

AGRITECHNOLOGY COMPETENCE IN AGRO-PROCESSING AND ITS CONTRIBUTION IN IMPROVING AGRIPRENEUR SKILLS TO REALIZE SUSTAINABLE AGRICULTURE

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Abstract

This study examines the role of agritechnology skills towards agro-processing and their influence on the development of agripreneur skills towards the advancement of sustainable agriculture. Agritechnology skills include environmentally friendly practices, product innovation, and resource management, which are believed to have an impact on entrepreneurial skills such as market study, adaptability, and sustainable business management. Using quantitative correlational study method, for this research participated 275 vocational students of XI grade of Agribusiness of Agricultural Product Processing expertise program at four vocational schools in East Java Province. Structural Equation Modeling (SEM) approach with Partial Least Squares (PLS) was employed for data analysis. The findings revealed that there was a high positive correlation between agritechnology competencies and agripreneur skills. This finding confirms the importance of incorporating green skills in vocational education curriculum as a strategic initiative for fostering sustainable agribusiness practice. This study also provides workable recommendations for curriculum development incorporating technical and entrepreneurial skills, in an attempt to prepare vocational graduates to meet market demands and environmental challenges.

Keywords: *Agritechnology Competence, Agripreneurship, Sustainable Agriculture Entrepreneurship, Green Skill*

INTRODUCTION

Sustainable agriculture is one of the main ways of attaining SDGs that pertain to agriculture (FAO et al, 2024). The imperatives to adopt sustainable agriculture in Indonesia have been a main concern in agricultural development for attaining SDGs. Several events are forcing the large-scale usage of sustainable agricultural models. There are at least 3 problems that require agricultural development in order to produce environmentally friendly results. Firstly, the countries collaborating in the Earth Summit agreed to play their part in environmental conservation by reducing business wastes and exploiting natural resources wisely. 2nd, the improving economic prosperity of the citizens and growing interest in a higher quality of lifestyles are supported by a healthy and uninterrupted environment. 1/3, the network

is increasingly aware of the importance of being fit, such that they pay keen attention to the quality of food and beverages they take in, both in terms of production process and nutritional content. Some of the available markets already have fruit and vegetables labeled as free from pesticides and other chemicals (Rachmawatie et al, 2020).

Comprehending global warming, climate change, global, regional, and local food availability, sustainable agriculture, institutional systems in production and market chain is one of the focuses of the Basic Agrotechnology of Agricultural Product Processing course (Ministry of Education, 2024). This is in harmony with the FDGs and green TVET implementation objectives in vocational high schools. These competencies are necessary for the next generation who will continue the agrotechnology of processing agricultural products by becoming young agripreneurs and/or being hired in the processing industry of agricultural products and being hired in testing service laboratories in accordance with the needs of the world of work (Gunansyah et al., 2021). In order to prepare students to become young agripreneurs, they should be provided with an overview of business operations, technological changes and global issues, agripreneur profiles, job profiles, business opportunities, and occupations/professions.

Competence in agricultural technology processing for agricultural products is important to support achieving sustainable agriculture that is more responsive to environmental changes and global market demand. This skill not only equips the next generation with the technical skills to economically generate natural resources in an environmentally friendly manner, but also promotes high value-added product creation and responds to market demand for "green" or organically labeled products (Lee and Park, 2023; Zulmi and Tentama, 2024) emphasize that the development of entrepreneurial abilities in agripreneurship among vocational high school students also increases their awareness of the importance of sustainable practices within the agribusiness sector. More research proves that education centered on agripreneurship, and in agricultural product processing particularly, has a positive influence on students' intention to pursue careers in the sustainable agriculture industry (Cavus & Uzunboyly, 2022).

Agripreneurship-based learning needs to emphasize applying innovative technology and market sensibility. They are among processing, storing, and selling eco-friendly agricultural products, which are in line with the demand pattern for "green" or organic food. Such competencies can be developed through the utilization of project-based learning and business simulation approaches where the students get the chance to learn and explore more about supply chain operations and sustainable agriculture practices (Kang et al., 2021). In addition, such education programs that emphasize "green skills" also enhance awareness among students regarding the environmental impact of processing operations in agriculture. The attainment of this learning not only enables environmental sustainability but also has the potential to make graduates more competitive in the globalized job market. All these facts are corroborated by yet another research that asserts that the integration of Agricultural Product Processing Competencies and agripreneurship practices is key assets in improving the sustainability of the agribusiness sector through product innovation and improving the economic value of local agricultural products (Lee and Park, 2023).

