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Analysis Of Human Resource Readiness In Supporting The Role Of Young Farmers In Preparing For The Regeneration Of Sugar Cane Farmers In Indonesia

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Abstract

This study examines human resource readiness to regenerate Indonesia's sugarcane farming sector, addressing the critical challenges of an aging farmer demographic and declining youth interest that threaten national production sustainability. Employing a qualitative design, data were collected through in-depth interviews, observations, and document analysis involving company representatives, senior farmers, and youth. Findings reveal that youth readiness is constrained by gaps in technical competence, practical experience, and motivation, alongside individual, structural, and social barriers such as limited financing, land access, and negative sector perceptions. Conversely, young farmers demonstrate strong potential in digital adaptation and managerial capabilities, positioning them to drive agricultural modernization. Key strategies to enhance youth participation include structured training, mentorship, improved financing access, and profit-oriented approaches to highlight farming viability. PT Sinergi Gula Nusantara plays a pivotal role in this regeneration process through targeted HR development and digitalization programs. Ultimately an integrated multi-stakeholder approach is essential to sustainably regenerate the sugarcane farming workforce, thereby strengthening national food security and industry competitiveness.

Keywords: Human Resource Readiness; Young Farmers; Sugarcane Farmer Regeneration; Sustainable Agriculture.

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INTRODUCTION

As an agrarian nation, Indonesia possesses significant potential in agriculture and plantation sectors with sugarcane being a strategic commodity serving as the primary raw material for national sugar production. Sugar is both a basic necessity and an important commodity for the continuously growing food and beverage industry. Alongside population growth, urbanization, and increased consumption of processed products, national sugar demand has risen significantly annually. However, PTPN Group data shows that in 2024 domestic sugar production reached only approximately 2.46 million tons, while national consumption is estimated at 3.4 million tons per year, indicating that domestic production cannot fully meet national demand. This aligns with the Indonesian government's Presidential Regulation No. 71 of 2015 concerning the Determination and Storage of Basic Necessities and Important Goods, which mandates that central and regional governments are responsible for providing adequate white crystal sugar at affordable prices (Julia F.Sinuraya, 2024). To strengthen the national sugar industry, the government through State-Owned Plantation Enterprises established PT Sinergi Gula Nusantara (SGN) as the Sugar Subholding of PTPN Group, tasked with managing all sugar mills under State-Owned Plantation Enterprises. PT SGN plays a crucial role in supporting government strategy to strengthen the national sugar industry through inter-mill synergy, operational efficiency, and productivity enhancement based on innovation and technology (Kurniawan Pangestu, 2025).

Despite various efforts, Indonesia's sugarcane agriculture sector still faces complex structural challenges. A critical issue is the declining interest of younger generations in agricultural work including the sugarcane subsector. According to the National Labor Force Survey (Sakernas, 2022), only approximately 4.06% of freelance workers are in the agricultural sector worsened by low sugarcane farmer regeneration with the majority aged over 45 years. This low involvement of young farmers threatens the sustainability of future sugarcane production especially if not balanced with digital transformation and modern agricultural approaches.

This regeneration crisis has serious implications for agricultural sustainability. According to (Susilowati, 2016), the dominance of elderly farmers can hinder the adoption of innovations and new technologies, ultimately impacting low productivity and farming efficiency. Additionally, this condition may reduce the competitiveness of Indonesian agricultural products in global markets and weaken rural economic structures. If not addressed immediately this regeneration crisis can threaten national food security in the long term. The Directorate of Food and Agriculture mentions several obstacles faced by

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young generations in agriculture, such as limited access to land resources, minimal access to financial services, and limited access to markets and new technologies to participate in agricultural value chains (Heriyanto, 2016). Furthermore, social factors such as the perception that the agricultural sector is less prestigious and does not promise a bright future also influence the low interest of young generations to become farmers.

