

Optimizing Millennial Farmers' Harvest Results by Maximizing Internet of Things Programs in Lamongan Regency

Emmy Hamidah^{1*}, Saifuddin Zuhri², Idum Satia Santi³, Ety Sri Hertini⁴, Yani Prabowo⁵

Universitas Islam Darul Ulum Lamongan Jawa Timur, Indonesia¹ Universitas Islam Darul Ulum Lamongan Jawa Timur, Indonesia², Universitas Islam Darul Ulum Lamongan Jawa Timur, Indonesia³, Universitas Boyolali, Indonesia⁴, Universitas Budi Luhur, Indonesia⁵
emmyhamidah@unisda.ac.id

ABSTRACT

This study is a type of qualitative research with a descriptive approach, namely an approach that describes one by one the main topics in this study. The topics in this study are related to Millennial Farmers, the Internet of Things, and agricultural production results used in this study. The data used in this study are secondary data that researchers obtained indirectly through scientific articles, books, magazines, and other sources used in this study. The data obtained were analyzed by stages of data collection, data selection, data reduction, and drawing conclusions with a more complete explanation in the results and discussion sections. Why is it the choice of millennial farmers? Because millennial farmers are the generation that is most sensitive to and literate in technology. In addition, millennial farmers have a longer term to develop compared to previous generations. In addition, why should it be Lamongan district? Because Lamongan is the largest rice contributor in East Java.

Keywords: Millennial Farmer, Internet of Things, Lamongan Regency

ABSTRAK

Penelitian ini merupakan jenis penelitian kualitatif dengan pendekatan deskriptif yaitu pendekatan yang menjelaskan satu per satu topik utama dalam penelitian ini. Topik-topik dalam penelitian ini terkait dengan Petani Milenial, Internet of Things, dan hasil produksi pertanian yang digunakan dalam penelitian ini. Data yang digunakan dalam penelitian ini adalah data sekunder yang diperoleh peneliti secara tidak langsung melalui artikel ilmiah, buku, majalah, dan sumber lain yang digunakan dalam penelitian ini. Data yang diperoleh dianalisis berdasarkan tahapan pengumpulan data, pemilihan data, reduksi data, dan penarikan kesimpulan dengan penjelasan yang lebih lengkap pada bagian hasil dan pembahasan. Mengapa ini pilihan petani milenial? Karena petani milenial adalah generasi yang paling peka dan melek teknologi. Selain itu, petani milenial memiliki jangka waktu yang lebih lama untuk berkembang dibandingkan dengan generasi sebelumnya. Selain itu, mengapa harus menjadi kabupaten Lamongan? Karena Lamongan merupakan penyumbang beras terbesar di Jawa Timur.

Kata kunci: Petani Milenial, Internet of Things, Kabupaten Lamongan

INTRODUCTION

Technological developments are also one of the things that influence farmers' interests. Technological developments in the agricultural sector that are still ineffective in managing agricultural land cause difficulties in tracing if obstacles occur. Many farmers still use traditional methods, but it is possible that some other farmers have begun to enter the realm of millennial farmers (Ansori, 2018).

Based on the Cluster of European (Babiuch, 2019), the Internet of Things is a dynamic global infrastructure network that has self-configuration capabilities based on communication protocol standards where physical objects and virtual objects in the system have identities, physical attributes, virtual characters and use intelligent interfaces, and are connected and integrated into an information network. The Internet of Things is a concept where the virtual world of information technology merges with real objects in the real world. This is possible by providing certain sensors on an object so that the object can capture events that occur in the real world as data to then be sent to the server system. These sensors can be RFID or other sensors that work like human senses such as light, sound, pressure sensors, and others. In some internet of things systems, objects that have sensors are also given the ability to react as ordered by the server through an embedded controller based on what happens in the surrounding environment. This allows a job to be done without human intervention. For example, a temperature sensor placed on a boiler that will capture a certain temperature and send data to the server. The server will order the boiler to stop working through the controller when the temperature reaches a certain degree (State of the Global Islamic Economy Report, 2022).

Internet of Things (IoT) is an ecosystem of integrated intelligent objects that are able to communicate with each other, share information and resources, and react to various situations or changes in their environment automatically. The concept of IoT has developed into one of the latest and most popular trends in information technology, defining a new era where communication is not only limited to human interaction, but also involves interaction between humans and objects, and objects with other objects, giving each object a digital identity (Cluster of European Research Projects, 2009).