The biggest issue that is significant in the context of agripreneurship and Agricultural commercial enterprise Competence in Agricultural Product Processing is the mismatch between the demand of the business for human resources equipped with "green talents" and the

supply of vocational training graduates to fill these demands. Numerous studies have called for the integration of sustainability competencies in vocational education, but processes in existing curricula have not been fully successful in equipping students with the hands-on skills to face the challenges of agripreneurship in the paradigm of sustainable agriculture (Yang et al, 2020). Furthermore, there may exist a major literature gap associated with the use of agripreneurship in agrotechnology program application, mainly in measuring the immediate effect of technical and entrepreneurial competencies at the successful uptake of sustainable farming methods. Past research has leaned towards acknowledgment of either the technical elements of agri-entrepreneurship or agrotechnology independently, while sparse research has addressed the integrative relationship between agrotechnology technical competencies and agri-entrepreneurship capacity building as a means of attaining sustainability in agriculture (Smith and Morris, 2021; Hidayatulloh and Ashoumi, 2022).

The small number of empirical studies on the actual impact of agrotechnology competencies on the sustainability of agripreneurship strategy at the point that our understanding of the determinants of enabling young agripreneurs to run sustainable organizations is not complete. although various studies highlight the significance of institutional and technological support factors in developing agripreneur sustainability, research regarding the role of control of Agricultural business Competence in Processing Agricultural products in strengthening the competitiveness and sustainability of agripreneur groups has not yet been widely investigated (Gonzalez, 2023). This study is timely because the need for sustainability in agriculture becomes more urgent, particularly in the context of the attainment of the Sustainable development goals (SDGs). Sustainable agriculture requires not just technical expertise in the area of agrotechnology, but also entrepreneurial skills (agripreneurship) to handle organizations that are able to withstand the long haul, are economically viable, and are friendly to the environment. This research contributes by developing a new vision that emphasizes the position of Agricultural enterprise Competence in Processing Agricultural products in agripreneur skills development, bridging the gap between technical skill and entrepreneurship competencies development with sustainability as an emphasis.

The uniqueness of this study is how it incorporates Agricultural Business Competence in Processing Agricultural Products and agripreneur skills as a single entity to enable sustainable agriculture. Previous studies tended to handle these two dimensions separately from one another, whereas this study provides empirical proof of the manner in which the technical skills of agrotechnology can directly influence and improve agripreneurship skills, especially in agricultural product processing. Models such as the "Menara Berkah" (Tower of Blessings) proposed by Sari (2024), for example, provide an entrepreneurship-oriented learning model for vocational education that can be used in agripreneurship settings.

This study offers a solution by attempting to develop a more integrated curriculum between Agri-business Competencies in Agricultural Product Processing and agripreneurship competencies in order to generate vocational education graduates who are able to conduct sustainable agriculture. By describing and measuring the direct influence of Agricultural Business Competencies in Processing Agricultural Products on agripreneurship competencies, this research will provide empirical confirmation that can be used as a basis for developing

more relevant and applicable training and learning programs for the future. This study will also identify key areas in Agricultural Product Processing Agribusiness Competence that are particularly attuned to developing agripreneurship competencies, such as green technology knowledge, waste management, and sustainable product development that will make graduates more competitive in the global labor market (Mariyono et al, 2024; Zhang and Wei, 2021). Thus, this research not only contributes to the quality of vocational education but also to the literature associated with agripreneurship and sustainable agriculture in Indonesia.

