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The Process Adoption And Diffusion Of Greenhouse Innovations Melon (*Cucumis Melo L.*) Culvation In Lamongan Regency

Rizqi Ardial Akbar, Kliwon Hidayat, Keppi Sukesi

Department of Sociology, Faculty of Agriculture, Brawijaya University, Lowokwaru, Malang, Indonesia
Correspondence email: k.hidayat@ub.ac.id

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ABSTRACT

Melon cultivation by farmers was initially only to fill empty land during the dry season because it was rain-fed land. After that, farmers continued even though it was not in the dry season because the price was high and stable. However, the results in the rainy season were not optimal, and pests were increasingly uncontrollable. Farmers continued to seek information and solutions until finally greenhouse technology emerged, but farmers needed a process to be able to optimise it. The objectives of this study were (1) to explain the adoption process of farmers in Lamongan Regency in accepting progress in greenhouse-based melon cultivation. (2) To explain the mechanism of greenhouse innovation diffusion in melon farming in Lamongan Regency. This study used a qualitative methodology. Determination of key informants using purposive sampling and for supporting informants using snowball sampling. Data collection techniques included observation, interviews, documentation, and literature reviews. The Miles and Huberman interactive model was used to analyse the data. The results of this study indicate that the adoption process of greenhouse innovation comes from farmers' initiatives to overcome the challenges of plant pests (OPT) and extreme climates. Farmers adopt this innovation optionally, and the majority of farmers continue to adopt it because of the more guaranteed production results. Some expand the scale of the greenhouse and market the results through agrotourism, social media, or cooperation with companies. However, some farmers do not continue due to limited capital and financial risks. The process of innovation diffusion is carried out through communication channels; one of the most effective is interpersonal communication, then through social media such as WhatsApp, Facebook, Instagram, and YouTube. The high initial capital for greenhouses is an obstacle for some farmers, so financial support, such as soft loans or subsidies from the government to increase adoption.

Keywords: *Adoption, Grenhouse, Inovation*

BACKGROUND

Melon cultivation by farmers was initially carried out because they utilised rain-fed land in the dry season to fill the empty land that was usually only planted with rice, corn, soybeans and shallots. Melon was chosen because this plant requires little water, making maximum use of sunlight. The high selling price of melon encourages farmers to continue cultivating it, even outside the dry season, although challenges such as climate change and disease attacks are significant obstacles (Nora et al., 2020).

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Melon plants, as seasonal fruit plants, are very vulnerable to climate change, which increases the risk of disease attacks and requires intensive handling, such as the use of pesticides (insecticides, herbicides, and fungicides).In an effort to overcome this problem, an innovation in greenhouse technology emerged as an effective solution, creating a controlled environment that minimises the impact of extreme weather, pests, and diseases while optimising the use of water and fertilisers (Iswandi et al., 2023). Greenhouses allow the cultivation of various crops throughout the year, increasing the income and sustainability of farming businesses (Nurhidayati et al., 2023).

According to Dwi Cahyani et al., (2024), the greenhouse adoption process can be influenced by several factors, such as socio-economics, education level, expertise, and financial access, as well as deep-rooted agricultural traditions, which can hinder the acceptance of new technologies. Although the greenhouse concept is well known and widely used, adapting greenhouse technology still requires modification and an appropriate level of expertise. This requires an understanding of essential infrastructure, proper cultivation methodology, and effective administration in greenhouse operation. In addition, the availability of knowledge and technical assistance plays an important role in encouraging the implementation of greenhouse progress (Riansyah et al., 2023). Farmers need accurate and available information regarding the benefits, utilisation, and management of greenhouses.

Previous studies have examined more factors in innovation adoption ((Harta et al., 2021; Dwi Cahyani et al., 2024) but studies on the process of adoption and diffusion of greenhouse technology for melon cultivation are still limited. Previous research conducted by (Febryanto, 2020) explained that farmer decision-making and adoption of innovations are on average based on Rogers' top-down innovation adoption theory, which is actually less relevant because it tends to force conditions in the field where there is no role of extension workers or top-down (Rahmah et al., 2019). Meanwhile, this study is interesting to conduct because the process of adoption and diffusion of greenhouse innovation in Lamongan Regency began with the initiative of farmers seeking information until the process of adoption and diffusion of greenhouse innovation, and there was no role of extension workers, so in this case, theoretically, it is less in accordance with what was expressed by Rogers, namely, the process of adoption and diffusion of innovation begins from the central government to farmers.