Young farmer groups are collections of farmers aged 15-35 years who group based on similar conditions and environments and are determined to develop agricultural production by applying innovations in agriculture (Muhammad Farkhan Akbar Al-Faridzi, 2022). This group has great potential to become the driving force for agricultural transformation toward a more modern, efficient, and sustainable system. The younger generation has advantages in adapting to digital technology, creativity, and entrepreneurial spirit. By utilizing various technologies, precision agriculture, and digital platforms for marketing, young farmer groups can increase productivity while expanding market access. Additionally, youth involvement can encourage innovation in the sugarcane agribusiness value chain, from production to distribution. Therefore, strengthening the role of young farmer groups in the sugarcane sector is a strategic step in facing existing challenges. Synergy between the government, state-owned enterprises like PT Sinergi Gula Nusantara, the private sector, and educational institutions is needed to create an agricultural ecosystem that supports youth involvement. These efforts can be achieved through providing land access, financing, technology training, and strengthening farmer group institutions. Thus, the sugarcane agriculture sector can not only increase national sugar production but also become a sustainable, competitive, and attractive sector for future generations.

Objectives

This research is expected to provide tangible benefits to PT Sinergi Gula Nusantara by enhancing operational effectiveness and supporting evidence based decision making. Specifically, to formulate the human resource capacity required to young farmer regeneration in the sugarcane agricultural sector and to identify practices or approach models that potentially increase the interest and participation of the younger generation in sugarcane farming enterprises.

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LITERATURE REVIEW

The Role of Human Resources in Operations Management

Organizations utilize human resources, technology, and systems to produce and distribute goods and services (Simamora, 2002). Among these, human resources are pivotal, as they operate technological and systemic components, determine workforce quality and placement, and manage procurement and maintenance (Hasibuan, 2017). Given the limited nature of human capital, organizations must empower and optimize its utilization to ensure sustainability. Effective human resource management enhances job satisfaction and organizational performance, whereas mismanagement may lead to future social issues. Thus, human resource planning should emphasize empowerment, skill development, equitable rewards, and supportive work environments to maximize workforce potential (Fahrudin, 2022). Operations management encompasses planning, organizing, implementing, and controlling activities to achieve efficient and effective production (Jumadi, 2021). It creates value-added products, manages production and distribution, and positions these processes as critical for delivering product value (Schroeder, 2011). Fundamentally, operations management transforms inputs into outputs (Jay Heizer, 2005). In the sugar industry, inputs such as human resources, sugarcane seeds, and operational equipment undergo off-farm transformation in sugar mills to produce final outputs.

Supply Chain Management

Supply chain management (SCM) has evolved from simple historical exchanges to complex systems, particularly following the 18th-century Industrial Revolution, which intensified the need for efficient logistics and production coordination (southern (2011); Chatra, 2023). SCM encompasses interconnected activities that plan, operate, control, and monitor the flow of goods, services, and information from initial sourcing to final delivery. Its primary objective is to ensure product availability at the right time, quantity, and optimal cost while maximizing customer satisfaction (Syamil, 2023). Key components, including suppliers such as sugarcane farmers, ensure seamless material-to-product flow. By integrating operational processes, distribution networks, and partner relationships, effective SCM enhances product quality and delivery timeliness, thereby fostering customer trust. Optimized supply chains reduce production costs, minimize waste, and improve operational efficiency, ultimately generating competitive advantage, higher profit margins, and strengthened customer loyalty in increasingly competitive markets (Jumiono, 2024).

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The Strategic Role of Sugarcane in National Food Security

Sugarcane serves as a strategic agricultural commodity for national sugar production, directly supporting household consumption, industrial needs, and overall food security and economic stability. Smallholder farmers currently dominate national sugar production, contributing over half of the total output, positioning them as key actors in the sugar supply system. However, national sugarcane productivity remains constrained by limited adoption of cultivation technologies, low-quality seeds, and suboptimal farm management. Additionally, the domestic sugar processing sector faces challenges from aging mills, low operational efficiency, reduced yield rates, and high production costs, which collectively weaken domestic competitiveness and increase reliance on sugar imports (Outlook Tebu, 2023). In 2022, harvested sugarcane covered approximately 398.4 hectares, yielding 2.29 million tons of crystalline sugar, which remains insufficient to meet rising domestic demand. To bridge this production-consumption gap, sugarcane development must be pursued through integrated strategies that enhance productivity, modernize processing infrastructure, diversify into high-value derivatives such as bioethanol and organic fertilizers, and implement farmer-oriented policy support (Outlook Tebu, 2023).