LITERATURE REVIEW

This reflection is based on Human Capital principle (Becker, 1993) with a focus that education and training fund will enhance individual productiveness in an economic climate. In this reflection, Agricultural business Competence in Processing Agricultural products is given priority as investment in human capital that enables students to acquire the technical skills sought in the agricultural industry, specifically processing agricultural products. This capacity is assumed to have far-reaching effects on entrepreneurial competences (agripreneurship) and, importantly, on the very implementation of sustainable farm practices. Consistent with this assumption, strengthening college students' technical and innovation abilities through vocational education may exert a sweet effect towards the realization of sustainable agribusiness (Becker, 1993). Agricultural business Agricultural Product Processing Competency is the students' capability to apply generation of agricultural product processing, create product innovations, and realize environmentally nice practices. To determine how such a competency is created and made popular with the use of students, the generation popularity model (TAM) is utilized, whereby attractiveness of technology is a function of through perceptions of perceived ease of use and perceived advantages. This capability is also congruent with the inexperienced capabilities Framework, being a framework of ability that drives the transition to an inexperienced economy through energy efficiency, waste control, and green manufacturing (Lee and Park, 2023; Ismail, 2025; Zhang et al, 2023). excessive Agricultural commercial enterprise Competency in Processing Agricultural merchandise invites college students to specialize in post-harvest technologies like fermentation, drying, and business-fashionable packaging, which immediately adds to the competitiveness of agribusiness products (Blankesteijn et al, 2021; Ibrahim et al., 2015).

The agripreneurial skills in this study include creativity, market evaluation abilities, adaptability to change in the enterprise landscape, and green business management. The conceptual foundation for this variable is Entrepreneurial Self-Efficacy notion, based on which one's entrepreneurial self-belief influences one's ability to start and sustain a business venture (Ndofirepi, 2020). In addition, Diffusion of Innovation theory (Rogers, 2003) confirms that skilled agripreneurs shall be exchange dealers in adopting new technology and developing brought value for produce. Creativity and self-efficacy were shown to be effective predictors of entrepreneurial achievement (Bellò et al, 2020; Kumar & Shukla, 2019), particularly when implemented by mission-mainly based knowing models as well as those devised by Abd Rashid et al (2025).

On the other hand, sustainable agriculture is defined as agricultural practices that can maintain long-run productivity, balance ecosystem stability, and enhance the socio-financial

prosperity of farming communities. The theoretical framework used in this variable is the Triple bottom Line (Elkington, 1997), where this hypothesis emphasizes using economic, social, and environmental elements in sustainable development. aside from this, the Sustainability Competence Framework discloses that sustainability is only attained by a combination of innovation know-how, systemic thinking, and cross-sector collaboration. research (Soh et al, 2020) discovers that technology adoption which encompasses IoT technology in agriculture processing will enhance performance and diminish environmental footprints. which is supported by an examine (Al-Awadhi & Ali, 2022) that confirms that Agricultural business Competence in Agricultural Product Processing along with sustainability guidelines constitutes a more flexible agribusiness to survive alternate and market pressures.

The correlation between the variables on this overview shows that Agricultural commercial enterprise Competence in Processing Agricultural products directly affects agripreneurial abilities. this means that the better the students' understanding of sustainable technology and approaches, the better they are able to manage innovative and sustainable agribusinesses (Zhang et al, 2023). beyond this, correct agripreneur skills also play a mediating role to comprehend sustainable agriculture practices. In other words, innovative, flexible agripreneurs who are able to read the market are likely to run agribusinesses that promote sustainable development goals (Lee et al., 2021). thus, the integration of Agricultural enterprise skills within Processing Agricultural products and agripreneur skills is the solution to a vocational training upgrade version that is favorable to the overall sustainability of the agricultural sector (Mariyono et al., 2024; Gonzalez, 2023).

