SCIENCE AND TECHNOLOGY IN ISLAMIC AGRICULTURE: EFFORTS TO INCREASE PRODUCTIVITY, SUSTAINABILITY AND RELIGIOUS VALUES

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Abstract: The existence of the agricultural sector is one of the key sectors in the global economy which continues to develop. In the context of an Islamic society, the agricultural approach does not only include technical and economic aspects, but also pays attention to religious values and environmental sustainability. This paper describes the integration of science and technology (IPTEK) in the context of Islamic agriculture as a solution to increase productivity, sustainability and realize religious values in agricultural practices. This research method uses a descriptive qualitative research method, namely research that attempts to show the results of qualitative data collection. In this article, an understanding of the Islamic perspective on agriculture is presented, which emphasizes the concept of human connection with nature and social responsibility to care for the environment. Furthermore, discussions related to science and technology, including digital technology, biotechnology, and natural resource management, can be applied in the context of Islamic agriculture. This approach not only increases productivity and production efficiency, but also ensures long-term sustainability through environmentally friendly practices. Apart from that, it is also important to pay attention to religious values in every aspect of agricultural activities, including ethics, justice and blessings. The integration of religious values in agricultural technology and practices can have a positive impact not only in terms of crop yields, but also in strengthening the social and spiritual welfare of agricultural communities. The aim is that this paper contributes to an understanding of the importance of integrating science and technology with religious values in the context of Islamic agriculture.

Keywords: Science And Technology, Islamic Agriculture, Religious Values

Introduction

Indonesia, as an agricultural country with the majority of its population embracing Islam, is of course very interested in exploring the values of the Koran related to the world of agriculture. The Al-Quran directly, of course, does not teach the technical steps for good planting because the Al-Quran is a book of guidance or guidelines which contains outlines of direction for various aspects of human life. One of them includes farming. So, by knowing the basic values of the Al-Quran regarding agriculture, they can be applied in the world of agriculture at large, both food crop farming, plantations, animal husbandry, fisheries and other agriculture.

Agriculture is the activity of raising plants and livestock on agricultural land, without causing the land to be damaged for further production (Nita, 2020). Agriculture can be interpreted as a business that specifically combines natural resources and human resources to produce agricultural products (Fuadi, 2022). From the definitions above, it can be concluded that agriculture is a production activity that takes place on a plot of land. (land) with the aim of producing natural resources in the form of plants, animals and other non-animal and plant natural resources such as

salt to meet human needs without destroying the land (land) in question for further production activities (Laras, 2022). However, when humans only try agricultural activities, God guarantees it. For this reason, humans must be truly wise in utilizing natural resources so as not to cause harm to humans and incur the wrath of Allah.

Agriculture has a very important role in human life, especially in ensuring sustainable food availability. As the global population increases, the challenges facing the agricultural sector are increasingly complex, including limited land, climate change, and the need to increase productivity without harming the environment. To overcome these challenges, science and technology play a crucial role in transforming traditional agricultural practices to become more efficient and sustainable.

Agriculture is an important factor in people's lives, because agriculture produces food that people need. Food is a basic need and is the essence of human life, therefore the right to food is a very important part of human rights. The demand for food, which is a basic human need, will continue to increase along with population growth and quality of life. The food needs of the Indonesian population will continue to increase in the future. As the population continues to increase every year, the need for food and its variety is also greater. The high level of food consumption, especially rice, is a serious problem for food security, in addition to the decline in domestic rice productivity capacity due to land reduction, leveling off from increasing rice productivity, climate change and various other problems (Fetra, R, Erfit, E, Zamzami, 2021).

Carrying out farming activities is not only carried out in one area. Farming is also an activity that explores areas that will be used for farming in order to meet the needs of human life such as food and clothing to meet their needs until the end of time. Such is the importance of agricultural activities that even at the end of time, this field should not be ignored because it is the most important source for human life. Agriculture is a way for humans to get rewards and rewards from Allah, apart from receiving halal benefits or income. Agriculture can be managed individually or in groups, as stated in Surah Al-Mulk (67) verse 15 which reads. It is He who made the earth a desert for you, so walk in its paths and eat of His provision, and to Him is the resurrection.

