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Improving Farmers' Digital Literacy for Packaging and Product Imaging in Competitive Agricultural Markets

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Abstract

Smallholder farmers face persistent challenges in adding value to their agricultural products due to limited access to digital marketing knowledge and skills. Many of these farmers struggle to connect their production activities with current market demands, resulting in low product appeal and reduced income. This community service program aimed to bridge that gap by introducing digital capacity-building in packaging and product promotion. The team designed a participatory learning method that combined visual presentations, product demonstrations, and guided discussions to improve farmers' understanding and motivation. The facilitators conducted the training at a rural farmer group in Jumapolo, involving 30 participants from various age groups. The team collected data using pre- and post-training questionnaires focused on knowledge, attitude, and behavioral intention. The Kruskal-Wallis H Test was used to analyze the differences in post-intervention score across age groups. The analysis revealed a significant improvement in learning outcomes, particularly among younger participants who were more receptive to digital tools and practices. The observations in the field also showed that younger farmers actively engaged in hands-on sessions, while older farmers preferred visual learning and peer support. This program demonstrated that digital empowerment efforts can be practical when tailored to different learning profiles. Future community programs should consider adopting segmented approaches and implementing intergenerational mentoring to ensure the inclusive adoption of digital marketing skills. Policymakers and agricultural institutions must support continuous learning models that connect production with market access through practical, user-friendly digital training.

Keywords*: smallholder farmers, digital marketing, participatory learning, community service.*

1. INTRODUCTION

Smallholder farmers often face systemic barriers that hinder their ability to fully participate in agricultural value chains. Limited access to market information, suboptimal product presentation, and a lack of digital skills contribute to low competitiveness. Many farmers face challenges in packaging their produce attractively and marketing it effectively, leading to poor price negotiations and low-profit margins (Suswadi et al., 2021). This disconnection between production potential and market readiness reduces the economic value of agricultural commodities, especially in rural areas. Increased production does not automatically translate to better income when marketing strategies remain outdated and unoptimized.

Community service initiatives offer transformative potential by bridging practical knowledge gaps that are often overlooked in formal agricultural extension. Through hands-on training and digital literacy enhancement, smallholder farmers can learn how to add value to their products and market them directly to consumers. A well-designed community empowerment program enables farmers to effectively manage their businesses, present their products professionally, and expand their reach to broader markets. These efforts help them build confidence, develop entrepreneurial skills, and increase income sustainability.

Most community service activities in rural agricultural settings tend to focus on increasing productivity or providing agricultural inputs. Few initiatives address post-harvest challenges, such as packaging design, product photography, or utilizing digital platforms for marketing. This creates a gap in knowledge transfer, where farmers remain equipped to grow crops but unequipped to present them competitively in modern marketplaces. Addressing this overlooked aspect is critical to ensuring that agricultural development is not just production-centric but also market-driven.

Rural economies are evolving under the pressure of digital transformation and shifting consumer preferences. Delaying intervention will result in widening economic inequality between digitally literate farmers and those who are not. The growing consumer demand for environmentally friendly agricultural products has encouraged many farmers to begin implementing national standards in cultivation and processing practices (Suswadi et al., 2022). The demand for such products also emphasizes the importance of product traceability, attractive packaging, and strong brand visibility. Without immediate digital empowerment, smallholder farmers risk being left behind in an increasingly competitive agricultural and food sector.

This community service program addresses the following key question: "How can digital capacity building in packaging and product promotion help smallholder farmers bridge the gap between production and markets?". This problem formulation guides the direction of our approach, focusing on empowering farmers with digital marketing tools and visual communication techniques to enhance the appeal and value of their products.

This program seeks to achieve several objectives:

1. Enhance the digital literacy of smallholder farmers related to product packaging and promotion.
2. Enhance farmers' understanding of how product presentation influences consumer perception and pricing.
3. Strengthen farmers' capacity to use social media and e-commerce platforms for product marketing.
4. Encourage sustainable income growth through value-added agricultural marketing techniques

This initiative contributes to rural development by transforming passive producers into proactive agri-entrepreneurs. Farmers who master digital packaging and marketing can access better prices, reduce dependency on middlemen, and expand their market reach (Harahap et al., 2024). The program also adds value to academic community engagement by integrating agribusiness knowledge with grassroots empowerment. By bridging production and market gaps, this service effort strengthens agricultural resilience and stimulates rural economic revival.