RESEARCH METHOD

This study employs the quantitative method with the correlational approach in examining the effect of Agricultural Business Competence in Processing Agricultural Products on vocational high school students' entrepreneurial competence. The correlational approach was utilized to identify the direct relationship between Agricultural Business Competence in Processing Agricultural Products and vocational high school students' entrepreneurial competence in agribusiness. The participants in this study were grade XI students of Agricultural Product Processing Agribusiness (APHP) majors in several vocational schools across East Java Province. The research sample was computed with stratified random sampling, and regional strata were classified based on the classification of high, medium, and low Minimum Wage Levels (UMK) by BPS data. The samples were taken from four schools, namely SMKN Kebonagung and SMKN 1 Tulungagung (high UMK region), SMKN 1 Trenggalek (medium UMK region), and SMKN 3 Madiun (low UMK region). The sample size was calculated using GPower software with the effect size parameter of 0,5, significance level of 0,05, and power ($1-\beta$) of 0,95, therefore the total number of 275 students. Sampling was conducted using the Purposive Sampling technique, wherein the researcher carefully picked students who were considered to represent key characteristics, including expertise in the area of APHP and regional grouping based on the UMK level. By utilizing this approach, the researcher took into account the diversity of the microeconomy of East Java to provide valid and relevant research results. The sample picked was 35 students of SMKN Kebonagung, 101

students of SMKN 1 Tulungagung, 110 students of SMKN 1 Trenggalek, and 29 students of SMKN 3 Madiun.

The tool employed by this study is a Likert scale questionnaire to quantify two major variables: Agricultural Business Competence in Processing Agricultural Products (variable X) and agripreneur skills (variable Y). Agricultural Business Competence in Processing Agricultural Products includes technology knowledge, product innovation, and green practices, while agripreneur skills comprise creativity, market analysis skill, flexibility, and sustainable business management. The construct validity and reliability of the instrument were established by the use of item-total correlation and Cronbach's Alpha with $>0,70$ as the reliability criterion. The data collected were analyzed using Partial Least Squares (PLS)-based Structural Equation Modeling (SEM). The analysis included testing construct validity by the use of loading factors ($>0,5$) and Average Variance Extracted (AVE $>0,5$), and testing construct reliability by the use of a Composite Reliability measure ($>0,70$). The hypotheses were tested on the basis of t-statistic values ($t > 1,96$) and p-values ($< 0,05$). This research design ought to be capable of providing comprehensive results on the effect of Agricultural Business Competence in Processing Agricultural Products on agripreneur skills among students, as well as representing diversity of the microeconomy in East Java region.

RESULT AND DISCUSSION

RESULT

The data were gathered by handing out questionnaires to 275 vocational high school students from grade XI in four schools in East Java Province. The sampling was conducted based on UMK regional stratification, i.e., SMKN Kebonagung (35 students) and SMKN 1 Tulungagung (101 students) for the high UMK region, SMKN 1 Trenggalek (110 students) for the medium UMK region, and SMKN 3 Madiun (29 students) for the low UMK region. The acquired data were processed using Partial Least Squares (PLS)-based Structural Equation Modeling (SEM) to examine the effect of Agricultural Business Competence in Processing Agricultural Products on the Agripreneur Skills of students. Through data analysis, it was observed that all indicators had a value of loading factor $> 0,5$, indicating good construct validity. The Average Variance Extracted (AVE) of Agricultural Business Competence in Processing Agricultural Products was 0,638 and Agripreneur Skills was 0,672, indicating satisfactory convergent validity. The reliability test showed a Composite Reliability of 0,856 for Agricultural Business Competence in Processing Agricultural Products and 0,879 for Agripreneur Skills with Cronbach's Alpha of $>0,70$, indicating high internal consistency.

The outcome of regression analysis is the equation as follows: $Y = -3,985 + 0,612 X$. The constant (-3,985) indicates that without the influence of Agricultural Business Competence in Processing Agricultural Products, the value of Agripreneur Skills is negative. The regression coefficient of 0,612 illustrates that adding one unit to the increase in Agricultural Business Competence in Processing Agricultural Products will increase Agripreneur Skills by 0,612 units.

