



Research Article

Empowering Agriculture: Exploring Farmers' Perception of Avocado Pameling Innovation in East Java

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ARTICLE INFO

Article history

Received February 23, 2024

Revised March 28, 2024

Accepted March 31, 2024

Published March 31, 2024

Keywords

Adoption

Innovation

Pameling Avocado

Perception

ABSTRACT

Export activities of agricultural commodities in Indonesia present significant opportunities, as evidenced by the implementation of the 'Gratiex' (Three Times Agricultural Export Movement) initiative aimed at bolstering the value of Indonesian agricultural exports. Leveraging this opportunity, the government collaborates with stakeholders in the agricultural industry across regions to foster the development of distinctive commodities. Among these notable products is the Pameling avocado, introduced as an innovative solution to the challenges faced by farmers in Tukur, Pasuruan, East Java, due to its various advantages. This study seeks to examine farmers' perceptions of the Pameling avocado innovation, conducted specifically in Tukur, Pasuruan, East Java. Utilizing a quantitative descriptive analysis approach, the study engaged 40 farmers as respondents. Findings reveal a positive outlook among farmers regarding the Pameling avocado innovation. Notably, indicators such as perceived relative advantage and observability attained a remarkably high rating of 97.8%, followed by the triability indicator (96.5%) and the appropriateness indicator (94.5%). Conversely, the complexity indicator exhibited the lowest score, standing at 26%.

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INTRODUCTION

The Statistics Indonesia (BPS) has indicated a promising outlook for the exportation of agricultural commodities in Indonesia. According to data from BPS (2019), November 2019 saw a decrease in export value by USD14.01 billion or 6.17 percent compared to October 2019. However, the agricultural sector uniquely experienced a 4.42 percent yearly increase, reaching a value of USD330 million. In response, the Ministry of Agriculture of the Republic of Indonesia initiated various strategies aimed at elevating the value of Indonesian agricultural exports and improving farmers' welfare. Minister of Agriculture Regulation No. 19 of 2019 underscores the objective of boosting the competitiveness of agricultural commodities in the global market by fostering the expansion of agricultural exports. Developing nations exhibit substantial potential for exporting horticultural products within the agricultural commodities sector (Santosa et al., 2018).

The Ministry of Agriculture of the Republic of Indonesia is actively engaged in enhancing the value of Indonesian agricultural exports through the implementation of the 'Gratieks' (Three Times Agricultural Export Movement) Program. This strategic, long-term initiative aims to triple the export potential of horticultural commodities and their derivatives from 2020 to 2024, with a targeted annual production increase of 7%. Utilizing a Cluster System, agricultural commodities in Indonesia are being developed and poised for further advancement. The Cluster System employs an organizational approach, grouping farmers within specific geographic areas to harness their collective strength for improved economic capacity (Endalew et al., 2024). Pamelang Avocado stands out as one of the premier commodities in this endeavor.

Pamelang avocado, a premium commodity cultivated in Malang, is managed by PT Pamelang Agro Nusantara (PAMOR). This innovative avocado variety offers distinct advantages over other varieties. These advantages encompass several key features: (a) sizable fruits, typically weighing between 600-2,000 grams each; (b) yellow, thick, and soft flesh; (c) a pleasant, sweet aftertaste; (d) relatively small seeds; (e) certification by the Technical Implementation Unit (UPT) of the Agriculture and Food Security Service; and (f) provision of technical guidance and support by the corporation to optimize crop yields for partner farmers. These enumerated advantages form the basis for fostering collaborations with diverse farmers throughout Indonesia.

Tutur, a sub-district within Pasuruan, encompasses an area spanning 86.30 km² and is situated along the slopes of Mount Bromo, ranging in elevation from 600 to over 1000 meters above sea level, resulting in moorland terrain. Moorland, characterized by aridity, relies heavily on seasonal rainfall for water supply, making it conducive for horticultural cultivation. Given its geographical and agricultural context, Tutur holds significant potential for agricultural endeavors, particularly in the cultivation of fruits and vegetables, including the Pamelang avocado variety. The selection of Tutur is informed by the predominant occupation of its residents as horticultural farmers and the absence of prior Pamelang avocado cultivation in the region. Additionally, farmers in Tutur face challenges stemming from the lack of guidance and support throughout the agricultural process, spanning from initial cultivation to harvest. These challenges manifest in issues such as substandard seed quality, difficulties in acquiring pesticides and fertilizers, and fluctuating market prices that fail to adequately offset farming costs. The Pamelang avocado, introduced as an innovative solution, addresses these challenges by offering a novel concept in agricultural production. Innovation, as defined by Noviyanti et al. (2020), entails the introduction of new ideas, concepts, or practices, exemplified by the Pamelang Avocado. The implementation of this innovation in Tutur has sparked varied opinions among farmers regarding its efficacy. Farmer acceptance of innovation is influenced by factors such as observability, trialability, simplicity, perceived advantages, and existing social networks and skills, as discussed by Kuehne et al. (2017). Therefore, a comprehensive study is warranted to explore farmers' perspectives in Tutur regarding the adoption of this innovation.