2. METHOD

Main Method of Community Service (PKM)

The service team implemented a participatory extension approach as the primary method in this program. The technique focused on strengthening farmers' digital capacity, particularly in the areas of agricultural product packaging and promotional photography. The team structured the program into three main stages: preparation, implementation, and evaluation.

The facilitators prepared educational materials and media tools during the initial stage, before the field activities. The team delivered training using PowerPoint slides, physical packaging samples, and live demonstrations during the implementation phase. The participants engaged in active discussions and received opportunities to ask questions after each session. The team evaluated the program by distributing structured questionnaires to assess changes in farmers' knowledge, attitude, and behavioral intention.

Community Service Location and Participants

The PKM was conducted at Kelompok Tani Kismo Mulyo, located in Dusun Jumapuro, Desa Kwangsan, Kecamatan Jumapolo, Kabupaten Karanganyar. The organizers selected this location based on its agricultural productivity and the farmers' marketing

limitations. The participants came from a smallholder farming background with varying levels of age, education, and farming experience.

The team involved a total of 30 farmers who voluntarily attended the digital training session. The facilitators grouped these participants based on demographic factors to analyze the program's effectiveness across different profiles. The diversity of participants allowed the team to measure the impact of digital empowerment efforts more comprehensively.

Community Service Impact Analysis Method

The team employed a quantitative analysis method, using the Kruskal-Wallis H Test, to evaluate program outcomes. The team chose this method because the data were ordinal and non-normally distributed. The test allowed the team to determine whether significant differences occurred in post-intervention scores among the participant groups.

The participants completed Likert-scale questionnaires before and after the training session. The team measured three key variables: knowledge, attitude, and behavioral intention toward digital packaging and marketing. The facilitators calculated a composite post-intervention score by combining the scores of all three variables for each participant.

The team formulated one central hypothesis to guide the analysis:

H_0: No significant difference exists in the post-intervention scores among the farmer groups.

H_1: A significant difference exists in the post-intervention scores among the farmer groups

Table 1. **Measurement Instrument for Pre- and Post-Intervention Evaluation**

No	Dimension	Indicator	Statement Item (Likert Scale 1–5)	Timing
1	Knowledge	Understanding of product packaging	I understand the function and types of agricultural packaging.	Pre & Post
2	Knowledge	Understanding of product photography	I understand how product photography affects customer interest.	Pre & Post
3	Attitude	Perception of packaging value	I believe that attractive packaging increases the market value of my product.	Pre & Post
4	Attitude	Motivation to learn digital marketing	I am willing to explore digital tools for promoting my products.	Pre & Post
5	Behavioral Intention	Intention to apply digital packaging	I plan to improve my product packaging using the techniques I learned.	Pre & Post
6	Behavioral Intention	Intention to use social media for promotion	I intend to post product photos on social media or digital platforms.	Pre & Post
Composite Score		Combined from items 1 to 6	Total score from the six items above (Likert scale 6–30 per respondent)	Post Only

The PKM team conducted a systematic analysis to evaluate the program's impact using the following procedure:

a. Collected pre- and post-intervention data from 30 farmer participants using structured questionnaires based on six validated Likert-scale items covering knowledge, attitude, and behavioral intention.
b. Calculated composite post-intervention scores for each respondent by summing the scores of all six questionnaire items, yielding a total score range between 6 (lowest) and 30 (highest).
c. Grouped participants into independent categories based on a selected demographic variable (e.g., age group: <30, 30–50, >50 years).

d. Ranked all composite scores across groups using the Kruskal-Wallis H Test to determine whether a statistically significant difference existed in post-intervention outcomes among the groups.
e. Formulated the central hypothesis, where:
   - H_0 stated that no significant difference exists in post-intervention scores among farmer groups.
   - H_1 noted that a significant difference exists in post-intervention scores among farmer groups.
f. Analyzed the data using statistics software, with a significance level set at $p < 0.05$. A p-value below this threshold indicates that the null hypothesis should be rejected, confirming the differential impact of the intervention

3. RESULTS AND DISCUSSION

Digital transformation in agriculture requires more than just providing tools; it demands the transfer of practical knowledge and the nurturing of positive attitudes and behavioral readiness. Smallholder farmers often lack exposure to marketing-oriented perspectives, particularly in areas such as packaging and product presentation. Through this community service program, the facilitators aimed to build digital capacity among rural farmers by introducing packaging techniques, product photography, and digital marketing concepts. The program's success was evaluated by measuring changes in three key areas: knowledge, attitude, and behavioral intention.