IoT extends the traditional connectivity boundaries commonly associated with electronic devices such as computers and smartphones to a global network. Physical objects such as road infrastructure and medical devices are connected via the internet (Bramawanto, 2019). Using sensors, actuators and wireless technology, these objects generate large volumes of data for analysis and enable physical systems to understand and respond more effectively to the complexity of their environment, often without human intervention. This revolutionary concept opens up opportunities for the creation of intelligent and automated systems in various aspects of life, marking a significant evolution in the way everyday objects and things interact in a global network (Azhari, 2024).

Based on the explanation above, researchers believe that the Internet of Things can be maximized by Millennial Farmers in increasing their production results. Millennial farmers are farmers aged around 19 to 39 years (Gaol, 2008) . In the

millennial farmer generation, it is believed that they can improve the welfare of the community, especially in rural areas whose basis is the agricultural sector. The presence of millennial farmers initiated by the Ministry of Agriculture provides an alternative in accelerating farmer regeneration. Millennial farmers are considered capable of bridging young farmers with those who have been farming for a long time. However, the tendency in the field has not yet seen the specific character possessed by millennial farmers. Millennial farmers are still considered a second choice of work and are only a label for the young generation who work as farmers (Buyya, 2016).

The Ministry of Agriculture as a policy maker has created various programs to support the development of millennial farmers, including through (Lestari & Rahardjo, 2022): 1) education and training; 2) extension and assistance; 3) development of agricultural product marketing systems and facilities; 4) consolidation and guarantee of agricultural land area; 5) provision of financing and capital facilities; 6) easy access to science, technology, and information and strengthening farmer institutions (Rachmawati & Gunawan, 2020). Therefore, this study aims to analyze the Optimization of Millennial Farmers' Harvest Results by utilizing the Internet of Things program in Lamongan Regency.

RESEARCH METHODS

Based on the comprehensive explanation above, it can be concluded that this study is a type of qualitative research with a descriptive approach, namely an approach that describes one by one the main topics in this study (Nartin et al., 2024). The topics in this study are related to Millennial Farmers, the Internet of Things, and agricultural production results used in this study (Sugiyono, 2019). The data used in this study are secondary data that researchers obtained indirectly through scientific articles, books, magazines, and other sources used in this study (Jonathan Sarwono, 2016). The data obtained were analyzed by stages of data collection, data selection, data reduction, and drawing conclusions with a more complete explanation in the results and discussion sections (Rukin, 2019). Why is it the choice of millennial farmers? Because millennial farmers are the generation that is most sensitive to and literate in technology. In addition, millennial farmers have a longer term to develop compared to previous generations. In addition, why should it be Lamongan district? Because Lamongan is the largest rice contributor in East Java (Rika Saputri, 2024).

RESULT AND DISCUSSION

Internet of Things and Millennial Farmer

Technological developments are also one of the things that influence farmers' interests. Technological developments in the agricultural sector that are still ineffective in managing agricultural land cause difficulties in tracing if obstacles occur. Many farmers still use traditional methods, but it is possible that some other farmers have begun to enter the realm of millennial farmers (Ansori, 2018).

Based on the Cluster of European (Babiuch, 2019), the Internet of Things is a dynamic global infrastructure network that has self-configuration capabilities based

on communication protocol standards where physical objects and virtual objects in the system have identities, physical attributes, virtual characters and use intelligent interfaces, and are connected and integrated into an information network. The Internet of Things is a concept where the virtual world of information technology merges with real objects in the real world. This is possible by providing certain sensors on an object so that the object can capture events that occur in the real world as data to then be sent to the server system. These sensors can be RFID or other sensors that work like human senses such as light, sound, pressure sensors, and others. In some internet of things systems, objects that have sensors are also given the ability to react as ordered by the server through an embedded controller based on what happens in the surrounding environment. This allows a job to be done without human intervention. For example, a temperature sensor placed on a boiler that will capture a certain temperature and send data to the server. The server will order the boiler to stop working through the controller when the temperature reaches a certain degree (State of the Global Islamic Economy Report, 2022).