The process of adopting innovations is a communicative endeavor aimed at disseminating information regarding the innovation, leading to changes in decision-making, as posited by Rogers & Shoemaker (1971). Rogers (1983) further elaborates that the adoption of innovations entails the deliberate incorporation of novel concepts to guide appropriate and accurate behavior. Soekartawi (1988) asserts that this process involves cognitive evaluation and acceptance of new ideas, considering factors such as time and thoughtful deliberation. The decision-making process regarding new technology involves a cognitive journey from the discovery of an innovation to a definitive choice to accept or reject the idea, followed by confirmation. Consequently, adopting or rejecting new ideas or technologies entails implementing innovations with the objective of realizing changes in individual decisions. The introduction of the avocado innovation in Tutur is intricately linked to the implementation of the GRATIEKS (Three Times Agricultural Export Movement) initiative, aimed at addressing challenges encountered by PT Pamelang Agro Nusantara (PAMOR) in Pamelang avocado production. This study is grounded in Rogers' (1983) innovation diffusion theory, which highlights innovation characteristics such as relative advantage, compatibility, complexity, trialability, and observability, influencing farmers' perceptions of innovation adoption.

METHOD

Quantitative methodology was employed in this study to provide a comprehensive understanding of the research subject. The research was conducted in Tutur, located in Pasuruan. The selection of the research site involved a meticulous decision-making process, considering various factors. The primary criterion for selecting Tutur was its proximity to Malang and its significance as the cultivation site for Pamelang avocado. Moreover, there is a notable scarcity of studies regarding the implementation of Pamelang avocado technologies, particularly in Tutur, Pasuruan. The research sample was obtained using a census approach, which involves

the complete enumeration of all elements within a population. This method was chosen due to the homogeneity of the research subjects, all of whom had uniformly adopted the Pamelang avocado innovation on their land. Consequently, the study comprised a single group of 40 farmers.

This study aimed to assess farmers' perspectives regarding the adoption of Pamelang avocado technology. The assessment focused on innovation quality dimensions, including relative advantage, compatibility, complexity, trialability, and observability, as delineated in Rogers' theory (1983). Utilizing a quantitative descriptive analysis approach with a Likert scale, this study assessed farmers' perceptions of Pamelang avocado adoption. The collected data were descriptively interpreted using predefined categories. Data analysis employed a numerical scale ranging from 1 to 5, with 5 representing very good, 4 representing good, 3 representing moderate, 2 representing poor, and 1 representing very poor perceptions. The parameters utilized to assess farmers' perceptions are outlined below.

Table 1. Criteria for Assessing Farmers' Perceptions

Score	Percentage	Category
1 – 1,8	20% - 36%	Very Poor
1,9 – 2,6	36,01 - 52%	Poor
2,7 – 3,4	52,01% - 68%	Moderate
3,5 – 4,2	68,01% - 84%	Good
4,3 – 5	84,01% - 100%	Very Good

RESULTS AND DISCUSSION

The following section presents the results and discussion derived from the study conducted among 40 farmers who have adopted Pamelang avocado cultivation in Tukur.

Characteristics of Farmers

The survey examined the demographic and personal characteristics of farmers involved, adjusting for parameters such as age group, educational level, land size, agricultural experience, land ownership status, reference group, and access to information sources. These characteristics were derived from primary data collected through questionnaire interviews with farmers. The perspectives of fruit growers in Tukur regarding the Pamelang avocado innovation are likely influenced by these characteristics.

