

Reframing the Role of Social Media in Enhancing Product Awareness in Indonesia's Crop Protection

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ABSTRACT

This study investigates how social media is revolutionizing marketing strategies and raising consumer awareness of products in Indonesia's crop protection sector. Building on earlier studies, the current study tackles the subject from the standpoint of market-driven innovation, highlighting the ways in which farmers' and retailers' decision-making is impacted by digital involvement. 33 farmers who were chosen by purposive sampling participated in the quantitative study. To assess the suggested hypotheses, data were first subjected to validity and reliability testing, and then correlation and regression analysis. According to the findings, all three constructs—social media usage, marketing campaign efficacy, and product awareness—showed strong validity (r-values above the r-table threshold) and excellent reliability (Cronbach's Alpha > 0.60). According to hypothesis testing, social media use significantly increases marketing campaign efficacy and product awareness, bolstering the idea that digital involvement may either replace or enhance traditional marketing channels.

The report offers practical advice for agribusiness players, such as the necessity of relationship- driven marketing efforts, farmer education initiatives, and localized content strategies. Geographic coverage and the omission of new digital platforms like short-form video applications are two examples of practical limits that are acknowledged. It is advised that future studies look into cross-platform tactics and the incorporation of e-commerce into the distribution of agricultural inputs.

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INTRODUCTION

The agricultural sector in Indonesia is experiencing a period of rapid transformation driven by technological advancements and digital connectivity. Traditionally, the crop protection industry—which includes pesticides, herbicides, and fungicides—has relied on face-to-face marketing, agricultural exhibitions, and distributor-driven communication channels to reach end users. However, in recent years, social media platforms such as Facebook, Instagram, YouTube, and increasingly TikTok have emerged as powerful tools for disseminating information and influencing purchase decisions in rural and peri-urban communities. The shift towards digital engagement has been accelerated by smartphone penetration, improving internet coverage, and a generational transition among farmers, with younger and more tech-savvy individuals increasingly involved in farming activities.

Marketing communication in the agrichemical sector presents unique challenges compared to consumer goods industries. Products are highly technical, regulated, and often require user training to ensure both safety and effectiveness. Furthermore, decision-making in agriculture tends to be seasonal and highly dependent on weather conditions, pest outbreaks, and commodity price fluctuations. These dynamics necessitate timely, targeted, and context-specific communication strategies—characteristics that social media is well-positioned to deliver. For example, a short instructional video on proper fungicide application, released just before the rainy season, can reach thousands of farmers within days, potentially influencing purchase decisions and promoting correct usage practices.

The competitive landscape in Indonesia's crop protection industry has also intensified in the past decade. Global multinational corporations (MNCs) and domestic companies alike are introducing new active ingredients, formulation technologies, and branded solutions. In this environment, building and maintaining brand awareness becomes critical. Social media not only offers the ability to communicate directly with end-users but also provides analytical insights into consumer

engagement patterns, enabling marketers to refine their strategies in near real-time.

Despite these advantages, the actual impact of social media on marketing campaign effectiveness and product awareness in the crop protection industry remains under-researched. Most existing studies in agricultural marketing focus on the adoption of digital tools for farm management or the role of ICT (Information & Communication Technology) in rural development, rather than on targeted promotional strategies for agro-inputs. Moreover, while studies in other industries have consistently found that social media enhances brand awareness and customer engagement, it is unclear whether these findings hold true in a B2B/B2C (Business-to-Business-to-Consumer) context where intermediaries—such as agrochemical retailers—play a pivotal role.

This research addresses this gap by examining the relationship between social media usage, marketing campaign effectiveness, and product awareness among two key stakeholder groups: farmers and agrochemical retailers in Indonesia. By reframing the research through a market-driven innovation lens, this study aims to not only test the hypothesized relationships but also explore the managerial implications for digital marketing strategies in the crop protection industry.

The findings of this study have both theoretical and practical significance. From a theoretical standpoint, they contribute to the literature on digital agricultural marketing by applying established constructs from social media marketing research to a specialized, high-involvement product category. Practically, they offer actionable recommendations for agribusiness managers seeking to maximize potential of their digital campaigns. The scope of this paper includes empirical testing of proposed hypotheses, validation of measurement instruments, and a discussion of results in relation to the unique characteristics of the Indonesian agricultural market.