Internet of Things (IoT) is an ecosystem of integrated intelligent objects that are able to communicate with each other, share information and resources, and react to various situations or changes in their environment automatically. The concept of IoT has developed into one of the latest and most popular trends in information technology, defining a new era where communication is not only limited to human interaction, but also involves interaction between humans and objects, and objects with other objects, giving each object a digital identity (Cluster of European Research Projects, 2009).

IoT extends the traditional connectivity boundaries commonly associated with electronic devices such as computers and smartphones to a global network. Physical objects such as road infrastructure and medical devices are connected via the internet (Bramawanto, 2019). Using sensors, actuators and wireless technology, these objects generate large volumes of data for analysis and enable physical systems to understand and respond more effectively to the complexity of their environment, often without human intervention. This revolutionary concept opens up opportunities for the creation of intelligent and automated systems in various aspects of life, marking a significant evolution in the way everyday objects and things interact in a global network (Azhari, 2024).

Based on the explanation above, researchers believe that the Internet of Things can be maximized by Millennial Farmers in increasing their production results. Millennial farmers are farmers aged around 19 to 39 years (Gaol, 2008) . In the millennial farmer generation, it is believed that they can improve the welfare of the community, especially in rural areas whose basis is the agricultural sector. The presence of millennial farmers initiated by the Ministry of Agriculture provides an alternative in accelerating farmer regeneration. Millennial farmers are considered capable of bridging young farmers with those who have been farming for a long time. However, the tendency in the field has not yet seen the specific character possessed by millennial farmers. Millennial farmers are still considered a second choice of work and are only a label for the young generation who work as farmers (Buyya, 2016) .

The Ministry of Agriculture as a policy maker has created various programs to support the development of millennial farmers, including through (Lestari & Rahardjo, 2022): 1) education and training; 2) extension and assistance; 3) development of agricultural product marketing systems and facilities; 4) consolidation and guarantee of agricultural land area; 5) provision of financing and capital facilities; 6) easy access to science, technology, and information and strengthening farmer institutions (Rachmawati & Gunawan, 2020). Therefore, this study aims to analyze the Optimization of Millennial Farmers' Harvest Results by utilizing the Internet of Things program in Lamongan Regency.

Optimizing Millennial Farmers' Harvest Results By Maximizing Iot Programs In Lamongan Regency

The presence of the Internet of Things researchers believe can increase the production of millennial farmers if it can be utilized optimally. Among others, here are some ways to utilize the Internet of Things to increase agricultural production.

Use of Field Monitoring System (FMS) for rice fields

Field monitoring system (FMS) is a technology used to monitor crop conditions and climate conditions in rice fields. The condition of the plants and climate is recorded and processed using sensors in real time. The data results from these sensors, such as sunlight levels, rainfall levels, wind speed, and so on will be recorded in the cloud and delivered to farmers in the form of data that appears in the application. Thus, farmers can observe the condition of the rice fields even when they are not at home. The hope is that with this data and the knowledge gained by farmers while working, it can be combined into one to produce more appropriate agricultural decisions. With the weather data they have, it can be a consideration for millennial farmers to decide on the best planting time with very large quantities so that production results can be maximized (Propaktani, 2024).

Use of Drones for Agriculture

Drones are also a useful tool to help millennial farmers. These mini aircraft can be used to map crop conditions, track animals, spread irrigation and spread pesticides. The drones are controlled using a special application that can also be used to receive sensor data. Thus, farmers do not need to circle the fields or gardens to eradicate pests, or spray plants. By having good control over plant conditions, pesticide distribution, and irrigation conditions, all things that become obstacles can be minimized. In the end, agricultural production will also increase.

Sales and Education Support Applications

One of the biggest challenges in the agricultural sector is the supply chain issue, from purchasing seeds and fertilizers to access to end consumers. Farmers, especially in Indonesia, generally sell their agricultural products to collectors and from collectors to retailers. Coupled with the increasingly expensive price of seeds and fertilizers, the amount of net profit obtained by farmers is getting thinner. Therefore, two important applications needed by farmers today are sales support applications that can help them cut the supply chain to end consumers and

educational applications to help them better understand how to use technology in agriculture. With the existence of supporting applications, the production results of millennial farmers can be marketed through a wider market share and generate a lot of profit. With the increasing profits owned, the production capital will be greater and the production results will also increase.