Table 2. Characteristics of Farmers as Respondents

No	Variable	Number of Respondents	Percentage
1.	Age		
	18 - 30 year old	4	10%
	31 - 60 year old	32	80%
	≥ 61 year old	4	10%
2.	Education		
	Elementary school/equivalent	0	0%
	Junior high school/equivalent	13	32,5%
	Senior high school/equivalent	20	50%
	Higher Education	7	17,5%
3.	Agricultural experience		
	<5 years (less experience)	4	10%
	6-10 years (moderately experienced)	7	17,5%
	11-5 years (experienced)	18	45%
	>15 years (very experienced)	11	27,5%
4.	Land size		
	≤ 0.5 Ha (very narrow)	19	47,5%
	0.51 - 1.25 Ha (narrow)	14	35%
	1.26 - 2 Ha (medium)	4	10%
	> 2 Ha (broad)	3	7,5%
5.	Land ownership status		
	Owned	39	97,5%
	Rented	1	2,5%
6.	Reference group		
	1 Group	40	100%
	2 Group	0	0%
7.	Access to information sources		

No	Variable	Number of Respondents	Percentage
	Direct face-to-face	34	85%
	Electronic media	6	15%
	Print media	0	0%

Source: Data Analysis, 2024

Analysis of the characteristics of Pameling avocado farmers in Tukur reveals that the majority fall within the 31-60 age bracket, comprising 32 individuals, accounting for 80%. Conversely, farmers aged 18-30 and those aged 61 years and above each total 4 individuals, constituting 10% respectively. This age distribution suggests that farmers adopting Pameling avocado innovations are predominantly within the productive age group, consistent with the classification proposed by Harmanto et al. (2016), wherein individuals aged 15-64 are deemed productive. The prevalence of farmers within the productive age range facilitates their understanding and acceptance of new innovations aimed at enhancing farming practices. This observation is further supported by Setiyowati et al. (2022), who assert that farmers within the productive age bracket exhibit heightened enthusiasm and motivation toward agricultural activities.

The educational background of Pameling avocado farmers in Tukur primarily consists of individuals educated at the senior high school or equivalent level, comprising 20 farmers or 50% of the total. Farmers with an educational background at the junior high school or equivalent level account for 13 individuals, constituting 32.5%. Additionally, 7 farmers have received higher education, representing 17.5% of the sample. The predominance of farmers with 10-12 years of education (junior high school/equivalent) in Tukur is attributed to their reliance on farming experience accumulated over generations when making decisions regarding innovation adoption. This assertion aligns with Sholikah's (2018) observation that agricultural land management by farmers is often influenced by direct farming experience or intergenerational learning rather than formal education level alone.

Most respondent farmers possess agricultural experience spanning 11-15 years, comprising 18 individuals or 45% of the sample. This suggests a significant level of familiarity with farming practices among the respondents. The duration of farming activities is closely tied to farmers' primary livelihood, namely agriculture. Additionally, some younger farmers engage in entrepreneurial activities alongside farming, while others are relatively new to agriculture, resulting in shorter farming experience. The duration of farming activities significantly influences the adoption of Pameling avocado innovations. This observation is consistent with the findings of Mulyati et al. (2016) cited in Noviyanti et al. (2020), indicating that farmers with varying levels of agricultural experience are better equipped to navigate challenges encountered in farm management.

The majority of respondent farmers utilize cultivated land ≤ 5 hectares, comprising 19 farmers or 47.5% of the sample. This data indicates that the land area allocated by farmers for Pameling avocado adoption activities is predominantly small or limited. The land owned by these farmers typically represents residual land resulting from development and land conversion, leading to a prevalence of narrow land holdings. This circumstance underscores the feasibility of Pameling avocado innovation adoption among farmers, regardless of land size. Such adoption is facilitated by farmers' awareness of innovation application on their land and the provision of quality inputs to optimize land utilization (Ullah et al., 2020).

Regarding land ownership status, 39 farmers possess private land ownership, constituting 97.5% of the respondents. This suggests that the majority of farmers adopting Pameling avocado innovations in Tukur own their land outright. This ownership status affords farmers authority over land management, facilitating the acceptance and implementation of Pameling avocado innovations. Windani et al. (2022) suggest that land-owning farmers typically exhibit greater autonomy in management and quicker decision-making when adopting agricultural innovations compared to those who rent land.