This study aims to understand the process of adoption and diffusion of greenhouse innovation in melon cultivation in Lamongan, which is driven by farmer initiatives. This study is expected to provide comprehensive insight into the dynamics of agricultural innovation adoption at the local level, as well as being a guide for stakeholders, such as extension workers and the government, to increase farmer productivity and welfare. With a focus on greenhouse technology, this study seeks to support the development of relevant strategies to accelerate innovation adoption, ensure agricultural resilience to climate change, and increase the competitiveness of melon commodities in Lamongan Regency.

RESEARCH METHODS

The research methodology uses a qualitative approach. The qualitative approach in this study was chosen because the focus of this study is to gain a deep understanding of the adoption and diffusion process of greenhouse innovation in melon cultivation in Lamongan Regency. This research

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design uses a case study. The case study design was chosen to clearly describe greenhouse innovation in melon cultivation. The selection of the research location was carried out in Lamongan Regency, namely four sub-districts determined by the purposive method. The basis for the researcher's consideration in choosing the location was in Solokuro, Laren, Brondong, and Paciran Districts because they are locations where greenhouse innovations in melon cultivation are found. The informant determination technique uses two sampling methods, namely the purposive samplinge, which is used to determine the selection of 1 key informant who is a young farmer from Lamongan and a young pioneer of East Java innovation. Snowball sampling is used to obtain supporting informants, namely based on recommendations from key informants, with a total of 5 people who are melon farmers in each sub-district. In addition, when the snowball sampling technique experiences saturation or the key informant cannot recommend the next informant, a new informant can be selected again using purposive sampling based on observations at the location. This study uses in-depth interview, observational, documentation, and literature study data collection techniques. Data analysis uses the Miles Huberman interactive model. Qualitative data obtained by researchers through observation, in-depth interviews, documentation, and literature studies collected will be simplified by researchers to suit the formulation and objectives of the study. Then, the data is presented in the form of narrative text. Furthermore, conclusions and research suggestions are drawn (Sugiyono, 2020).

RESULT AND DISCUSSION

1. The Process of Adopting Greenhouse Innovation for Melon Cultivation in Lamongan Regency

The first greenhouse innovation for melon cultivation in Lamongan Regency based on research results was in Laren District, precisely in Bulubrangsi Village. The farmer who first initiated the greenhouse was Mr NHT, who came from Turi District, Lamongan, meaning he was not a native farmer from Laren District. The greenhouse innovation was developed purely from the thoughts and ideas of farmers to find solutions based on their needs. However, the innovation adoption theory put forward by Rogers in previous research Alkornia, (2018) emphasised that innovations are produced by extension workers or research institutions which will then be applied to farmers, and farmers are only the subjects receiving innovation. This is considered inappropriate because basically farmers choose to adopt the greenhouse technology innovation for melon cultivation not based on institutions or extension workers but from the farmers themselves who seek information.

Before the greenhouse innovation, the majority of farmers planted rice, shallots and corn in the rainy season and peanuts, cassava, melons and cayenne pepper in the dry season. However, in the cultivation of horticultural commodities such as melons and cayenne peppers, farmers experience problems, namely the large number of plant pests (OPT) that attack so that plant production is not optimal and is damaged (Mulyani et al., 2021). This is caused by extreme weather factors that trigger significant pest and disease development. In line with the statement, climate change results in an explosion of pests and diseases that can threaten various types of plants and livestock (Syaiful et al., 2024). The rainy season is shorter, while the longer dry season will cause drought (Putra et al., 2023). The following are the results of an interview with one of the sources, Mr MIK and Mr NHT:

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"Before the greenhouse existed, I had cultivated melons but in open land, but yes, the use of pesticides was very continuous; it could be up to twice a week spraying." (MIK 27/07/2024)

"Previously, only farmers planted rice and corn in the rainy season; during the dry season, they tried plants such as chillies, cucumbers, pumpkins, watermelons and eggplants. But for melons, I had never done it; I just started planting when I had a greenhouse." (NHT 21/07/2024)