Table 1. Regression Analysis Results

Model	Unstandardized Coefficient (B)	Std. Error	Standardized Coefficient (Beta)	t	Sig.
Constant	-3,985	1,024	-	-3,891	0,000
Agribusiness Competency in Agricultural Product Processing (X)	0,612	0,083	0,701	7,372	0,000

Source: data analysis results

Table 2. F Test Results and Coefficient of Determination (R^2)

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	1027,123	1	1027,123	54,392	0,000
Residual	1335,642	75	17,808		
Total	2362,765	76			

Source: data analysis results

The determination coefficient (R^2) value of 0,435 indicates that 43,5% of the variation of Agripreneur Skills is accounted for by Agricultural Business Competence in Processing Agricultural Products, and the other 56,5% is accounted for by other variables outside this model. This is computed using the ratio of the Sum of Squares Regression (SSR) and the Total Sum of Squares (SST), namely:

$$R^2 = \frac{SSR}{SST} = \frac{1027,123}{2362,765} = 0,435 \text{ atau } 43,5\%$$

In addition, a partial determination coefficient (r^2) test was conducted to evaluate the specific contribution of Agricultural Business Competence in Processing Agricultural Products to Agripreneur Skills. The analysis results show that the partial correlation coefficient (rrr) between Agricultural Business Competence in Processing Agricultural Products (X) and Agripreneur Skills (Y) is 0,701, so that the partial contribution is calculated as:

$$r^2 = 0,701 \times 0,701 = 0,491 \text{ atau } 49,1\%$$

These results confirm that Agricultural Business Competence in Processing Agricultural Products partially contributes 49,1% to the development of Agripreneur Skills, while other factors not included in this analysis contribute the remainder. Agricultural Business Competency in Processing Agricultural Products, which includes understanding technology, product innovation, and environmentally friendly practices, plays an important role in shaping entrepreneurial skills that support sustainable agriculture.

DISCUSSION

The results of this study indicate that Agricultural Business Competence in Agricultural Product Processing has a significant impact on Agripreneur Skills with a 43,5% contribution. This suggests that almost half of students' difference in agripreneur skills can be explained by their competence in Agricultural Business Competence in Agricultural Product Processing. The

foregoing finding evidently addresses the research question, i.e., whether Agricultural Product Processing Agribusiness Competence makes a substantial contribution to vocational high school students' agripreneur capabilities in agribusiness. Agricultural Product Processing Agribusiness Competence involving technology awareness, product innovation, and green practices has been revealed to be a key keystone in the building of entrepreneurial capabilities sensitive to the needs of the modern agribusiness market. Technological knowledge enables students to work effectively in agricultural product processing, create high-quality products, and expand their market. This is followed by the work of Blankesteyn et al (2021), which posits that technological knowledge is among the main causes of innovation across agriculture-based industries.

Product innovation is a vital element to create added value from agricultural crops. Good Agricultural Business Competence in Processing of Agricultural Products allows students to transform raw crops into high-value processed goods that meet market needs. Ibrahim et al. (2019) posit the necessity of product innovation to increase students' competitiveness in the agribusiness market. For example, better-trained learners with modern techniques of drying and fermentation can formulate agribusiness products that are durable and high in value for commercial purposes. This ability does not only increase the economic value of the product, but also creates new business opportunities with respect to local innovation. Environment-friendly techniques are also a major part of Agricultural Business Competency in Processing Agricultural Products. Students' ability to implement organic waste management, energy efficiency, and sustainability contributes not only to environmental sustainability but also to the efficiency of operations. Kumar & Shukla (2019) emphasize that sustainability is becoming a critical source of competitive edge in the global market, specifically in the agribusiness sector. Incorporating sustainability principles into agrotechnology education, therefore, equips students with stronger and more future-resistant agribusinesses.

To make a picture even clearer, table 3 below is an overview of Agribusiness Competency in Agricultural Product Processing contribution towards agripreneur skills:

Table 3. Contribution of Agribusiness Competency Elements in Agricultural Product Processing to Agripreneur Skills

Agribusiness Competency Elements in Agricultural Product Processing	Contribution to Agripreneur Skills	Practical Impact
Understanding Technology	Improving efficiency and productivity	Process optimization
Product Innovation	Enhancing competitiveness and creativity	New processed products, increased selling value
Environmentally Friendly Practices	Promoting resource efficiency and business ethics	Green and sustainable agribusiness

Source: data analysis results

Agripreneurial skills, including creativity, market analysis skills, adaptability, and sustainable management of businesses, are key elements in fostering sustainable agriculture. For this study, students who had high Agricultural Business Competence in Processing