CONCLUSION

Based on the results of the presentation in the introduction, research methodology, and discussion results show that the presence of the Internet of Things can be the most important instrument to increase the production of millennial farmers in Lamongan. Why is it the choice of millennial farmers? Because millennial farmers are the generation that is most sensitive to and literate in technology. In addition, millennial farmers have a longer term to develop compared to previous generations. In addition, why should it be Lamongan district? Because Lamongan is the largest rice contributor in East Java. Some things that can be utilized from the Internet of Things to increase the production of millennial farmers are the Use of Field Monitoring System (FMS) for rice fields, Use of drones for agriculture, and Applications to support sales and education which have been explained in detail in the section above.

BIBLIOGRAPHY

- Ansori, A. (2018). *Studi Pemanfaatan Internet Of Things Untuk Pengawasan Bahan Bakar Minyak (Studi Kasus: Perusahaan Pelayaran Penumpang Nasional)*. Fakultas Teknologi Kelautan Institut Teknologi Sepuluh November Surabaya.
- Azhari, M. R. (2024). Implementasi Internet Of Things (Iot) Dalam Identifikasi Salinitas Air Laut Pada Tambak Garam Di Lhoong Aceh Besar. In *Universitas Islam Negeri Ar-Raniry* (Vol. 15, Issue 1). Fakultas Sains Dan Teknologi Universitas Islam Negeri Ar-Raniry.
- Babiuch, M. (2019). Using The ESP32 Microcontroller For Data Processing. *Proceedings Of The 2019 20th International Carpathian Control Conference*, 18. <https://doi.org/10.1109/Carpathiancc.2019.8765944>
- Bramawanto, R. (2019). Pemanfaatan Teknologi Mikrokontroler Untuk Pengukuran Evaporasi Dan Suhu Pada Produksi Garam. *Jurnal Kelautan Nasional*, 4(3), 6. <https://doi.org/https://doi.org/10.15578/jkn.V14i3.7126>
- Buyya, R. (2016). Big Data: Principles And Paradigms. *Elsevier*, 4(1), 5.
- Cluster Of European Research Projects. (2009). Cluster Of European Research Projects. 2009. Internet Of Things And Its Strategic Research Agenda (SRA). *Living In Tomorrow's Internet Of Things World*, 16.
- Gaol, C. (2008). *Sistem Informasi Management: Pemahaman Dan Aplikasi*. Grasindo.
- Jonathan Sarwono. (2016). *Meode Penelitian Kualitatif Dan Kuantitatif*. Graha Ilmu.

- Lestari, O. A., & Rahardjo, B. T. (2022). Keanekaragaman Arthropoda Hama Dan Musuh Alami Pada Lahan Padi Jajar Legowo Dan Konvensional. *Jurnal Hama Dan Penyakit Tumbuhan*, 10(2), 73–84. <https://doi.org/10.21776/Ub.Jurnalhpt.2022.010.2.3>
- Nartin, N., Faturrahman, F., Deni, A., Santoso, Y. H., Utama, E. I.-F. Y., & Tarigan, W. J. (2024). Metode Penelitian Kualitatif. In *Yayasan Cendikia Mulia Mandiri*.
- Propaktani, A. (2024). 5 Contoh Iot Dalam Bidang Pertanian Untuk Smart Farming. Paktani. <https://propaktani.com/Inovasi-Pertanian/5-Contoh-Iot-Dalam-Bidang-Pertanian-Untuk-Smart-Farming>
- Rika Saputri. (2024). Lamongan Jadi Penghasil Padi Terbesar Nomor 1 Di Jatim, Tapi Produktivitasnya Justru. [Jatimnetwork.Com](https://www.jatimnetwork.com). <https://www.jatimnetwork.com/kolom/4312474814/lamongan-jadi-penghasil-padi-terbesar-nomor-1-di-jatim-tapi-produktivitasnya-justru>
- Rukin, R. (2019). Metodologi Penelitian Kualitatif. In *Yayasan Ahmar Cendekia Indonesia*.
- State Of The Global Islamic Economy Report. (2022). State Of The Global Islamic Economy Report. *Dinarstandard*, 1–40. <https://haladinar.io/hdn/doc/report2018.pdf>
- Sugiyono. (2019). *Metode Penelitian Kuantitatif, Kualitatif, R&D*.