Concerning reference groups, all respondent farmers have a single reference group utilized for decision-making regarding Pameling avocado adoption. The presence of reference groups influences farmers' decision-making processes, as they seek information and recommendations or observe behaviors within these groups (Cheung et al., 2019). Similarly, in adopting Pameling avocado innovations, farmers rely on observations and feedback from reference groups, with GAPOKTAN (Farmers Association) Nakulo serving as a prominent reference group. GAPOKTAN Nakulo, comprising farmer groups in Wonorejo, Lawang, Malang, was established to enhance the welfare of Pameling avocado cultivators. Harvests from GAPOKTAN Nakulo contribute to meeting both domestic and international demand for Pameling avocados, ultimately enhancing the economic status of its members. The success of farmers affiliated with GAPOKTAN Nakulo serves as an incentive for farmers in Tukur to adopt Pameling avocado innovations.

In Tukur, farmers predominantly rely on face-to-face communication as a relevant and accessible medium for accessing information. This communication method involves personal or group meetings with the company, facilitating interpersonal interaction (Joni et al., 2019). Through face-to-face communication, farmers can directly convey messages and openly discuss problems and solutions with the company. These meetings typically entail reviews of Pameling avocado innovation implementation progress and consultations between the company and farmers.

Farmers' Perception of Pameling Avocado Innovation

Farmers' perceptions of the Pameling avocado innovation can be assessed through the lens of Rogers' (1983) innovation characteristics framework, comprising five indicators: relative advantage, compatibility, complexity, triability, and observability. The following elucidates farmers' perceptions of Pameling avocado innovation adoption based on these innovation characteristics.

Table 3. Data Distribution of Farmers' Perception of Pameling Avocado Innovation

No	Variable	Indicator	Score	%	Category
1.	Relative advantage	Increase productivity	4,95	98,5%	Very High
		Increase income	4,85	97,0%	Very High
		TOTAL	9,8	98%	Very High
2.	Compatibility	Corresponds to farmers' cultivation habits	4,83	96,5%	Very High
		Corresponds to the farmer's experience	4,53	90,5%	Very High
		Corresponds to the needs of farmers	4,83	96,5%	Very High
		TOTAL	14,18	94,5%	Very High
3.	Complexity	Complex to understand and implement	1,5	30%	Very Low
		Complex cultivation techniques to perform	1,25	25%	Very Low
		Complex marketing of harvested crops	1,25	25%	Very Low
		TOTAL	4	26%	Very Low
4.	Triability	Easy to trial in farmers' fields	4,825	96,5%	Very High
		Easy to trial by both experienced and inexperienced farmers	4,825	96,5%	Very High
		TOTAL	9,65	96,5%	Very High
5.	Observability	Providing more crop yields than before	4,8	97,0%	Very High
		Being able to solve farmers' problems	4,9	98,5%	Very High
		TOTAL	9,8	98%	Very High

Source: Primary Data Processed, 2024

Assessment of Relative Advantage

The concept of relative advantage assesses the extent to which an innovation offers economic and social benefits, convenience, and satisfaction to adopters. This study evaluates relative advantage through indicators related to Pameling avocado cultivation production and income. The Relative Advantage assessment yielded a score of 9.8 or 98%, categorizing it as very high. This evaluation is substantiated by scores indicating increased farmer productivity (4.95 or 98.5%) and augmented farmer income (4.85 or 97.0%). Relative advantage provides insights into farmers' perceptions of an innovation, indicating whether it surpasses previous methods. Soekartawi (1988) asserts that innovations demonstrating superior relative advantage tend to experience faster adoption rates. The highest relative advantage value, observed in increased farmer productivity (98.5%), underscores the pivotal role of productivity in agricultural endeavors. Productivity, defined as the ratio of inputs to outputs over a specific period, is influenced by various factors, including agricultural inputs (e.g., land, capital, labor, and technology) and social and economic variables. Social factors encompass farmers' education level and experience, while economic factors entail resource allocation for seeds, fertilizers, pesticides, and equipment during production. The benefits accrued by farmers, such as seed provision, technical guidance, and marketing support for Pameling avocado, incentivize adoption and cultivation. This

elevation in farmer productivity consequently enhances income levels. With favorable benefits and substantial investments, farmers embrace innovation while enhancing their social standing (Cofré-Bravo et al., 2019).