Regulation and Management of Staple and Essential Goods

Presidential regulation defines staple and essential goods as critical commodities required for daily living, characterized by high fulfillment demand and direct impact on public welfare. The central government classifies these goods based on household expenditure allocation, inflationary influence, nutritional value, and regional price disparities, categorizing them into agricultural, industrial, and livestock/fishery products. To ensure availability and price stability, both central and regional governments implement strategies including domestic production protection, strategic stock and logistics management, inter-island distribution optimization, and reference price establishment. During periods of scarcity or price volatility, government intervention is mandated through price stabilization measures, subsidies, and regulated export-import policies (Perpres No.71 Tahun 2015).

Human Resource Development

Human resource development (HRD) enhances workforce potential through job rotation, professional education, training, and effective workforce management, ultimately fostering positive organizational culture, boosting morale, improving corporate image, and

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increasing productivity. Methods such as motivational seminars are employed to strengthen work motivation, which is essential for achieving individual and organizational performance goals (Sianturi, 2024). In agriculture, targeted HRD investments significantly improve productivity by equipping farmers with best practices, technological innovations, and efficient resource management. Sustainable HRD strategies must encompass continuous education, technical training, improved information access, and organizational capacity building for farming communities.

Declining Youth Labor Force in Agriculture

Sustainable agricultural development relies heavily on a productive workforce, particularly younger generations. However, the sector globally and in Indonesia faces a critical decline in youth participation alongside an aging farmer demographic, threatening agricultural regeneration and national food security. This trend stems from societal undervaluation of farming, inadequate financial returns, limited landholding sizes, shifting generational aspirations, and the influence of digital-era subcultures. The resulting youth deficit and aging dominance negatively impact agricultural productivity, market competitiveness, and rural economic capacity, ultimately jeopardizing long-term food security. Strategic interventions, including agroindustry development, agricultural modernization, targeted training, and youth-specific incentives, are essential to revitalize young farmer engagement (Susilowati, 2016).

Youth Perceptions Toward Agriculture

Youth engagement is critical for advancing Indonesia's agricultural sector, particularly amid demographic shifts and an aging farming population. Young farmers are expected to drive agricultural modernization, adopt emerging technologies, and bridge generational gaps through entrepreneurial mindsets (Haryanto, 2021). Despite this potential, youth participation remains critically low. National data indicate that the majority of current farmers are over 45 years old, with only approximately 4% of individuals aged 15–23 expressing interest in farming careers. This disinterest is primarily driven by negative perceptions of agriculture as physically demanding and economically unviable, coupled with consistently low income levels (Sandra, 2023).

Motivation and Performance

Motivation serves as the foundational driver for skill acquisition and continuous learning, directly influencing competency development and long-term knowledge

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retention (Rahman, 2021). In agriculture, motivation determines younger generations' willingness to acquire and apply farming competencies, ultimately shaping the quality of human capital and readiness for sugarcane farmer regeneration. Higher motivation correlates with improved learning outcomes and greater professional preparedness. Performance optimization remains a critical organizational challenge, often hindered by competency gaps in specialized fields. Effective performance enhancement requires a human-centric management approach that prioritizes workforce development (Prihantoro, 2015). Research confirms that human resource performance is strongly influenced by organizational commitment, defined as an employee's psychological identification with and active involvement in organizational goals. Personal commitment emerges when individuals recognize their responsibility to contribute optimally, fostering a dynamic, mutually beneficial relationship that drives organizational success (Christina and Maren (2010)).