Agricultural Products had higher levels of creativity in creating innovative products and better skills in assessing market opportunities. This is supported by the study carried out by Bellò et al. (2020), which shows that creativity and innovation are key factors in entrepreneurial success. Additionally, increased adaptability through technology expertise helps learners better deal with policy changes and trends in markets. Ndofirepi (2020) contends that technology-enhanced education increases learners' self-efficacy, which further increases their ability to deal with challenges. It can be understood based on these findings that Agricultural Business Competence in Processing Agricultural Products not only has a technical impact but also becomes a strong entrepreneurial culture. These findings complement Human Capital theory (Becker, 1993), in which learning skills have a direct contribution to developing individuals' capability to innovate and create economic value. This is also in line with the Diffusion of Innovation strategy (Rogers, 2003), where high-capacity agripreneurs would likely be change agents within their own communities.

This research also applies in contributing to sustainable agriculture goals. Agribusiness capabilities in agricultural product processing enabling resource efficiency, reduced environmental footprints, and increased added value to products enable low-emission agribusiness activities. Resource-saving and environmentally friendly agricultural product processing technologies constitute agribusiness systems with compatibility in SDGs. Aside from that, integrating agrotechnology with entrepreneurship enables students to be change agents in the agribusiness sector, creating innovative products that benefit society and the environment. This study is also supported by current studies. For example, a study by Soh et al (2020) shows that the application of IoT-based technology in processing agri-products improves efficiency in production but reduces environmental impact. Lee et al. (2021) affirm in research that product innovation in the market becomes more competitive with technology-based agripreneur development. Furthermore, Al-Awadhi and Ali (2022) state that combining agrotechnology education with sustainability values results in an agribusiness system that is resilient to climate and market change. Research by Zhang et al. (2023) also inferred that individuals with high technological skills have enhanced competence in analyzing markets and operating businesses in an eco-friendly way. Ahmed et al. (2022) also did a study that illustrates the importance of project-based curricula in enabling the development of agripreneur skills among vocational education students.

Based on all these results, it is possible to say that Agricultural Business Competence in Agricultural Product Processing is the most important determinant of Agripreneur Skills. These results confirm previous hypotheses and at the same time leave opportunities for adjusting curricula of vocational education based on technology and entrepreneurship. Practical implications of the study are: (1) vocational education must establish project-based learning so that students can experiment with agrotechnology in real situations, for example, treatment of organic agricultural products or simulation of agribusiness; (2) collaborative efforts with the agribusiness industry can expose students to the latest technology and real practice; and (3) strengthening the significance of sustainability within the curriculum for agrotechnology education is important to develop a generation of agripreneurs focused on sustainable agriculture.

CONCLUSION

There is a positive relationship between Agricultural Business Competence in Agricultural Product Processing and vocational high school students' Agripreneur Skills. The Agricultural Business Competence in Agricultural Product Processing variable's contribution to Agripreneur Skills is 43,5%. This means the higher the Agricultural Business Competence in Processing Agricultural Products, including technology understanding, product innovation, and environmental consideration, the higher the agripreneur ability of the students with creativity, market analysis skill, adaptability, and sustainable business management. The regression test results show the equation $Y = -3,985 + 0,612 X$ having a regression coefficient value of 0,612. This implies that a one-unit increase in Agricultural Business Competence in Processing Agricultural Products will increase Agripreneur Skills by 0,612 units. The F statistical test produced a calculated F value of 54,392 with a p-value $< 0,05$, so Agricultural Business Competence in Processing Agricultural Products has a significant impact on Agripreneur Skills. The coefficient of determination (R^2) of 43,5 informs us that 43,5% of the variation of Agripreneur Skills is explained by Agricultural Business Competence in Processing Agricultural Products, and 56,5% by other explanations outside the model, e.g., job experience, support by family, or personal motivation of students. This study emphasizes increasing Agricultural Business Competence in Processing Agricultural Products in vocational schools to support the creation of creative, innovative, and sustainable agripreneur capacities in line with the Sustainable Development Goals (SDGs). The results of this study also open up possibilities for the conceptualization of a more integrated project-based curriculum with the agribusiness sector and emphasize the role of sustainability, in order to develop a generation of highly competent and resilient agripreneurs to adapt to global challenges.