The adoption process by farmers is done optionally. This can be seen that farmers who choose to innovate greenhouse-based melon cultivation are personally interested because they see the results directly. This innovation comes from the experience of previous farmers who continue to strive to find solutions to the problems they face. In this case, farmers as innovators are more trusted than other media because innovators have conducted trials before disseminating greenhouse innovations (Widjayanthi & Asdi Mauladani, 2021). Starting from the problem of less productive land (fields and yards), where agricultural yields always decrease, especially in the dry season where there is not much to do and extreme climate conditions, Mr NHT was encouraged to take the initiative to innovate. This is in line with (Harta et al., 2021), which states that problems and needs can stimulate the emergence of research and development activities designed to create innovations for solving problems or meeting needs. At this knowledge stage, farmers begin to realise the importance of innovating. This is in accordance with what Mr NHT expressed in the following interview.

"What I feel is that agriculture everywhere is getting more advanced, but why are agricultural results increasingly less than optimal? There are many pests and unpredictable changes in seasons, such as long dry seasons. That made me look for solutions, such as trying out various plants until I finally saw on YouTube in 2017 and in 2019 made a greenhouse. Until now, many have come to ask questions and learn together, from young to old. For me, it must be very helpful, especially now that it is safer from pests and can be planted at any time and is very safe for the results. (NHT 21/07/2024)

Mr NHT was first interested after seeing it on social media, YouTube, and then looking for information related to training for cultivating melon greenhouses in Purwakarta, which was made by agricultural institutions there, starting from the shape of the building, planting media, the maintenance and harvesting stages, and post-harvest. From this, Mr NHT finally decided to make a greenhouse from bamboo after getting quite complete information and knowledge. Mr NHT immediately decided to cultivate melons in a greenhouse with a very large size, namely 80m x 45m with a population of 1500 plants.

Farmers are making decisions to adopt evenough they are based on various considerations, but decisions are taken optionally or because it is clearly impossible in terms of authority because there is no government role (Chuang et al., 2020). The decision-making process is carried out individually (optional); there is also no collective because the role of farmer groups or organisations does not provide authority for their members to adopt melon greenhouse innovations (Geleta et al., 2023).

Based on the results of in-depth interviews, most farmers decided to adopt greenhouse innovations in melon cultivation. There are also farmers who decided not to adopt greenhouse innovations in melon cultivation because of the large initial capital to build a greenhouse. They do not dare to take the risk of borrowing capital from the bank with a large nominal value. Putra et al., (2023) explained that farmers will not take risks in farming because this concerns the livelihood of

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farmers and their families, and usually this happens to farmers who have limited land or are only sharecroppers.

"For me, it's my own capital, thank God, after saving during college and also a little extra from my parents." (GPY 25/07/2024)

"The capital is from borrowing from the bank, and what makes me sure is just being optimistic that I can succeed even though I have no experience, but for me this is part of the risk and indeed a necessity, yes, Bismillah." (MSD 30/07/2024)

Melon farmers in Lamongan Regency initially chose to implement it on narrow land because they anticipated that if there was a failure, farmers would still have land for other commodities that farmers were experienced in cultivating. In addition, if farmers have initially made a large greenhouse, the capital needed will also be large because the materials and equipment used are quite expensive. Farmers generally use their yards and fields to build greenhouses. Farmers who have succeeded in cultivating melons in greenhouses will expand their greenhouse area. Until now, it has been confirmed that there were two decisions taken by melon farmers who previously adopted greenhouse innovation in melon cultivation; the first was choosing to continue, and the second was choosing not to continue adoption (Tara et al., 2024).

"I chose to continue because I have felt the results for sales. Why? I opened for picking tourism, yes, because the results are better because there are no grade provisions and directly to consumers, not through agents. On the other hand, my goal is also to educate." (GPY 25/07/2024)

"From those who have been here and are serious about making a greenhouse until now it is still running, because there is almost never a loss and it is not a hard job; for sales, they have collaborated with companies through agents so they don't need to think about where to sell it." (MIK 27/07/2024)

"Until now it is still continuing, and they continue to plan to make more buildings because the results can be seen; they have never experienced a loss. It's just that sometimes the results go up and down. I can adjust sales; if I think the results are good, I can send them to the company; if the results are not good, I market them online on social media." (KWA 2/07/2024)