Agripreneurship Program

Millennial farmers possess the adaptability to rapidly adopt agricultural technologies and drive innovation. However, declining youth engagement in farming, driven by structural labor shifts, negative sectoral perceptions, limited land access, low profitability, and financing constraints, threatens national food availability and sovereignty (Dyah Panuntun Utami, 2021). To counter this, regional governments, particularly in East Java, have implemented agripreneurship programs that foster digital agricultural ecosystems and promote precision farming technologies. The millennial farmer initiative serves as a strategic regeneration effort to enhance regional agricultural output. Agripreneurs are defined by an entrepreneurial mindset and long-term vision, enabling them to optimize production and marketing strategies. Digital integration, particularly through e-commerce platforms, accelerates supply chain processes and expands market accessibility for young agricultural entrepreneurs (Inez Diva Rahmaniar, 2025).

METHODOLOGY

Research Approach

This study employs a qualitative approach, widely utilized in social sciences and humanities to examine micro level phenomena particularly human behavior and its underlying patterns which are inherently difficult to quantify. Grounded in inductive reasoning, qualitative research relies on objective observation and participation in social phenomena (Harahap, 2020). Establishing the research focus involves identifying core

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issues requiring investigation and formulating foundational truths. The unit of analysis comprises human resources, specifically stakeholders directly or indirectly involved in facilitating young farmer regeneration within Indonesia's sugarcane farming sector.

Data Sources and Collection Techniques

Primary data were collected through in depth interviews with senior sugarcane farmers, youth, and representatives from PT Sinergi Gula Nusantara to capture diverse perspectives. Direct observation was also conducted to assess field conditions. Primary data collection techniques include field observation, in depth interviews, conducted directly with key informants (farmers and PT SGN staff), and comprehensive exploration. Secondary data were obtained from company internal documents, current sugarcane farmer condition reports, and regeneration/HR development program reports to contextualize and support primary findings.

Data Analysis Techniques

Data analysis employs Miles and Huberman's interactive qualitative method, comprising three iterative stages (Qomarudin, 2024). (a) Data reduction, selecting and simplifying raw field notes to sharpen focus, (b) Data display, structuring information into narratives, tables, or diagrams to illustrate interconnections, and (c) Conclusion drawing, deriving data-driven interpretations to determine research directions. This systematic process of processing and interpreting data before, during, and after fieldwork centers on reduction, display, and conclusion drawing (Qomarudin, 2024). Specifically, this study analyzes Human Resource readiness to cultivate young farmers for Indonesia's sugarcane regeneration addressing the critical demographic reality of an aging workforce (>45 years) and low youth interest that threatens production sustainability.

RESULTS AND DISCUSSION

Results

A qualitative approach with in-depth interview techniques was employed, selected for its capacity to explore social phenomena deeply, particularly regarding individual behavior, perceptions, and motivations within the agricultural sector (Nasution, 2023). The presentation begins with current sugarcane farmer conditions, followed by youth perceptions and interests, and concludes with PT SGN's programs and strategies for young farmer regeneration.

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Current Condition of Sugarcane Farmers

Interview results with Mr. Reino Arif Perdana from the company revealed that the current condition of sugarcane farmers is predominantly over 40 years old indicating an aging workforce trend in sugarcane agriculture. He further stated that current partnerships mostly still involve senior farmers demonstrating that farmer regeneration has not progressed optimally. Conversely, the younger generation perceives farming as an enjoyable profession with good income potential, even more attractive than monotonous office work. This suggests regeneration opportunities exist if agriculture can offer more attractive economic prospects. Interviews with senior farmers indicated that sugarcane agriculture has evolved over time, shifting from company-centered management to partnership systems, and currently to direct transaction systems (outright purchase). While this facilitates payment, it has reduced cultivation quality as farmers prioritize production quantity.