Assessment of Compatibility

Compatibility refers to the degree to which an introduced innovation aligns with the social norms, past experiences, and needs of farmers in Tukur. It assesses the correlation between new and existing innovations, considering whether innovations replace, complement, or sustain previous practices. The suitability indicator scored 14.18, equivalent to 94.5%, indicating a very high level of compatibility. This assessment is corroborated by scores indicating the alignment of the innovation with farmers' cultivation habits and needs (4.83 or 96.5%) and their experience (4.53 or 90.5%). According to Soekartawi (1988), higher scores signify innovations meeting farmers' needs, facilitating adoption as improvements on existing technologies tailored to farmers' requirements. Thus, the introduction of pameling avocado aligns with farmers' practices, encompassing land cultivation and plant care. Adoption rates are influenced by familiar farming practices that can seamlessly integrate new methods (Kaine & Wright, 2022). Moreover, the Pameling avocado innovation offers assistance to Tukur farmers throughout the cultivation process, addressing their needs for support to achieve agricultural independence. Collaborative efforts between the government, private sector, and companies can enhance smallholder farmers' access to innovations for on-farm application (Sutherland et al., 2017).

Assessment of Complexity

Complexity refers to the difficulty level farmers encounter in understanding and implementing an innovation. The decision to adopt innovations depends largely on their perceived complexity. If an innovation is perceived as complicated, farmers may hesitate to adopt it, and vice versa. In this study, complexity is assessed based on the intricacy of caring for Pameling avocado. The evaluation reveals a very low complexity level, scoring 4 or 26%. This suggests that farmers find the Pameling avocado innovation easy to comprehend and apply. This perception is supported by farmers' understanding and application of Pameling avocado innovations, cultivation complexity, and marketing, all falling into the very low category. A low complexity level enhances the likelihood of farmers accepting an innovation (Doole et al., 2019). Farmers attribute the ease of understanding and application of Pameling avocado innovation to their existing experience in horticultural agriculture and the supportive assistance from the company. Consequently, farmers find it convenient to implement the Pameling avocado innovation on their land. Consistent with Soekartawi (1988), innovations with lower complexity levels are adopted more swiftly by farmers. The complexity level plays a crucial role in encouraging farmers to accept and adopt innovations (Vecchio et al., 2020).

Assessment of Triability

Triability denotes the ease with which farmers can experiment with or apply a new innovation independently. This accessibility allows potential adopters to assess new innovations or technologies without external involvement. The degree of ease in experimentation can be gauged based on indicators such as the simplicity of trialing Pameling avocado on farmers' land and its applicability by both experienced and novice farmers. The ease of trialing the Pameling Avocado innovation is classified as very high, scoring 9.65 or 96.5%. This assessment is supported by indicators indicating its straightforward implementation on farmers' land and its suitability for cultivation by farmers of varying experience levels. According to farmers' accounts, the Pameling avocado innovation is uncomplicated to integrate into their land and is manageable for both seasoned and novice farmers. Farmers' adoption of an innovation hinges on its ease and the benefits it offers (de Janvry & Sadoulet, 2020). The convenience facilitated by PT Pameling Agro Nusantara (PAMOR) in providing inputs and assistance empowers farmers to overcome obstacles encountered when experimenting with the Pameling avocado innovation. Therefore, the ease of experimentation is a crucial factor for farmers when adopting the Pameling avocado innovation on their land. This aligns with Soekartawi's (1988) assertion that the easier the adoption process of new technology or innovation, the more swiftly farmers will adopt innovations.

Assessment of Observability

Observability refers to the degree to which farmers directly perceive an innovation. When an innovation yields positive outcomes, there is a likelihood of its adoption by farmers. The level of observability in this investigation is assessed through indicators such as increased yields and the effectiveness of Pameling Avocado in addressing farmers' challenges. The observability level of the Pameling avocado innovation falls within the very high category, scoring 9.8 or 98%. This result is reinforced by the indicator with the highest

score, indicating that the Pamelng avocado innovation effectively addresses issues faced by Tukur farmers, scoring 4.9 or 98.5%. This illustrates that through the adoption of the Pamelng avocado innovation, farmers perceive it as a solution to their challenges. One such challenge is the fluctuation in horticultural commodity prices during harvest seasons, which can lead to financial losses for farmers if costs exceed revenues. However, with the benefits offered by adopting Pamelng avocado, farmers find it more lucrative due to consistent market availability and fixed commodity prices, enabling them to cover operational expenses. Furthermore, farmers in Tukur conduct direct observations with their reference groups to gain insights into the entire process of Pamelng avocado cultivation, from upstream to downstream activities. When farmers witness firsthand the ease of implementation and financial advantages of innovations on their land, it influences their intention to adopt innovations (Caffaro et al., 2020). Therefore, by directly observing these innovations, farmers can make informed decisions regarding their adoption, particularly concerning Pamelng avocado.