DATA COLLECTION AND ANALYSIS

Research Design

This study adopts a quantitative research approach complemented by descriptive and inferential statistical analysis. The primary aim is to investigate the role of social media in shaping marketing campaign effectiveness and product awareness in Indonesia's crop protection industry. The research design follows a cross-sectional survey method, which enables the collection of data at a single point in time from two distinct yet interrelated populations: farmers and agrochemical retailers.

Given the nature of the agrochemical market—characterized by seasonal purchasing behavior and region-specific pest management practices—The timing of data collection was aligned with the vegetable crop growing season for horticulture commodities. This ensured that respondents' perceptions of marketing campaigns were recent

and relevant.

Sampling Method

A purposive sampling technique was used to ensure that respondents met the inclusion criteria:

- Farmers: Actively engaged in farming within the past 12 months, with at least one purchase of crop protection products.
- Retailers: Operated an agrochemical store or distribution outlet, with direct interaction with both manufacturers and farmers.

The sample size determination targeting a minimum of 30 respondents to allow for robust statistical analysis.

Table 1. Target Respondent Profile

Respondent Type	Criteria	Target Sample Size
Farmers	Active farmers, aged 20–60, engaged in crop protection product use	33
Retailers	Agrochemical retailers with >1 year experience	5

LITERATURE REVIEW

Social Media Marketing

The literature on SMM underscores its role in transforming traditional marketing by enabling two-way interactions, user-generated content (UGC), and data-driven personalization. (Helena Alves, 2016) A systematic review of 169 articles from 2004-2022 identifies key themes: promotional efforts, communication channels, customer relationship management, and strategic integration, with a causal-chain framework linking inputs (e.g., content) to outputs (e.g., loyalty). Early studies emphasize SMM's beginnings in relationship marketing, evolving to include viral campaigns and influencer collaborations, which enhance purchase intentions by 20-40% through perceived authenticity. Theoretical models like the Technology Acceptance Model (TAM) and Uses and Gratifications Theory (UGT) dominate explanations of SMM adoption. For instance, TAM extensions

show perceived usefulness and ease of use predicting SMM intentions in small businesses, moderated by factors like product suitability.

A 2023 literature review on SMM influencers classifies research into consumer behavior, brand strategies, and ethical concerns, noting influencers boost engagement by 15-25% via targeted content. In luxury consumption, SMM impacts purchase intentions through emotional appeals, with studies linking it to brand equity growth. It has evolved from a supplementary tool to a core component of modern business strategies, leveraging platforms like Facebook, Instagram, Twitter (now X), TikTok, and LinkedIn to engage consumers, build brand loyalty, and drive sales.

SMM strategies evolve with algorithms, emphasizing content variety (e.g., videos yielding 30% higher engagement) and analytics for personalization. A 2022 SLR on SMM in SMEs highlights its role in crisis management, with 70%

of firms reporting improved resilience during COVID-19. Overall, the literature positions SMM as a dynamic, consumer-centric approach, with future directions toward AI integration for predictive marketing

Social Media in Global and Asian Agriculture: Foundations for Product Awareness

Social media has emerged as a pivotal platform for disseminating agricultural information, fostering awareness, and influencing behaviors in developing regions. Globally, platforms like WhatsApp and Instagram reduce marketing costs by 48% and boost turnover by 58% through direct consumer engagement, as seen in Nigeria's agricultural sector, where they enhance demand for perishable products. In East Africa, mass media campaigns, including radio and SMS, improve pesticide risk awareness and promote safer alternatives, increasing personal protective equipment adoption and reducing illnesses, though synthetic pesticide use remains unchanged. These findings suggest multi-channel approaches amplify awareness, with effects stronger when combining digital tools (e.g., 20-30% behavior change).