Perception and Interest of the Young Generation

The company identified low youth interest in sugarcane farming as the primary regeneration challenge attributed to perceptions that agriculture is unattractive. As stated by Mr. Reino Arif Perdana, *"Tantangan utamanya adalah membangkitkan minat dan ketertarikan untuk menjadi petani tebu itu sendiri".* Regeneration involves not only technical capabilities but also building youth interest in agriculture. However, senior farmer interviews revealed that youth possess potential interest in the sugarcane sector supported by sugar being a staple commodity with high demand making it economically profitable. Mr. Sunardi Edy Sukamto also said *"Pertanian tebu dalam hal gula merupakan komoditi 9 bahan pokok yang menjadi kebutuhan vital dan belum tercukupi produksi dalam negeri sehingga kita masih mengimpor gula setiap tahun untuk pemenuhan kebutuhan nasional baik konsumsi langsung maupun industri. Sehingga secara Analisa usaha adalah salah satu usaha pertanian yang menguntungkan karena hasilnya sangat dibutuhkan."* This explained that sugarcane agriculture, specifically sugar, is one of 9 basic commodities that are vital and not yet sufficiently produced domestically, so we still import sugar annually to meet national consumption and industrial needs. Thus, from a business analysis perspective it is a profitable agricultural venture because its output is highly needed. This indicates significant economic potential if managed professionally.

The younger generation maintains a positive view of farming considering it enjoyable with good income potential. However, they recognize ongoing challenges particularly yield uncertainty and harvest difficulties. As expressed by Nurdya Faiz,

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"Menurut saya, profesi petani adalah pekerjaan yang menyenangkan dan berpotensi menghasilkan pendapatan yang baik, bahkan lebih menarik dibandingkan pekerjaan kantoran yang cenderung monoton" and *"pertanian tebu belum sepenuhnya bisa dikatakan menjanjikan, karena setiap tahun sering menghadapi berbagai kendala, terutama saat musim panen."* Regarding human resource readiness, young farmers entering sugarcane agriculture can be analyzed through three main dimensions which are technical competence, managerial capability, and technological readiness.

In technical competence, the younger generation remains at an early stage with limited knowledge and minimal practical experience indicating a gap between industry needs and young farmer capacity. According to (Sianturi, 2024), human resource development is a continuous process involving education, training, and work experience, necessitating systematic and structured approaches to enhance young farmer competence.

Regarding technology, the younger generation demonstrates greater potential than senior farmers showing more openness to innovation and higher adaptation capacity for digital technology. This presents a strategic opportunity for transforming agriculture toward technology-based modern farming although technological readiness requires training and mentoring for effective implementation. As stated by Nurdya Faiz, *"Saya tertarik menggunakan teknologi digital, tetapi masih membutuhkan proses penyesuaian dan pembelajaran lebih lanjut.*" which he stated his interested in using digital technology but still need further adjustment and learning processes. In managerial aspects the younger generation shows potential for business development through adaptive, innovative thinking, and openness to technological and informational developments. However, implementation faces challenges including limited experience, decision making readiness, and capacity to handle field conditions directly.

Barriers to Sugarcane Farmer Regeneration

Barriers to sugarcane farmer regeneration result from interactions among various interrelated factors. Based on research findings, these barriers can be categorized into three main aspects such as individual, structural, and social. At the individual level, primary barriers include low motivation, limited experience, and insufficient self-confidence among the younger generation, indicating that psychological factors play crucial roles in determining individual decisions to engage in agriculture (Syahfri Dewantoro, 2022). Regarding that, Mr. Reino Arif Perdana explained *"Tantangan berikutnya yaitu tentang pola budidaya di pulau jawa maupun luar jawa serta dengan*

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keterbatasan yang ada, kita harus pandai melakukan penerapan pola budidaya nya." which he said the next challenge concerns cultivation patterns in Java and outside Java, and with existing limitations, we must be skilled in applying cultivation patterns." Additionally, Mr. Sunardi Edy Sukamto stated that farming is a very complex and lengthy process although everything can be calculated and is certain, young people tend toward instant businesses, making patience an absolute parameter. This indicates that mindset changes among the younger generation significantly influence low agricultural interest.