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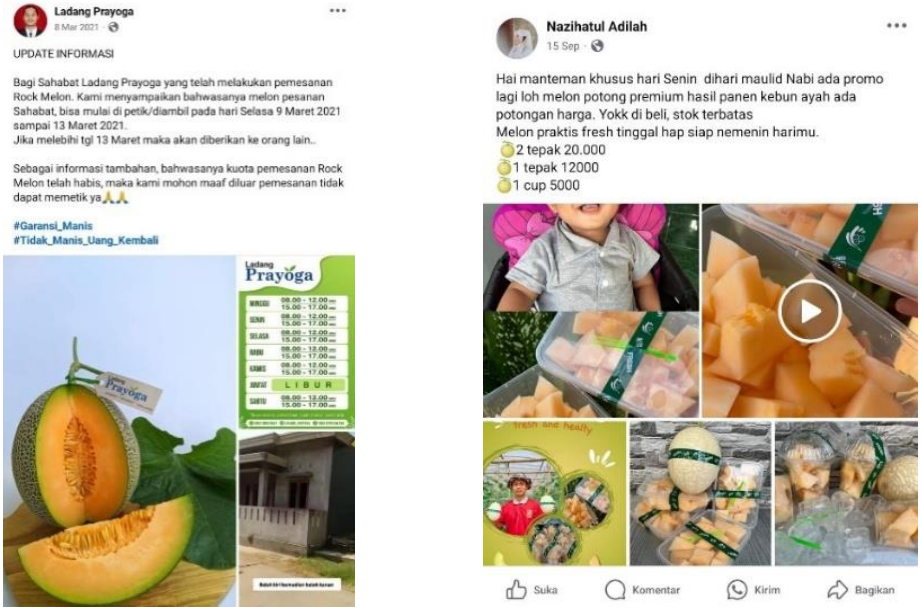

Figure 1. Melon fruit marketing mechanism

Until now, farmers who act as innovators continue to survive and also continue to develop greenhouse technology for melon cultivation to be able to get maximum results; even farmers apply greenhouse innovations on a large scale and wider because farmers already have markets and regular customers in the areas of Surabaya, Semarang and Jakarta. Another innovation that has been developed so far is trying to cut off sales through agents or middlemen so that melons reach consumers directly. This can be seen that there are two types of sales mechanisms, namely the agrotourism system, namely consumers buy melons by selecting and harvesting melons directly in the greenhouse. There are also farmers who choose marketing through social media so that consumers can have a variety of choices.

2. Diffusion Process of Melon Cultivation Greenhouse Innovation in Lamongan Regency

Rogers in (Martina, 2016) put forward the term in the diffusion of innovation, namely decentralisation, where there is a practitioner who discovers change as an innovator in this case, namely the first farmer who innovates the greenhouse, then it is developed and spread to renewal practitioners, namely other farmers who then follow to innovate the greenhouse.In the process of spreading innovation. then it is developed and spread to renewal practitioners, namely other farmers who then follow to innovate the greenhouse (Bambang et al., 2022) .

In the process of spreading innovation, there are four elements that are interrelated, namely innovation, communication channels, time, and social systems. In this case, the innovation introduced is the greenhouse. A greenhouse is a modern agricultural system that aims to reduce dependence on the outside environment. On average, information related to greenhouses is obtained from the mass media, both conventional mass media such as television or social media such as YouTube, Instagram, and Facebook.

"I initially saw it on television, in a news story that made me interested, namely the benefits obtained and the ease of maintenance. On the other hand, I want to contribute directly to agriculture

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and food security. I really regret seeing young people, especially students, who now only take action on the streets but do not want to get involved directly in order to participate as agents of change" (Mr. MIK). 07/27/2024)

"I saw Mr. MIK's and was very tempted because of the results; almost every day I came to observe every process, and I think it's easy, then I think about making it myself." (Mr. AGF, 08/30/2024)

Communication channels play an important role in social change through the diffusion of innovation (Sri Wulandari & Kurniati, 2024). Innovation communication channels consist of interpersonal communication channels and mass media, where mass media is relatively more important at the knowledge stage and interpersonal channels are relatively more significant at the persuasion stage in the innovation decision process. Nowadays, innovation communication channels have increased with the presence of internet channels called hybrid media, which is a combination of the potential offered by mass media and interpersonal communication (Sirajuddin, 2021). Hybrid media can be exemplified as social media because, in addition to being able to function as mass media, it can also be used for interpersonal communication.