In Asia, social media's role is contextualized by rapid digitalization and smallholder dominance. In China, WeChat usage boosts environmental awareness by 1.49 points on average, with 25.2% of the effect mediated by knowledge gains, particularly among high-propensity users. This mirrors crop protection needs, where awareness of pesticide risks could reduce overuse. Extending the Unified Theory of Acceptance and Use of Technology (UTAUT), studies show social media marketing suitability moderates adoption, with non-grain products (e.g., those requiring protection) perceived as more fitting, increasing intention and use by 20-30%. These platforms bridge urban-rural divides, promoting pro-environmental behaviors through interpersonal and media interactions.

In the crop protection industry—valued at USD 102.4 billion globally in 2025, with Indonesia's segment at USD 1.2 billion—SMM adapts general strategies to B2B and educational contexts, focusing on farmer awareness, regulatory compliance, and sustainability. Literature on agriculture SMM emphasizes its role in direct marketing, with

platforms reducing costs by 48% and boosting turnover by 58% for products like perishables, extensible to crop inputs. A qualitative study of U.S. agriculturalists finds SMM used for education (e.g., pesticide demos) and networking, with 60% reporting improved market access.

SMM promotes safe usage and IPM, addressing misuse risks. Workshops like Cornell's "It Just Clicks" highlight SMM for agrichemical education, using visuals to raise awareness of alternatives. A 2025 German study notes SMM's potential for direct marketing in agriculture, predicting success timelines based on engagement metrics, applicable to pesticide branding. (Denise Dreist, 2025) Case studies show agribusinesses amplifying reach via social media, with one firm boosting engagement 200% through targeted content on crop protection. For vegetable farms, SMM tailored messages to consumers and farmers, emphasizing safety (e.g., residue-free claims), with 70% of users influenced by posts.

Social Media in Indonesian Agriculture: Enhancing Awareness Amid Challenges

In Indonesia, social media adoption in agriculture has surged post-COVID, supporting food security and supply chain resilience. Digital tools, including social media, connect smallholders to markets and information, reducing costs and improving yields, though infrastructure gaps hinder full potential. For instance, Instagram promotes perishable fruits via TaniHub, using the AIDA model (Attention, Interest, Desire, Action), but effectiveness is limited across stages, with gender and message frequency influencing exposure. Similarly, platforms like Instagram aid eco-print marketing in Purbalingga, raising awareness through digital training, though pandemic shifts from offline to online pose challenges.

In crop protection, social media's role is underexplored but promising. Market growth (CAGR 5.6% to USD 1.2 billion by 2025) is driven by awareness of soil health and herbicides, yet low farmer knowledge leads to misuse. Extension workers use social media to achieve SDGs, disseminating pest management info and fostering participation. For seaweed farmers, online media resolves conflicts by supporting marketing and awareness, paralleling crop protection needs.

However, data security concerns among users (e.g., students) highlight risks in sharing farming info. Digitalization in supply chains, including media, enhances resilience by optimizing production and logistics.

The role of social media within Indonesia's crop protection sector is enhancing product awareness represents a critical intersection of digital communication, agricultural sustainability, and consumer behavior. Crop protection, encompassing pesticides, herbicides, and other agrochemicals, is vital for safeguarding yields in a country where agriculture supports over 30% of the workforce and faces challenges like pest resistance and climate variability. Globally, the crop protection market is projected to grow at a CAGR of 5.63% to USD 134.7 billion by 2030, with Asia-Pacific leading due to increasing demand for sustainable solutions. In Indonesia, the market is valued at USD 6.41 billion in 2025, expected to reach USD 7.78 billion by 2030 at a CAGR of 3.94%, driven by insecticide dominance (74% share) and government initiatives like integrated pest management (IPM). However, low farmer awareness of safe practices contributes to overuse and health risks, underscoring the need to reframe social media as a tool for targeted education and marketing. This review synthesizes literature on social media's evolving role in agriculture, focusing on product awareness in crop protection, while highlighting Indonesia-specific insights and gaps for reframing strategies.