REFERENCES

- Abd Rashid, N. H., Ismail, N. A., & Bakar, M. A. (2025). Integration of Agri-Tech Tools Among Malaysian Women Agripreneurs in Sustainable Farming. *e-Academia Journal*. Retrieved from <https://journal.uitm.edu.my/ojs/index.php/e-AJ/article/view/5625>
- Ahmed, K., Mustafa, A., & Khan, T. (2022). Project-Based Learning in Agripreneurship Education: Developing Entrepreneurial Competencies. *International Journal of Vocational Education*, 29(4), 345-362.
- Al-Awadhi, M., & Ali, Z. (2022). Integrating sustainability values in agritechology education: A pathway to adaptive agribusiness. *Journal of Agricultural Education and Development*, 18, 145–159.
- Becker, G. S. (1993). *Human capital: A theoretical and empirical analysis, with special reference to education (3rd ed.)*. Chicago: University of Chicago Press. Retrieved from <https://press.uchicago.edu/ucp/books/book/chicago/H/bo3684037.html>
- Bellò, B., Mattana, V., & Loi, M. (2020). The power of peers: A new look at the impact of creativity, social context, and self-efficacy on entrepreneurial intentions. *International Journal of Entrepreneurial Behavior & Research*, 26(5), 1013–1037. Retrieved from <https://doi.org/10.1108/IJEBr-07-2019-0427>

- Blankesteyn, M., Bossink, B., & van der Sijde, P. (2021). Science-based entrepreneurship education as a means for university-industry technology transfer. *International Entrepreneurship and Management Journal*, 17(2), 779–808. Retrieved from <https://doi.org/10.1007/s11365-019-00623-3>
- Blankesteyn, M., Bossink, B., & van der Sijde, P. (2021). Science-based entrepreneurship education as a means for university-industry technology transfer. *International Entrepreneurship and Management Journal*, 17(2), 779–808. Retrieved from <https://doi.org/10.1007/s11365-019-00623-3>
- Cavus, N. and H. Uzunboylu. (2022). Green skills in vocational education and training. *Sustainability*, 14(2), 123–136. doi:10.3390/su14010123
- Cavus, N., & Uzunboylu, H. (2022). Green skills in vocational education and training. *Sustainability*, 14(2), 123–136. Retrieved from <https://doi.org/10.3390/su14020987>
- Elkington, J. (1997). *Cannibals with Forks: The Triple Bottom Line of 21st Century Business*. Oxford, UK: Capstone Publishing. Retrieved from https://books.google.co.id/books?hl=en&lr=&id=hRJGrsGnMXcC&oi=fnd&pg=PA49&redir_esc=y#v=onepage&q&f=false
- FAO; IFAD; UNICEF; WFP; WHO. (2024). *The State of Food Security and Nutrition in the World 2024: Financing to end hunger, food insecurity and malnutrition in all its forms*. Rome, Italy : FAO ; IFAD ; UNICEF ; WFP ; WHO. doi:<https://doi.org/10.4060/cd1254en>
- Gonzalez, A. &. (2023). Institutional support and technology in sustainable agripreneurship. *Sustainability Science*, 18(2), 213–227. doi:doi: 10.1007/s11625-023-01297-6.
- Gunansyah, G., U. Zuhdi, S. Suprayitno, and M. Rohadatul ‘Aisy. (2021, May). Sustainable development education practices in elementary schools. *Journal of Education and Learning (EduLearn)*, 15(2), 178–187. doi:doi: 10.11591/edulearn.v15i2.17091
- Hidayatulloh, M. K. Y. and H. Ashoumi. (2022, November). Creativity and entrepreneur knowledge to increase entrepreneurial intent among vocational school students. *Journal of Education and Learning (EduLearn)*, 16(4), 434–439. doi: 10.11591/edulearn.v16i4.19771
- Ibrahim, W. N. A., Bakar, A. R., Asimiran, S., & Mohamed, S. (2015). Impact of entrepreneurship education on the entrepreneurial intentions of students in technical and vocational education and training institutions. *International Education Studies*, 8(12), 141–148. Retrieved from <https://files.eric.ed.gov/fulltext/EJ1083944.pdf>
- Ismail, I. J. (2025). The influence of green absorptive capacity on agripreneurs’ adoption of precision agriculture technologies: Mediating effects of green innovations. *Innovation and Green Development*, 1(1). Retrieved from <https://doi.org/10.1016/j.igd.2025.100073>
- Kang, S., S. Kim, and J. Park. (2021). Project-based learning in vocational education: Fostering sustainable agricultural practices. *Journal of Agricultural Education*, 62(4), 101–119. doi:10.5032/jae.2021.04101
- Kementerian Pendidikan, K. R. (2024). Kepka BSKAP Nomor 032/H/KR/2024 tentang Capaian Pembelajaran.