"From the beginning of seeing greenhouse innovations until now, I have seen on YouTube farmers from abroad such as Korea and Japan, which then made me continue to learn and look for where in Indonesia there are already." (Mr. GPY 07/25/2024)

"Yes, if there is a problem, I will definitely find out for myself through anything; it can be social media, articles; if I don't find it, then discuss it; there is a group if I am in JATAM (Jamaah Tani Muhammadiya), so I go straight there if I need discussion and help from friends." (Mr. MNA 07/18/2024)

Figure 2. JATAM organization logo

in interpersonal communication and group communication in the process of innovation diffusion, the information conveyed is usually new ideas, practices, and ideas that aim to make social changes and development for society. Mr. NHT, as a pioneer, provides information about the materials needed to make a greenhouse, greenhouse design, and procedures for cultivating melons in a greenhouse clearly and easily understood by farmers.

"It's better to come directly if you really want to ask questions because you can see and observe the greenhouse directly, but maybe it takes the right time so that we can both be satisfied." (Mr. NHT 07/21/2024)

"Yes, it's better to come and meet me directly to ask questions; if it's through social media, I might only respond briefly. If you really want to be serious, just come so it's clear and you understand without misunderstanding." (Mr. GPY 07/25/2024)

Until now, the dissemination of information on greenhouse innovation has been very easy to obtain, especially on social media (Youtube, Facebook, and Instagram) and there are also contacts

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that can be contacted to discuss either online or in person. Of the various communication channels available for the diffusion process that occurs among farmers, according to him, the most effective is interpersonally or coming and meeting face to face because it will be more satisfying in asking and explaining, namely the existence of two-way communication that occurs (Fadeyi et al., 2022).

Figure 3. Diffusion map of melon cultivation greenhouse innovation in Lamongan district