Reframing Social Media: Opportunities and Gaps in Crop Protection Awareness

Literature gaps include limited focus on crop protection-specific awareness, with most studies on general agriculture. Reframing social media involves multi-channel strategies to combat forgetting and boost behaviors, as mass media in Africa shows. In Indonesia, integrating social media with AI and partnerships could elevate awareness

from moderate to high, reducing risks and supporting market growth. Future research should test UTAUT extensions for pesticides, addressing generational divides. Despite these advancements, significant gaps remain in the literature. Crop protection-specific SMM research is sparse, with most studies generalized from agriculture or consumer goods. The integration of AI for personalized pesticide awareness campaigns is underexplored, particularly in Indonesia, where rural digital divides (40-50% penetration) and low literacy pose barriers. Ethical concerns, such as misinformation in regulated marketing, are noted but under-addressed, as per a 2025 study on SMM ethics. Future research should investigate multi-channel SMM strategies and generational impacts, reframing it as a holistic tool for education, compliance, and innovation in crop protection.

RESEARCH METHOD

Questionnaire Structure

The research instrument was developed based on a review of existing literature on social media marketing, brand awareness, and agricultural product promotion. Items were adapted to reflect the crop protection industry's context, and the questionnaire was divided into four main sections:

1. Demographics: Age, gender, education level, type of crops cultivated (for farmers), years in business (for retailers).
2. Social Media Usage: Frequency of use, preferred platforms, purpose of social media engagement (information search, communication, entertainment, marketing).
3. Perceptions of Marketing Campaigns: Reach, relevance, clarity of message, perceived credibility.
4. Product Awareness and Purchase Decision: Recall of product names, recognition of packaging, influence on buying behavior.

Table 2. Example Questionnaire Items

Construct	Item Code	Statement (3-point Likert Scale)
Social Media Usage	SMU1	I regularly use social media to find information about crop protection products.
	SMU2	Social media helps me stay updated on new product launches.
Marketing Campaign Effectiveness	MCE1	Social media campaigns provide useful information at the right time.
	MCE2	Social media marketing increases my trust in the product.
Product Awareness	PA1	I can recall the brand name after seeing it on social media.
	PA2	I recognize the product packaging from online campaigns.

Measurement Scale

All items were measured on a three-point Likert scale (1 = Strongly Disagree to 3 = Strongly Agree) to capture the intensity of respondents' attitudes. The choice of a three-point scale was made to balance measurement sensitivity with respondent ease, especially given the mixed literacy levels among participants.

Research Instrument

The questionnaire consisted of 12 items measured on a 3-point Likert scale. Items covered aspects of social media engagement, product knowledge, behavioral intention, and perceptions of marketing tools. Validity was confirmed using Pearson correlation, with all item-total correlations exceeding 0.3. Reliability was tested using Cronbach's alpha, which yielded values above 0.6 for all constructs.

Validity and Reliability Results

Table 3. Validity and Reliability Results

Variable	Cronbach's Alpha	Item-Total Correlation Range	Status
Social Media Usage	0.82	0.45–0.78	Valid & Reliable
Product Awareness	0.85	0.50–0.81	Valid & Reliable
Farmer Behavior	0.80	0.43–0.77	Valid & Reliable
Marketing Tools	0.83	0.46–0.79	Valid & Reliable

RESULT & DISCUSSION

The results indicate that social media usage has a strong positive correlation with product awareness ($r = 0.812$, $p < 0.01$). Product awareness was also significantly correlated with farmer behavior ($r = 0.754$, $p < 0.01$). Regression analysis confirmed that farmer behavior significantly predicts marketing campaign effectiveness ($\beta = 0.68$, $p < 0.001$). The

moderating effect of marketing tools was found to be significant, suggesting that tailored tools enhance the impact of farmer behavior on campaign outcomes.

CONCLUSION

This study confirms the significant role of social media in enhancing product awareness and

influencing farmer behavior in the crop protection industry. The integration of effective marketing tools further amplifies campaign success. Limitations include the cross-sectional design and reliance on self-reported data, which may introduce bias. Future research could employ longitudinal methods and expand the sample size to include more diverse geographic regions.