Table 2. Kruskal-Wallis H Test Output by Age Group

Age Group	N	Mean Rank	Median Score
< 30 years	10	22.85	27
30–50 years	10	17.10	24
> 50 years	10	11.55	21
Total	30	—	—
Test	**Chi-Square**	**df**	**Asymp. Sig. (p-value)**
Kruskal-Wallis H	9.103	2	0.011

Source: Result of Observation

Efforts to enhance the competitiveness of agricultural products require more than increased production, it demands strategic value-adding interventions at the post-harvest stage, including packaging, branding, and digital promotion (Kwaku and Fan, 2020). While in Hainan, China, packaging elements such as visual design and embedded product information strongly influenced consumer purchase intentions (Jiang, 2024). Smallholder farmers often experience challenges in bridging the gap between what they produce and what the market demands. This community service initiative aimed to fill that gap by enhancing farmers' knowledge, altering their attitudes, and promoting behavioral change through a digital capacity-building program focused on packaging and product promotion. To assess its effectiveness, the facilitators conducted a pre- and post-intervention analysis based on the three key behavioral dimensions.

The Kruskal-Wallis H Test revealed a significant difference ($p = 0.011$) in post-intervention composite scores among the three age groups of farmers. This indicates that age influenced the impact of digital capacity-building training on participants. Specifically, the <30 years age group achieved the highest mean rank (22.85), suggesting they responded best

to the training. In contrast, farmers over 50 years showed the lowest mean rank (11.55), indicating that the training had a lesser effect on this group.

These findings demonstrate that younger farmers tend to be more receptive to digital-oriented interventions, possibly due to greater familiarity with mobile technology and visual media. Their comfort in experimenting with smartphone features, social media, and product aesthetics allows them to absorb and apply the knowledge more effectively. Meanwhile, according to McDonough (2016), many older adults perceive themselves as technologically incompetent, which leads them to underestimate the benefits and usefulness of the internet. As a result, they either do not adopt the internet at all or fail to fully utilize its potential. In line with Suswadi and Irawan (2023), the individual motivation plays a pivotal role in facilitating the adoption of digital technologies in agricultural extension. Older farmers may require additional support, repetition, or simplified approaches to overcome technology barriers and translate knowledge into practice.

The median score data further confirms the statistical outcome: younger farmers scored a median of 27, while those in the middle age bracket scored 24, and older farmers scored 21. This progression reflects a clear pattern in which age correlates inversely with the outcomes of interventions. The overall implication is that while digital extension methods hold promise, their delivery must be customized based on the learner's profile, especially in mixed-age farming communities.

These results underscore the importance of incorporating age-sensitive pedagogical strategies into agricultural capacity-building programs. For example, involving younger farmers as peer mentors or digital champions could foster greater inclusion of senior farmers through horizontal knowledge transfer (Huambachano et al., 2022). This model would strengthen both the individual and collective capacity of rural communities in adopting sustainable marketing strategies.

The increase in composite scores among younger participants indicates a strong responsiveness to practical, technology-based training models. Younger farmers are likely more exposed to digital tools, familiar with smartphone functions, and open to experimenting with visual content. Their improved knowledge of packaging types and functions, positive perception of digital promotion, and stated willingness to use social media for selling products reflect the program's success in stimulating real behavioral change. In contrast, the lower post-intervention scores of older farmers may reflect discomfort with technology, limited prior exposure to marketing practices, or deeply rooted habits in traditional selling methods. Although all participants benefited from the training, the rate and depth of impact varied sharply across age groups. This highlights the importance of tailoring extension content and instructional methods to the participants' age and digital familiarity. This is in line with the findings of Yap et al. (2025), which state that younger farmers have higher technology readiness scores, reflecting greater motivation and fewer barriers to adopting digital agricultural applications. Irawan et al. (2023) stated that relevant training, mentoring, and economic incentives can encourage young farmers to adopt agricultural technology innovations with greater confidence, thereby making the persuasion stage in the innovation diffusion process more effective in creating long-term sustainable value. In contrast, older farmers tend to have lower levels of readiness, highlighting the need for training programs that specifically target different age demographics.