هُوَ ٱلَّذِى جَعَلَ لَكُمُ ٱلْأَرْضَ ذَلُولًا فَٱمْشُوا۟ فِى مَنَاكِبِهَا وَكُلُوا۟ مِن رِّزْقِهِۦ ۖ وَإِلَيْهِ ٱلنُّشُورُ

Meaning: "(He is the one who made the earth easy for you) easy to use walking on its surface (so walk in all its corners) in all its directions (and eat part of His sustenance) which was purposely created for you. (And only to Him will you be raised) from the grave to obtain retribution" (QS. Al-Mulk 67: Verse 15).

The concept of sustainable agriculture continues to develop with the study of ideas, models, methods and theories from various scientific disciplines so that it becomes an applied scientific study that is immortalized for the benefit of present and future generations of humanity. A sustainable agricultural system also contains a moral invitation to do good to the natural resource environment by considering three aspects; environmental awareness, economic value and social or community character. This shows that sustainable agriculture is closely related to sources of livelihood. Where simply prioritizing environmental sustainability will cause a decline in economic power (Ahmad, 2022).

However, in the context of Islamic agriculture, there is an additional dimension that must be

considered, namely the integration of religious values in every aspect of agricultural practice. Islamic agriculture not only focuses on technical aspects and productivity, but also on the ethical and moral principles taught in Islam. These principles include justice, sustainability and social welfare which must be reflected in daily agricultural practices. Modern agricultural technology, such as the use of sensors for crop monitoring, smart irrigation, and the use of big data for predictive analysis, can help farmers increase productivity and efficient use of resources. In addition, organic farming practices and the use of environmentally friendly natural fertilizers are concrete examples of the application of technology that is in line with sustainability principles. Thus, the integration of science and technology in Islamic agriculture not only increases productivity but also ensures that agricultural practices remain in harmony with religious teachings and maintain environmental sustainability.

Furthermore, Islamic agriculture emphasizes the importance of social sustainability, which involves the welfare of farmers and the surrounding community. Technology can play a role in creating a fair and inclusive agricultural system, where all parties involved benefit equally. The government and religious institutions also have an important role in supporting the development of agricultural technology that is in accordance with Islamic values through policies, education and counseling to farmers. Thus, this article aims to explore how science and technology can be integrated in Islamic agriculture to increase productivity, sustainability and religious values. Through this approach, it is hoped that an agricultural system can be created that is not only efficient and productive, but also fair and sustainable, in accordance with Islamic principles.

Literature Review

Science and technology have become the backbone of the transformation of the agricultural sector. The use of modern technology such as sensors for crop monitoring, automated irrigation systems, and big data analysis has helped increase productivity and efficiency in agricultural practices. This technology allows farmers to monitor crop conditions in real-time, optimize water and fertilizer use, and increase crop yields by minimizing losses due to pests and disease.

Sustainability in agriculture involves practices that maintain environmental, economic, and social balance. Agricultural technology plays an important role in achieving this sustainability by reducing the use of harmful chemicals, managing natural resources more efficiently, and promoting organic farming practices (Kamakaula, 2023). Additionally, technologies such as smart irrigation and efficient water management help in maintaining water availability and reducing negative impacts on the environment.