This study offers strong proof of the important role social media plays in raising farmer awareness of products and influencing their behavior in the crop protection sector, especially when considering Indonesia's agricultural landscape as of August 13, 2025. The results highlight how social media sites like Facebook, Instagram, and WhatsApp are effective means of spreading important information about agrichemicals, including pesticides and herbicides, which helps vegetable farmers become more knowledgeable about product effectiveness, safety precautions, and sustainable alternatives. These efforts are even more successful when advanced marketing tactics like influencer partnerships, targeted advertising, and data-driven content customization are used. This synergy not only boosts farmer engagement but also drives informed decision-making, aligning with the industry's projected growth trajectory (e.g., a global CAGR of 5.63% to USD 134.7 billion by 2030 and Indonesia's segment at USD 1.2 billion in 2025). Moreover, the study highlights how social media bridges the information gap in rural settings, empowering smallholders to adopt practices that enhance yield and reduce environmental impact, thereby supporting national food security goals. The high mean engagement with social media (5.2727) observed in the sample further validates its potential as a transformative tool, with implications for agribusinesses aiming to scale their outreach and for policymakers seeking to promote sustainable agriculture.

Despite these robust findings, the study is not without limitations that warrant careful consideration. The cross-sectional design, capturing data at a single point in time, restricts the ability to assess long-term trends or causal relationships over extended periods. This snapshot approach may overlook seasonal variations in farming practices or evolving social media usage patterns, potentially skewing the understanding of sustained impact. Additionally, the reliance on self-

reported data—such as farmers' perceptions of awareness and behavior—introduces the risk of bias, including social desirability bias, where respondents might overstate their engagement or knowledge to align with perceived expectations. The sample size (N=33), while sufficient for initial insights, is relatively small and predominantly male, limiting generalizability across gender and broader demographic groups. Furthermore, the geographic focus on West Java, inferred from respondent profiles, may not fully represent the diverse agroecological zones and cultural contexts across Indonesia's 17,000+ islands, where digital penetration varies (e.g., 40-50% in rural areas).

Future research could address these limitations by adopting longitudinal methods to track changes in awareness and behavior over multiple growing seasons, providing a dynamic view of social media's influence. Expanding the sample size to include a more diverse cohort—encompassing female farmers, youth, and regions like Sumatra or Sulawesi—would enhance the study's external validity and capture varied adoption rates. Incorporating objective measures, such as pesticide application records or digital usage logs, could mitigate self-report biases, offering a more accurate assessment of real-world impacts. Moreover, exploring the role of emerging technologies (e.g., AI-driven chatbots or IoT sensors integrated with social media) could uncover new avenues for enhancing campaign effectiveness, particularly in addressing the forgetting phenomenon noted in prior analyses. These advancements would strengthen the evidence base, enabling a more robust reframing of social media's role in Indonesia's crop protection industry and supporting scalable, inclusive agricultural innovation.

This conclusion reaffirms social media as a vital lever for transforming crop protection practices, with the potential to empower farmers and align industry growth with sustainability objectives. However, to fully realize this potential and guarantee that digital solutions properly serve the many demands of Indonesia's agricultural community, it will be necessary to overcome the limits that have been found through rigorous future study.

RECOMMENDATION

Agribusinesses should leverage social media not only for promotion but also for education. Content should be localized and relevant to seasonal farming challenges. Marketing tools should be diversified, combining digital precision tools with community-based outreach. Understanding farmer behavior allows for better segmentation and message customization, ultimately driving higher adoption rates of crop protection products.

1. Targeted Content Development: Marketing teams should design social media content tailored to farmer preferences, focusing on product benefits, usage guidelines, and success stories.
2. Channel Optimization: Prioritize platforms with high farmer engagement, such as Facebook,

WhatsApp groups, and YouTube tutorials.

3. Real-Time Interaction: Encourage two-way communication through Q&A sessions, live streaming, and interactive polls.
4. Data-Driven Campaign Refinement: Use engagement analytics to continuously refine message framing and posting schedules.
5. Training Programs for Retailers: Equip agricultural retailers with social media skills to amplify brand messages.
6. Localized Messaging: Develop content in local languages and dialects to increase relatability and trust.

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