incomes. *Scientific Reports, 14*(1), 13554. https://doi.org/10.1038/s41598-024-64100-w

Zulpardiasyah, & Eko, B. (2022). Empowerment of millennial farmers in increasing farmers welfare in the industrial 4.0 era and towards the society 5.0 era. *Journal Research of Social Science, Economics, and Management*, 1748–1754. https://doi.org/10.36418/jrssem.v1i10.168

Biographies of Authors

Md Baha Uddin, Master Program of Agribusiness, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Central Java, 57126, Indonesia; Faculty of Agricultural Economics and Business Studies, Sylhet Agricultural University, Sylhet-3100, Bangladesh.

- Email: baha.sau1992@gmail.com
- ORCID: 0009-0006-1987-165X
- Web of Science ResearcherID: N/A
- Scopus Author ID: N/A
- Homepage: N/A

Ernoiz Antriyandarti, Agribusiness Study Program, Faculty of Agriculture, Universitas Sebelas Maret, Surakarta, Central Java 57126, Indonesia.

- Email: ernoiz_a@staff.uns.ac.id
- ORCID: 0000-0002-0948-4000
- Web of Science ResearcherID: N/A
- Scopus Author ID: 57201775415
- Homepage: https://scholar.google.com/citations?user=uTQxsToAAAAJ&hl=en