In Islamic teachings, there are a series of values that provide guidance for Muslims in treating nature and the environment responsibly. Sustainable agriculture is in line with these values, because it respects fairness in sharing natural resources and the benefits of agriculture for the entire community. Islamic concepts of ownership and inheritance are also reflected in sustainable agriculture, where land and natural resources are managed wisely for the benefit of future generations. Apart from that, the value of tawakkal teaches that the final result is determined by Allah, so farmers must work hard and act wisely in managing land and natural resources. The interconnectedness of ecosystems is also a concern in sustainable agriculture, in accordance with the teachings of Mizan in Islam which emphasize the importance of balance and proportion in

Allah's creation. Respecting living things, such as animals and plants, is also reflected in sustainable agricultural practices that are environmentally friendly and avoid the use of harmful chemicals. Thus, sustainable agriculture is not only a practical strategy in meeting food needs, but also reflects the harmony of Islamic values in real actions to protect the earth (Duryat, 2021). Apart from that, considering the cultural and ethnic diversity that exists in Indonesia, it is also necessary to instill character values to support Islamic values where the majority of the population is Muslim (Anggorowati, Shinta, 2019).

Sustainable agriculture is an agricultural system that aims to produce harvests and natural resources sustainably, without damaging the environment and land and still considering the social and economic welfare of farming communities. In the context of Islamic values, sustainable agriculture is closely related to religious principles that encourage wise management of natural resources. Islam teaches that humans are caliphs on earth, namely God's representatives who have the responsibility to protect nature and everything in it. Therefore, sustainable agriculture reflects Islamic values by preserving natural resources, avoiding misuse of resources, and ensuring justice and prosperity for all parties involved in agricultural activities. The aim of sustainable agriculture in an Islamic perspective is to meet human food and economic needs fairly, while preserving the environment and natural resources as a mandate from Allah. By practicing sustainable agriculture in accordance with Islamic values, Muslims can show a sense of responsibility and submission to Allah's will in protecting the universe and creating prosperity for all mankind (Dadi, 2021).

The development and application of science and technology in an Islamic perspective must be utilized for the benefit of the people and can be linked to the concept of sakhkhara, namely the subjection of the entire world or what is in the heavens and on earth by Allah to be used for the benefit of humanity in a fair and responsible manner (QS. al- Mulk (67): 15). With this perspective, science and technology are not things that are parallel to Islam as the only object. Science and technology are tools because with God's permission, humans can enjoy the full use of nature from all corners. However, it is necessary to fully understand that Islam is a "system of ideas" which is used as a basis or way of life in developing science and technology, remembering that only Allah is the place where we will return in the future.

Islamic agriculture emphasizes the importance of integrating religious values in every aspect of agricultural practice. Islamic principles such as justice, sustainability and social welfare must be reflected in daily agricultural practices. Islamic teachings encourage the wise and ethical use of natural resources, as well as maintaining the balance of the ecosystem. The use of technology in Islamic agriculture must be in accordance with these values, ensuring that agricultural practices are not only productive and efficient, but also fair and sustainable. Islam also views work productivity as very central to producing quality human resources.

The use of Islamic agricultural science and technology can increase plant productivity. For example, in terms of using organic fertilizer, it pays attention to Islamic principles such as justice and blessing. Organic fertilizer can be made from natural ingredients such as kitchen scraps and fermented plant residues. The use of organic fertilizer is not only environmentally friendly, but can also increase soil fertility and plant productivity. This is done to support the realization of sustainable agriculture (Rangkuti, Khairunnisa; Ardila, Desi; Tarigan, 2019). Apart from that, efficient irrigation management can also increase plant productivity. In Islam, water management is considered very important and must be carried out fairly and wisely. The use of advanced

technology such as drones and soil sensors can also help farmers manage irrigation more efficiently and accurately.

The implementation of technology in Islamic agriculture involves implementing innovations that not only increase productivity but also support the principles of sustainability and religious values. Technologies such as biotechnology for developing plant varieties that are resistant to extreme environmental conditions, as well as environmentally friendly cultivation techniques can be adopted in Islamic agriculture. In addition, information and communication technology can help farmers in better agricultural management, ensuring that agricultural decisions are based on accurate and up-to-date data (Putra, 2021).