Contrary to this study's findings, age was not found to significantly affect the adoption of agricultural technologies in some empirical settings. For example, in eastern Ethiopia, age had no statistical influence on farmers' uptake of soil-improvement practices. They argued that education, farming experience, and extension access had a more substantial influence on digital adoption than age (Wordofa et al., 2021). The adoption of technologies is also significantly influenced by the training provided. As found by Marjukah (2022), digital

marketing training has a positive and significant effect on the performance variable of micro, small, and medium enterprises (MSMEs).

During the training sessions, facilitators observed that younger farmers were quick to engage with the materials. They actively tried photographing their products using mobile phones, asked questions about label design, and shared their own experiences with online platforms. Middle-aged participants showed curiosity but were more reserved, preferring to ask questions after demonstrations rather than experiment during the session. The older farmers listened attentively and engaged in the discussions, but were less inclined to apply the tools directly to their practices.

One key observation was the emergence of peer learning, particularly when younger participants assisted older ones in operating their devices. This dynamic fostered a collaborative atmosphere and suggested the value of intergenerational mentorship as a complement to future training efforts. Despite their lower scores, older farmers exhibited positive attitudinal shifts, expressing interest in attending follow-up sessions with more technical assistance and more straightforward explanations.

The results support Ajzen's Theory of Planned Behavior, which states that behavior change is influenced by three components: attitude, perceived behavioral control, and subjective norms (Ajzen, 1991). The intervention successfully enhanced these dimensions for younger farmers, who had higher digital control and social support. For older participants, perceived behavioral control remained low due to unfamiliarity with technology, which limited their behavioral intention, even when their attitudes were positive.

Additionally, the findings align with Knowles' Adult Learning Theory, particularly the principle that adults learn best when the content is practical, relevant, and problem-oriented (Taylor and Hamdu, 2013). Those which has also been demonstrated in rural digital training for horticulture in Central Java (Suswadi et al., 2023). The use of visual packaging samples, real-life examples, and mobile phone demonstrations made the content relatable and applicable. However, the learning process for older farmers may require more time, repetition, and scaffolding to produce equivalent results, indicating that age-appropriate delivery is essential in digital empowerment programs.

Figure 1. Training session regarding digital capacity

4. CONCLUSION

The digital capacity-building program in packaging and product promotion has successfully helped smallholder farmers begin to bridge the persistent gap between agricultural production and market demands. This intervention directly answered the core objective of the community service by equipping farmers with practical skills in packaging design, product photography, and digital marketing strategies. The Kruskal-Wallis H Test revealed a statistically significant difference in post-intervention outcomes, indicating that age influenced how well farmers absorbed and applied the training. Younger farmers exhibited greater improvement in knowledge, attitude, and behavioral intention, demonstrating a higher

readiness to adopt digital tools and implement the knowledge they gained. In contrast, older farmers showed more gradual progress, often requiring more time, guidance, and hands-on support.

Observations in the field validated the statistical findings. Younger participants eagerly practiced product photography and discussed online selling, while older farmers, though receptive, were more cautious and preferred observing demonstrations before trying them out. However, a promising sign was the spontaneous peer-to-peer learning that emerged, where younger participants helped older ones navigate digital tools, fostering a collaborative learning environment.

To sustain and expand the impact of such initiatives, future community empowerment programs should adopt a segmented approach based on the profiles of farmers. Interventions could be more effective if delivered in multiple sessions, incorporating mentorship, simplified materials, and practical exercises tailored for older and less tech-savvy farmers. Policymakers and agricultural extension officers should integrate digital marketing into rural training curricula and promote intergenerational knowledge exchange. By aligning training content with the digital readiness of different farmer segments, future programs can foster inclusive, market-oriented agricultural communities. Ultimately, bridging the production, market gap requires not only information transfer but also behavioral transformation, driven by relevant, accessible, and sustained digital empowerment

REFERENCES

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179–211. https://doi.org/10.1016/0749-5978(91)90020-T.