CONCLUSION

Based on the study outcomes concerning farmers' perceptions of adopting Pamelng avocado innovations in Tukur, Pasuruan, it is evident that farmers perceive the characteristics of the innovations very positively. Relative advantages and ease of observation scored 98%, ease of trial reached 96.5%, and suitability was at 94.5%. Conversely, the complexity indicator was notably low, at 26%. These results indicate a favorable perception among Tukur farmers towards the Pamelng avocado innovation in their region, suggesting its efficacy in addressing farmers' challenges and enhancing their socio-economic conditions.

Recommendations stemming from this study suggest that the company should enhance information dissemination channels, particularly through electronic media platforms like WhatsApp groups and other online forums for discussions between the company, farmers, and relevant stakeholders. Moreover, leveraging online platforms such as websites, YouTube, and Instagram can augment farmers' access to Pamelng Avocado-related information, potentially fostering partnerships with farmers beyond Tukur. Given the positive farmer perception of the Pamelng avocado innovation, government and private sector support can further empower companies and breeders by providing assistance aimed at enhancing productivity. This assistance may include technology transfer initiatives spanning from harvesting to post-harvest activities, ultimately bolstering the competitiveness of Pamelng avocado commodities in the international market.

ACKNOWLEDGMENT

The author expresses gratitude to PT Pamelng Agro Nusantara (PAMOR) for their valuable assistance and support throughout this study.

REFERENCES

- Badan Pusat Statistik. (2019). STATISTIK Perkembangan Ekspor dan Impor Indonesia November 2019. In *Ekspor, impor* (Issue 71). <https://www.bps.go.id/pressrelease/2022/09/15/1925/ekspor-agustus-2022-mencapai-us-27-91-miliar--naik-9-17-persen-dibanding-juli-2022-dan-impor-agustus-2022-senilai-us-22-15-miliar--naik-3-77-persen-dibanding-juli-2022.html>
- Caffaro, F., Micheletti Cremasco, M., Roccato, M., & Cavallo, E. (2020). Drivers of farmers' intention to adopt technological innovations in Italy: The role of information sources, perceived usefulness, and perceived ease of use. *Journal of Rural Studies*, 76(April), 264–271. <https://doi.org/10.1016/j.jrurstud.2020.04.028>
- Cheung, M. L., Chau, K. Y., Sum Lam, M. H., Tse, G., Ho, K. Y., Flint, S. W., Broom, D. R., Tso, E. K. H., & Lee, K. Y. (2019). Examining consumers' adoption of wearable healthcare technology: The role of health attributes. *International Journal of Environmental Research and Public Health*, 16(13). <https://doi.org/10.3390/ijerph16132257>
- Cofré-Bravo, G., Klerkx, L., & Engler, A. (2019). Combinations of bonding, bridging, and linking social capital for farm innovation: How farmers configure different support networks. *Journal of Rural Studies*, 69(May), 53–64. <https://doi.org/10.1016/j.jrurstud.2019.04.004>
- de Janvry, A., & Sadoulet, E. (2020). Using agriculture for development: Supply- and demand-side approaches. *World Development*, 133. <https://doi.org/10.1016/j.worlddev.2020.105003>