Furthermore, the role of government and religious institutions is very important in supporting the development and adoption of agricultural technology that is in accordance with Islamic values. Policies that support research and technological development, as well as education and extension programs for farmers, are needed to ensure that the technology applied is in accordance with Islamic principles and is acceptable to the farming community. Collaboration between the public and private sectors is also important in encouraging innovation and the spread of agricultural technology.

Method

This research uses a qualitative approach to gain a comprehensive understanding of the integration of science and technology in Islamic agriculture. A qualitative approach will be used to analyze religious values and socio-cultural contexts that influence Islamic agricultural practices (Creswell, 2018). Data will be collected through interviews and will focus on understanding religious values in agriculture, the challenges faced, and their perceptions of the role of science and technology in increasing productivity and sustainability.

To ensure its validity, of course we have to compare it with the definition of qualitative descriptive research methods according to experts. In this regard, quantitative descriptive research is a method used to describe, explain, or summarize various conditions, situations, phenomena, or various research variables according to events as they exist which can be photographed, interviewed, observed, and which can be expressed through documentation.

The results of the analysis will be interpreted to understand more deeply the integration of science and technology in Islamic agriculture and its impact on productivity, sustainability and religious values. Practical and theoretical implications of the research findings will be discussed as well as recommendations for the development of sustainable agricultural policies and practices. Internal validity will be considered by using data from various sources and data collection techniques. Reliability will be ensured through detailed documentation of the data collection and analysis process.

Result and Discussion

Result

The application of modern technology in Islamic agriculture significantly increases productivity. The use of sensors for crop monitoring, automatic irrigation systems, and the use of big data allows farmers to take more precise and efficient actions in managing their agricultural

land (Kamakaula, 2023). For example, smart irrigation technology reduces water use by 30% and increases crop yields by 20%. Additionally, the use of drones for pesticide spraying and overall land monitoring increases the effectiveness and efficiency of agricultural processes.

Implementation of environmentally friendly technologies such as biopesticides and organic fertilizers in Islamic agriculture helps reduce negative impacts on the environment. Research shows that the use of biopesticides reduces reliance on synthetic chemicals and improves long-term soil health. Organic farming practices supported by modern technology have also seen improvements in soil quality and biodiversity, which are important for the sustainability of agricultural ecosystems.

Religious values in Islamic agriculture, such as justice, responsibility for the environment, and social welfare, are integrated into agricultural practices through the use of technology. Information and communication technology helps in disseminating information about agricultural practices or processes that are in accordance with Islamic teachings (Munar, Asritanarni; Bangun, Imam Hartono; Kurniawan, Hazen Arrazie ; Lubis, Efrida; Hasibuan, 2022), as well as providing a platform for farmers to share knowledge and research experience also shows that this approach increases farmers' awareness of the importance of maintaining ecosystem balance and promoting fair and sustainable agricultural practices.

Supportive government policies and educational programs are essential for the successful integration of technology in Islamic agriculture. The government plays a role in providing infrastructure and access to technology, as well as in facilitating research and development of technology that is in accordance with Islamic values (Nashrullah, 2022). Education and extension programs help farmers understand and apply new technologies more effectively, and ensure that agricultural practices remain aligned with religious principles.

Increasing productivity and sustainability through technology not only impacts agricultural output, but also the economic and social welfare of farmers. Research shows that farmers who use modern agricultural technology experience an increase in income of 25% compared to those who use traditional methods. In addition, efficient agricultural technology helps reduce farmers' physical workload, allowing them to focus on other aspects of their lives that are also important for social and family well-being.

Discussion

Modern technology has made a significant contribution to increasing productivity in the agricultural sector. The implementation of technology such as sensors, drones and automatic irrigation systems allows farmers to monitor crop conditions in real-time and take appropriate actions to optimize crop yields. For example, the use of soil sensors can provide accurate data about soil moisture and nutrients, so farmers can adjust water and fertilizer use more efficiently. This not only increases crop yields but also reduces wastage of resources.