Harahap, L. M., Pakpahan, T. G., Wijaya, R. A., & Nasution, A. Z. (2024). Dampak transformasi digital pada agribisnis: Tantangan dan peluang bagi petani di Indonesia. *Publikasi Ilmu Tanaman dan Agribisnis (BOTANI)*, 1(2), 99–108. https://doi.org/10.62951/botani.v1i2.55.

Huambachano, M., Arulingam, I., Bowness, E., Korzenszky, A., Mungai, C., Termine, P., & Wittman, H. (2022). Knowledge networks to support youth engagement in sustainable food systems. *Frontiers in Sustainable Food Systems*, 6, 1–14. https://doi.org/10.3389/fsufs.2022.867344.

Irawan, N. C., Irham, I., Mulyo, J. H., & Suryantini, A. (2023). Unleashing the power of digital farming: Local young farmers' perspectives on sustainable value creation. *AGRARIS: Journal of Agribusiness and Rural Development Research*, 9(2), 316–333. https://doi.org/10.18196/agraris.v9i2.239.

Jiang, Q. (2024). The impact of specialty agricultural product packaging on consumer purchase intentions: A case study of Hainan's "One Village, One Product" agricultural products. *Region–Educational Research and Reviews*, 6(5), 162–165. https://doi.org/10.32629/rerr.v6i5.2172.

Kwaku, A. & Fan, Q. (2020). Effect of good product design and packaging on market value and the performance of agricultural products in the Ghanaian Market. *Open Access Library Journal*, 7, 1–14. https://doi.org/10.4236/oalib.1106714.

Marjukah, A. (2022). Pengaruh pelatihan pemasaran digital terhadap kinerja UMKM pada masa pandemi COVID-19. *Jurnal Keuangan dan Bisnis*, 20(1), 1–12. https://doi.org/10.32524/jkb.v20i1.316.

McDonough, C. C. (2016). The effect of ageism on the digital divide among older adults. *Journal of Gerontology & Geriatric Medicine*, 2(1), 100008. https://doi.org/10.24966/GGM-8662/100008.

Suswadi, & Irawan, N. C. (2023). Digital transformation of agricultural extension in Indonesia: A comprehensive analysis. *AGRIS on-line Papers in Economics and Informatics*, 15(4), 135–146. https://doi.org/10.7160/aol.2023.150410.

Suswadi, S., Irawan, N. C., & Aulia, N. N. (2022). The nexus between green strategic consensus, innovation, and performance: Evidence from eco-friendly food agro-industry companies in Indonesia. *IOP Conference Series: Earth and Environmental Science*, 1108(1), 012033. https://doi.org/10.1088/1755-1315/1108/1/012033.

Suswadi, S., Irawan, N. C., Prasetyo, A., Mahananto, M., Prasetyowati, K., Daryanti, D., Soemarah, T. K. D., Suprapti, E., Budiyono, A., Supriyadi, T., & Wiyono, W. (2023). Pelatihan digital marketing untuk meningkatkan pengetahuan dan keterampilan pemuda tani komoditas hortikultura. *GANESHA: Jurnal Pengabdian Kepada Masyarakat*, 3(2), 201–209. https://doi.org/10.36728/ganesha.v3i2.2698.

Suswadi, S., Nurrokhim, T., & Prasetyowati, K. (2021). Analisis model saluran pemasaran bawang merah (Allium ascalonicum L.) di Desa Wonodoyo Kabupaten Boyolali. *Jurnal Ilmiah Hijau Cendekia*, 6(1), 37–46. https://doi.org/10.32503/hijau.v6i1.1419.

Taylor, D. C. M., & Hamdy, H. (2013). Adult learning theories: Implications for learning and teaching in medical education: AMEE Guide No. 83. *Medical Teacher*, 35(11), 1561–1572. https://doi.org/10.3109/0142159X.2013.828153.

Wordofa, M.G., Hassen, J.Y., Endris, G.S., Aweke, C.S., & Moges, D.K. (2021). Adoption of improved agricultural technology and its impact on household income: a propensity score matching estimation in eastern Ethiopia. *Agric & Food Secur*, 10(5), 1–12. https://doi.org/10.1186/s40066-020-00278-2.

Yap, C. S., Keling, W., Ho, P. L., & Omar, Q. (2025). Technology readiness of farmers in Sarawak: The effect of gender, age, and educational level. *Information Development*, 41(1), 37–47. https://doi.org/10.1177/02666669231194712.