At the structural level, Mr. Sunardi Edy Sukamto stated, "*Dukungan yang dibutuhkan di antaranya pencatatan terhadap semua kegiatan baik pendanaan atau pembiayaan maupun pekerjaan dalam budidaya tanaman tebu serta support permodalan dengan pendampingan perbankan."* Support needed includes recording all activities both financing and cultivation work for sugarcane plants, as well as capital support with banking assistance. Furthermore, literature reviews indicate that limited land access also potentially hinders farmer regeneration. At the social level, differences in younger generation mindsets tending to desire quick-return jobs, present distinct challenges as explained by Mr. Sunardi Edy Sukamto, *"…anak muda condong usaha yang instan sehingga kesabaran menjadi parameter mutlak".* Which changing youth work preferences has become a primary factor in declining agricultural workforce (Ida Syamsu Roidah, 2024).

Company's Role and Strategy in Sugarcane Farmer Regeneration

PT Sinergi Gula Nusantara plays a crucial role in supporting sugarcane farmer regeneration through various human resource development programs. A primary program is the Agripreneur Program, initiated with selection processes followed by bootcamp training. This program provides comprehensive learning from cultivation to harvest (cutting and transport). As explained by Mr. Reino Arif Perdana, *"program yang dilakukan oleh PT SGN adalah melakukan seleksi lalu akan dipilih petani mana saja yang akan mengikuti program agripreneur di PT SGN, yang selanjutnya akan mengikuti program Bootcamp yang berisi tentang proses dari awal hingga akhir di pertanian tebu."* Additionally, the company provides intensive mentoring to young farmers including transfer of sugarcane cultivation knowledge, mentoring for financing access through banking partnerships, and monthly monitoring and evaluation.

To support digitalization, the company has developed information systems for monitoring cultivation processes and integrating data with government financing systems such as People's Business Credit (*KUR*). According to Mr. Reino Arif Perdana, the most

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effective strategy for attracting the younger generation is to attract young farmers' interest, the company describes that this program provides many benefits for young people related to farming programs particularly regarding margins or profits. When farmers obtain certain profits, each harvest will also attract young farmers so it is more oriented toward the profitability of becoming a farmer.

DISCUSSION

Overall, the findings indicate that sugarcane farmer regeneration cannot be implemented partially but requires an integrated approach combining human resources, technology, and institutional frameworks. From an operations management perspective, farmers as primary suppliers in the sugar industry supply chain make regeneration a critical determinant of production sustainability. Additionally, transitioning toward technology-driven modern agriculture serves as a strategic solution to enhance the sector's appeal to younger generations (Irin Oktafiani, 2021). Consequently, farmer regeneration extends beyond individual responsibility and necessitates active collaboration among companies, government, and related institutions to establish a supportive ecosystem.

Quality of Human Resources Required

Interviews with company representatives, senior farmers, and youth reveal that the human resource quality essential for sugarcane farmer regeneration comprises three integrated aspects: basic cultivation competence, business management capability, and attitude/motivation readiness.

First, basic sugarcane cultivation competence. Senior farmers emphasized that young farmers must master fundamentals including land preparation, variety selection, fertilization, pest control, and harvesting/transport. The company also stressed continuous knowledge transfer from planting to harvest, indicating that technical skill acquisition forms the foundational basis for farming success. As noted, *"…disisi lain juga pihak perusahaan melakukan pendampingan dari proses awal hingga akhir. Seperti proses awal dilakukan transfer knowledge mengenai budidaya tanaman tebu, lalu melakukan pendampingan untuk proses mencari atau mendapatkan fasilitas kredit dari bank".*

Second, business management and financing capabilities. The company actively mentors young farmers in financing access and farm business planning, including partnerships with banking institutions as informant stated *"…kebetulan pihak perusahaan*

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juga sudah menjalin Kerjasama dengan bank BNI khusus untuk program agripreneur". The senior farmers further highlighted the necessity of business analysis and financial record-keeping. This demonstrates that modern sugarcane farmers must operate as entrepreneurs rather than mere production laborers.