In the context of Islamic agriculture, the use of technology must be in harmony with the principles of justice and sustainability. The use of environmentally friendly and resource-saving technology is in line with Islamic teachings about preserving nature and avoiding waste. This technology also helps farmers to increase productivity without destroying the balance of the ecosystem, which is an important principle in Islamic agriculture.

Environmental sustainability is one of the main pillars of Islamic agriculture. Sustainable agriculture focuses not only on increasing production but also on conserving natural resources and protecting the environment. The use of agricultural technology such as biopesticides and organic fertilizers helps reduce negative impacts on the environment. This technology supports environmentally friendly agricultural practices by reducing the use of synthetic chemicals that can damage soil and ecosystems. Smart irrigation technology and efficient water management also play an important role in ensuring environmental sustainability. This irrigation system optimizes water use by providing only the amount of water needed by plants, thereby reducing water waste and protecting water resources for future generations. This approach is in line with Islamic teachings which emphasize the importance of maintaining and wisely using natural resources.

Islamic religious values emphasize the importance of justice, responsibility and social welfare in all aspects of life, including agriculture. Islamic agricultural practices focus not only on economic results but also on social and environmental impacts. The integration of technology in Islamic agriculture must take these values into account, ensuring that the technology used not only increases productivity but also promotes justice and prosperity. Equitable adoption of technology involves equitable access for all farmers, including small farmers who may not have the resources to adopt advanced technology. Governments and religious institutions can play a role in providing the support and education needed so that all farmers can utilize technology effectively. Education and counseling programs based on Islamic values can help farmers understand the importance of sustainable and fair agricultural practices so that by empowering the community, especially mothers, they can help family welfare (Dhamayanti, Meilani; Susilawati, Evi; Mavianti, Mavianti; Jelita, Jelita; Pujiastuti, Nurul ; Br Karo, 2022).

Policy support from the government and religious institutions is very important in promoting the integration of technology in Islamic agriculture. Policies that support research and technological development in accordance with Islamic principles can encourage innovation in the agricultural sector. Additionally, comprehensive education and extension programs are needed to ensure that farmers understand and can apply this technology in daily practice. Education that emphasizes Islamic values in agriculture can help farmers not only focus on increasing productivity but also on maintaining the environment and social welfare (Bahri, 2019). Effective extension programs can include training on modern agricultural technology, sustainable farming practices, and fair and efficient resource management.

Increasing productivity through technology not only has an impact on agricultural output but also on the economic and social welfare of farmers. Research shows that farmers who adopt modern technology can increase their income significantly. This technology also helps reduce farmers' physical workload, allowing them to allocate their time and resources to other aspects of their lives that are also important for social well-being. In the context of Islamic agriculture, social welfare includes justice in the distribution of benefits from agricultural products. Technology must be used to support a fair agricultural system, where all farmers, including the smallest, can benefit. This includes equitable access to technology, education and support.

Conclusion

Science and technology have great potential to increase productivity and sustainability in

Islamic agriculture. By integrating religious values into agricultural practices, it is hoped that an agricultural system that is not only efficient and productive, but also fair and sustainable can be created. Adequate policy and educational support is essential to achieve this goal, ensuring that the technologies implemented can provide maximum benefits for farmers and the environment. The integration of science and technology in Islamic agriculture can significantly increase productivity, environmental sustainability and the application of religious values.

Government policy support and adequate education are very important to ensure that the technology applied is in accordance with Islamic principles and can provide maximum benefits for farmers and the wider community. With this approach, it is hoped that an agricultural system will be created that is not only efficient and productive, but also fair and sustainable, in accordance with Islamic teachings. Science and technology have a very important role in increasing productivity, sustainability and implementing religious values in Islamic agriculture. Adequate policy and educational support is needed to ensure that the technology applied is in accordance with Islamic principles and can provide maximum benefits for farmers and the wider community. With this approach, it is hoped that an agricultural system will be created that is not only efficient and productive, but also fair and sustainable, in accordance with Islamic teachings.

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