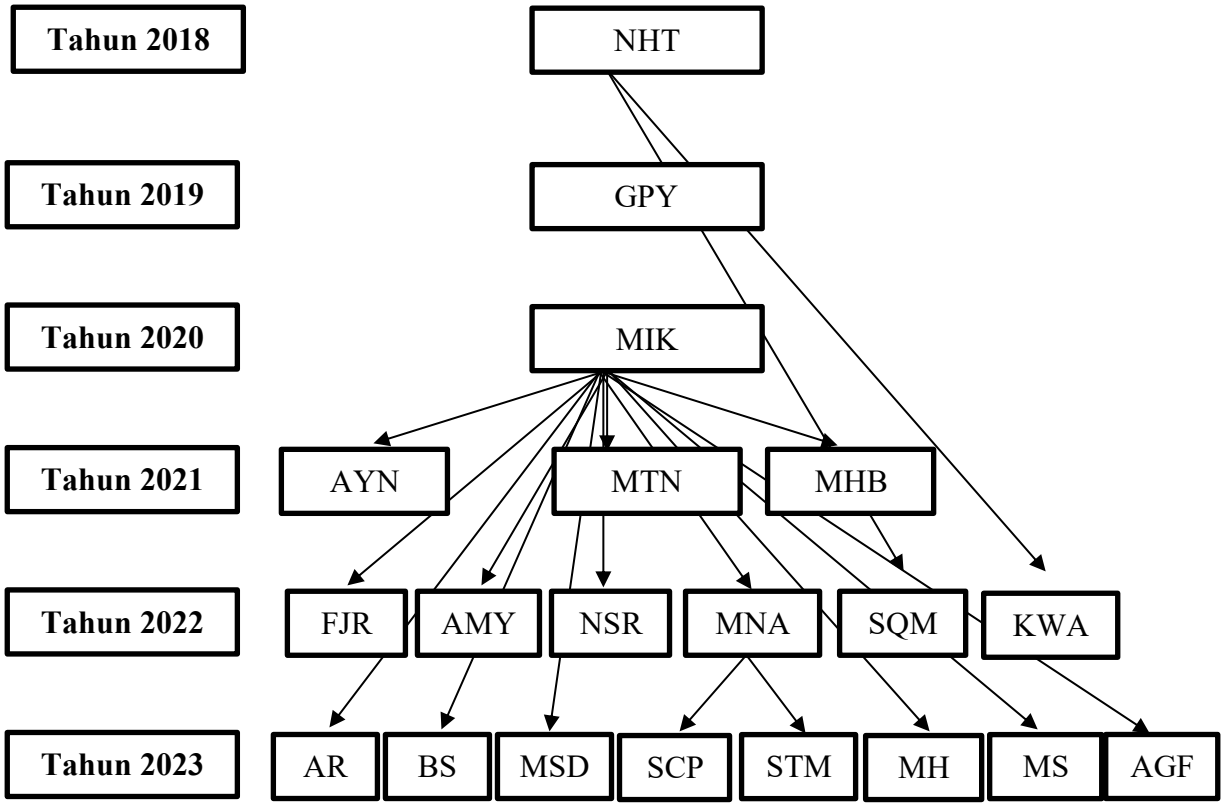

Figure 4. Diffusion process scheme of melon cultivation greenhouse innovation in Lamongan district

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"From some information that I got, some greenhouses are unemployed; maybe in today's terms they are FOMO because they have enough savings and then want to have a greenhouse, but their human resources are not diligent and persistent, plus maybe they are too lazy to learn." (KWA 2/07/2024)

"There is one here that is no longer used now; it has almost collapsed even though it used to be made together with me. What I know is because the person is not serious and is used to getting direct income, while for melons you have to wait 2 to 3 months before you can feel the results." (MNA 18/07/2024)

Based on the results of the study, it can be seen that in the picture above related to the distribution of greenhouses in Lamongan Regency, the number increases every year. However, on the other hand, there are also three greenhouses that are no longer active or not used. This is because farmers feel that the process is long to get maximum results or farmers are not diligent and persistent in managing greenhouse-based melon cultivation. In the end, farmers who let the greenhouse become abandoned decided to change professions; some went abroad, and some ran other businesses with the aim of gaining direct and fast profits.So far, the important role in the efforts of the melon greenhouse innovation diffusion process is someone who has succeeded and continues to consistently provide education to all farmers that greenhouse-based melon cultivation can be an alternative to increase income; on the other hand, the dissemination of information about greenhouse innovations has been very massive, especially through social media. However, there are also obstacles in the efforts of farmers as innovators to spread information about greenhouse-based melon cultivation, namely public trust in success, especially with a faster process. The public generally sees the results and then compares them with other efforts so that the assessment is still not considered successful. This can also affect other farmers who want to adopt and then doubts arise, especially novice farmers who are just starting a business and do not have experience and knowledge in the agricultural sector.

CONCLUSION AND SUGGESTION

Based on the results of the study on the adoption and diffusion process of greenhouse innovation for melon cultivation in Lamongan Regency, it can be concluded that this innovation comes from the independent initiative of farmers, not from institutions or agricultural extension workers, as expressed in Rogers' innovation adoption theory regarding the decentralisation of innovation adoption. Farmers develop greenhouses as a solution to the problems of pest attacks, plant diseases, and climate uncertainty that cause suboptimal harvests. The adoption process is carried out optionally, driven by farmers' direct experience and information from social media such as YouTube, as well as training from agricultural institutions. However, the adoption of this innovation faces obstacles, especially the large initial capital to build a greenhouse, which makes some farmers reluctant to take risks. Successful farmers continue to develop this innovation, even expanding the scale of the greenhouse and creating direct marketing systems such as agritourism and social media to increase profits. In the diffusion process, interpersonal communication and social media become the main channels for disseminating information. Farmers as innovators play an important role in disseminating knowledge through direct discussions and groups such as JATAM. However, challenges arise from the lack of perseverance of some farmers and community expectations for quick

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results, which cause some greenhouses to be abandoned. Nevertheless, the spread of greenhouse innovation continues to grow every year, showing great potential in increasing farmers' income and food security. To increase the success of adoption and diffusion of greenhouse innovation, support is needed from the government and related institutions in the form of subsidies or low-interest capital loans to reduce the financial burden on farmers, especially novice farmers. Agricultural extension needs to be strengthened with intensive training on greenhouse-based melon cultivation techniques, including pest management and marketing. The formation of a more active farmer community, such as JATAM, can be a forum for sharing experiences and solutions to the obstacles faced. In addition, education for the community needs to be improved to change the perception that melon cultivation requires a process that is not instant but promises long-term results. The development of informative and easily accessible social media content can also accelerate the spread of information.

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