Third, attitude readiness, motivation, and process resilience. Interviews identified low interest and a preference for instant results as primary regeneration challenges. Senior farmers stressed that sugarcane farming is a prolonged, complex process requiring patience and perseverance. Conversely, youth indicated that their interest depends on family support and clear opportunity visibility. Thus, psychological factors such as motivation, interest, and self-confidence are critical determinants of individual readiness to enter agriculture.

Development Strategies to Enhance Youth Participation

First, capacity strengthening through training and mentoring. The company implements an agripreneur program encompassing candidate selection, bootcamp training, and continuous mentoring from planting to harvest. Regular monitoring and evaluation track youth progress, as stated by Mr. Reino, "*setiap bulan, perusahaan melakukan monitering dan evaluasi yang meliputi progress budidaya tebu sendiri, pembiayaan, maupun proses kualitasnya*." This confirms that effective human resource development relies on sustained practical engagement rather than theoretical instruction alone.

Second, support for business systems, particularly financing access and technical mentoring. The company facilitates credit access through banking partnerships, while senior farmers emphasize the necessity of capital support and cultivation guidance. "*Support permodalan dengan pendampingan perbankan dan pendampingan bertani serta pengawalan terhadap semua aplikasinya*", stated Mr. Sunardi Edy Sukamto. This indicates that regeneration success depends not only on individual capability but also on institutional support systems that enable youth to initiate and manage farming enterprises.

Third, economic appeal and business opportunity approaches. A primary strategy to attract youth involves highlighting sugarcane farming profitability. Youth respondents noted increased attraction when presented with concrete success examples and expansion pathways. "*menurut saya, program yang menampilkan kisah sukses petani muda dan memberikan peluang nyata untuk berkembang akan lebih menarik bagi generasi muda*," stated Nurdya Faiz. This underscores that economic incentives

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significantly shape youth interest, positioning agriculture as a viable and competitive business sector.

CONCLUSION

Sugarcane farmer regeneration in Indonesia constitutes an urgent necessity, given the current predominance of aging farmers without significant youth replacement, rendering the sector's sustainability vulnerable without systematic, continuous intervention. Within operations management and supply chain frameworks, farmers as primary raw material suppliers establish human resource quality and continuity as critical determinants of national sugar industry production stability. Findings indicate that youth possess considerable potential for sugarcane agriculture, particularly regarding technological adaptability and innovation-oriented mindsets; however, readiness remains constrained by limited technical competence, practical experience, and understanding of agricultural risk dynamics. Additionally, low youth interest stems from negative perceptions of agriculture as economically unviable, compounded by structural barriers including limited capital access and shifting work preferences toward non-agricultural sectors. Institutional actors, particularly PT Sinergi Gula Nusantara, play a strategic role in advancing regeneration through human resource development programs, training, mentoring, and digital technology integration. These efforts confirm that farmer regeneration requires an integrated approach encompassing individual capacity, technological adoption, and institutional support. Consequently, successful regeneration depends on synergistic collaboration among youth as primary actors, companies as facilitators, and government as regulators to establish a more attractive, productive, and sustainable agricultural ecosystem.

Based on these conclusions, the following recommendations are proposed: (1) PT Sinergi Gula Nusantara should strengthen young farmer human resource development through more applicable, sustainable training and expand mentoring beyond cultivation to include managerial and entrepreneurial competencies, while enhancing financing access via expanded partnerships with financial institutions to address capital constraints faced by youth, (2) the government should provide concrete policy support favoring young farmers, including streamlined land access, farming incentives, and reinforcement of modern agricultural education and training programs to foster a conducive environment for youth engagement in agriculture, (3) educational and training institutions should assume a more active role in preparing agriculturally competent youth through practice-based curriculum enhancement, integration of modern agricultural technologies, and

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agribusiness incubation programs, thereby bridging the gap between academic preparation and industry requirements to ensure graduates possess adequate readiness for direct agricultural sector engagement.

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