- Kumar, R., & Shukla, S. (2019). Creativity, proactive personality, and entrepreneurial intentions: Examining the mediating role of entrepreneurial self-efficacy. *Global Business Review*, 20(5), 1173–1186. Retrieved from <https://doi.org/10.1177/0972150919844395>
- Lee, J. and H. Park. (2023). Integrating agripreneurship in green vocational education for sustainable agribusiness development. *Journal of Vocational Education Research*, 46(3), pp. 299–313,. doi:10.33140/jver.46.3.299
- Lee, S. Y., Kim, H. J., & Park, J. W. (2021). Technology-based agripreneurship: Innovations for sustainable agriculture. *Journal of Agribusiness Management*, 37(3), 201–220.
- Mariyono, D., M. Maskuri, and M. D. Ghony. (2024, May). Entrepreneurial basic capital and its contribution to developing multicultural Islamic education. *Journal of Education and Learning (EduLearn)*, vol. 19, no. 2, pp. , . doi: 10.11591/edulearn.v19i2(2), 684–698. doi:doi: 10.11591/edulearn.v19i2.21554
- Ndofirepi, T. M. (2020). Relationship between entrepreneurship education and entrepreneurial goal intentions: Psychological traits as mediators. *Journal of Innovation and Entrepreneurship*, 9(1). Retrieved from <https://doi.org/10.1186/s13731-020-00123-1>
- Rachmawatie, S.J., J. Sutrisno, W.S. Rahayu, L. Widiastuti. (2020). *Mewujudkan Ketahanan Pangan melalui Implementasi Sistem Pertanian Terpadu Berkelanjutan*. Yogyakarta: Plantaxia.
- Rogers, E. M. (2003). *Diffusion of innovations (5th ed.)*. New York: NY: Free Press.
- Sari, M. N., S. P. Harto, and M. Muhyadi. (2024, August). Development of entrepreneurship education based on the menara berkah model in Indonesian vocational high schools. *Journal of Education and Learning (EduLearn)*, 18(3), 868–880. doi:doi: 10.11591/edulearn.v18i3.21003
- Smith, J. and R. Morris. (2021). Challenges in integrating sustainable practices in agripreneur education. *International Journal of Agricultural Sustainability*, 19(1), 45–59. doi: 10.1080/14735903.2021.1867963
- Soh, W. T., Tan, J. Y., & Lim, C. S. . (2020). IoT applications in agricultural product processing: Enhancing efficiency and sustainability. *Agricultural Systems*, 185, 101–112. Retrieved from <https://doi.org/10.1016/j.agry.2020.102951>
- Yang, H., T. Li, and R. Liu. (2020). The role of TVET in fostering green skills in agricultural sectors. *Journal of Vocational Education & Training*, 72(3), 307–325. doi:10.1080/13636820.2020.1736338
- Zhang, T., Wei, H., & Liu, Y. (2023). Market analysis skills in agribusiness education: The role of technology. *Education for Sustainable Development*, 45, 315–330.
- Zhang, Y. and Z. Wei. (2021). Integrative skills in green technology for sustainable agripreneurship development. *Journal of Vocational and Technical Education*, 33(2), 189–203. doi:doi: 10.1007/s11633-021-00232-5
- Zulmi, N. and F. Tentama. (2024, February). The effect of entrepreneurial readiness, adversity quotient, and social intelligence on employability students. *Journal of Education and Learning (EduLearn)*, 18(1), 26–36. doi:10.11591/edulearn.v18i1.207