- Doole, G. J., Kaine, G., & Dorner, Z. (2019). The optimal diffusion of mitigation options for environmental management. *Australian Journal of Agricultural and Resource Economics*, 63(2), 354–382. <https://doi.org/10.1111/1467-8489.12291>
- Endalew, B., Elias, A., & Yasunobu, K. (2024). Impact of cluster farming on smallholder farmers teff commercialization in Ethiopia. *CABI Agriculture and Bioscience*, 5(1), 1–12. <https://doi.org/10.1186/s43170-024-00220-7>
- Harmanto, M. N., Rumiyati, A. T., & Yahya, K. (2016). Analisis Pengelompokan Mengenai Perubahan Struktur Kependudukan Dalam Menghadapi Era Bonus Demografi di Kabupaten/Kota Provinsi Jawa Timur. *Jurnal Sains Dan Seni ITS*, 5(2), 486–491. http://ejournal.its.ac.id/index.php/sains_seni/article/view/17628/3092
- Joni, N., Asmawi, A., & Arif, E. (2019). Strategi Komunikasi Program Tanam Jajar Legowo Kepada Masyarakat Petani Padi. *Jurnal Antropologi: Isu-Isu Sosial Budaya*, 21(1), 39. <https://doi.org/10.25077/jantro.v21.n1.p39-47.2019>
- Kaine, G., & Wright, V. (2022). Relative advantage and complexity: Predicting the rate of adoption of agricultural innovations. *Frontiers in Agronomy*, 4(September), 1–17. <https://doi.org/10.3389/fagro.2022.967605>
- Kuehne, G., Llewellyn, R., Pannell, D. J., Wilkinson, R., Dolling, P., Ouzman, J., & Ewing, M. (2017). Predicting farmer uptake of new agricultural practices: A tool for research, extension and policy. *Agricultural Systems*, 156(June), 115–125. <https://doi.org/10.1016/j.agsy.2017.06.007>
- Noviyanti, S., Kusmiyati, K., & Sulistyowati, D. (2020). Adopsi Inovasi Penggunaan Varietas Unggul Baru Padi Sawah (*Oryza Sativa* L.) di Kecamatan Cilaku Kabupaten Cianjur Provinsi Jawa Barat. *Jurnal Inovasi Penelitian*, 1(4), 771–782. <https://doi.org/10.47492/jip.v1i4.144>
- Rogers, E. M. (1983). *Diffusion of Innovations* (3rd ed.). New York Free Press. <http://digilib.ub.ac.id/opac/detail-opac?id=40186>
- Rogers, & Shoemaker. (1971). *Communication of Innovation: A Cross-Cultural Approach*. Free Press.
- Santosa, E. P., Firdaus, M., & Novianti, T. (2018). Daya Saing Komoditas Hortikultura Negara Berkembang Dan Negara Maju Di Pasar Internasional. *Jurnal Ekonomi Dan Kebijakan Pembangunan*, 5(2), 68–86. <https://doi.org/10.29244/jekp.5.2.68-86>
- Setiyowati, T., Fatchiya, A., & Amanah, S. (2022). Pengaruh Karakteristik Petani terhadap Pengetahuan Inovasi Budidaya Cengkeh di Kabupaten Halmahera Timur. *Jurnal Penyuluhan*, 18(02), 208–218. <https://doi.org/10.25015/18202239038>
- Sholikah, E. (2018). Faktor-Faktor yang Mempengaruhi Adopsi Inovasi Pertanian Organik (Studi Kasus Petani Bawang Merah Pelaksana Program Kawasan Pertanian Organik di Desa Torongrejo Kecamatan Junrejo Kota Batu). In *Universitas Brawijaya*. Universitas Brawijaya.
- Soekartawi. (1988). *Prinsip Dasar Komunikasi Pertanian*. UI Press. <http://digilib.ub.ac.id/opac/detail-opac?id=21250>
- Sutherland, L. A., Madureira, L., Dirimanova, V., Bogusz, M., Kania, J., Vinohradnik, K., Creaney, R., Duckett, D., Koehnen, T., & Knierim, A. (2017). New knowledge networks of small-scale farmers in Europe's periphery. *Land Use Policy*, 63, 428–439. <https://doi.org/10.1016/j.landusepol.2017.01.028>
- Ullah, A., Arshad, M., Kächele, H., Khan, A., Mahmood, N., & Müller, K. (2020). Information asymmetry, input markets, adoption of innovations and agricultural land use in Khyber Pakhtunkhwa, Pakistan. *Land Use Policy*, 90(August 2018), 104261. <https://doi.org/10.1016/j.landusepol.2019.104261>
- Vecchio, Y., Agnusdei, G. P., Miglietta, P. P., & Capitano, F. (2020). Adoption of precision farming tools: The case of Italian farmers. *International Journal of Environmental Research and Public Health*, 17(3). <https://doi.org/10.3390/ijerph17030869>
- Windani, M., Ismiasih, & Yusuf, I. F. (2022). Respon Dan Tingkat Adopsi Petani Terhadap Program Corporate Farming Di Desa Trimulyo Kabupaten Bantul, DIY. *Jurnal Agribisains*, 8(1), 20–31. <https://doi.org/10.30997/jagi.v8i1.5417>