Economic Innovation for Global Food Crisis: Technology-based Sustainable Solutions Review

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Abstract

One of the biggest problems confronting humanity in the twenty-first century is the global food crisis. Global food security is becoming more and more precarious as population growth picks up speed and climate change puts agricultural sustainability and food security in jeopardy. Technology is an important factor for increasing sustainable food systems in order to accomplish this goal. Smart Farming concept combines sensors, data analytics, artificial intelligence, Internet of Things (IoT), and information and communication technology (ICT). In this research paper, the researchers' method of gathering data is documentation studies. This research aims to review technologies that could be utilized to overcome the global food crisis, one of which is smart farming. The society is expected to contribute to collective efforts to create a world free of starvation and abundant food for all through this understanding of smart farming.

Introduction

One of the most important problems confronting humanity in the twenty-first century is the global food crisis. Food security is at risk due to the acceleration of population growth and the threat posed by climate change to the sustainability of agriculture. The security of food is increasingly at risk worldwide. But given these difficulties, innovation in development economics is now essential to solving the global food crisis. The standard of living of economic actors will be dependent on their abilities to improve and add value to the products they produce. One of the primary factors influencing such capacity will be the ability to innovate

using science and technology. Economic innovation in development is the continuing process to decide how to guarantee food availability, accessibility, and sustainability on a global scale (Nainggolan, 2011).

One country like Indonesia actually has genuinely established food security with a lot of grace. The main advantage of Indonesia in implementing food security plans is its natural capacity, which is still relatively good, its large and well-organized agricultural land, its mostly agrarian culture, and its excellent soil conditions. But, there are number of challenges must be faced, including a deficient food logistics system, low farmer exchange rates, dwindling agricultural land area and natural carrying capacity, a lack of cohesive food security policies, and deteriorating food diversification, make the strategy of implementation is difficult to achieve for the future of food security (Universitas Islam Riau, 2022).

These creative solutions need to make use of advanced technology, environmentally responsible practises, and strong international collaboration. Implementing the appropriate technology will definitely have a very positive effect concerning the way the food industry develops around the world. Investing in the appropriate technology has grown in popularity and importance for the betterment of society (Sufa et al., 2019). With a concentrate on technological and sustainable solutions, researchers will analyse the important role that innovation plays in solving the world food crisis in this article. The significance of this study rests on its capacity to clarify the ways in which innovation in economic development can contribute to the establishment of food systems that are more resilient, effective, and ecologically sustainable (Saffa, 2023).

Smart farming is the concept of technology that used by certain countries to increase productivity and food security. Achieving the goals for global food security will also largely depend on sustainable solutions, like expanding impoverished communities' access to food and using green farming practices (Dewi et al., 2022). This article examines at some of the innovations that have been implemented in different nations to help solve the global food crisis and discusses the importance of sustainability and technology in building a better future for all.

Developing a better understanding about the innovation of Smart Farming in development economics can assist people in contributing to the global initiative to decrease starvation and make sure there is enough food for everyone.

Literature Review

Food Crisis

The Food and Agriculture Organisation of the United Nations (FAO) declared in early 2009 that there were now over 1 billion people suffering from chronic hunger worldwide. "The food crisis is not over," the director-general of the FAO, Jacques Diouf, declared bluntly in an interview with the Financial Times, following this announcement (Clapp, 2009). The food crisis issue is part of the goal of eradicating hunger. To be more precise, it aims to eradicate hunger and malnutrition while encouraging productivity and investment in the food and

agriculture sectors. Productivity, distribution, and food consumption are the main factors influencing the food crisis. There will inevitably be a discrepancy between the amount of food available and what the community needs in the face of expanding food consumption, distribution, and productivity declines (Amri & Muttaqin, 2022).

A food crisis happens when there is an inadequate supply of food in a particular area. "A condition where food supplies are not sufficient for the needs of the community" is how the University of Muhammadiyah North Sumatra defines a food crisis. Among the factors contributing to the food crisis are (Fai, 2022):

1. Prices of food increase as a result of rising fertiliser costs.
2. Losses to crops as a result of weather variations and climate change.
3. Food production is declining as a result of social unrest, climate change, and social transformation.
4. The proliferation of novel virus strains and the Covid-19 pandemic.
5. Inflation led to an increase in food imports.
6. Lack of funding for food in the government budget.
7. Disparities in the application of food security initiatives and a lack of enthusiasm for agricultural technologies.
8. The results of unfair government regulations, like export prohibitions.

Global issue that present significant challenges for the participating countries and policymakers are the food crisis.

Food crises can have an impact on vulnerable populations and jeopardise a nation's food security and well-being. Therefore, measures such as the advancement of agricultural technology, increased government budget allocations in the food sector, and robust international cooperation are required to address this issue through appropriate policies and actions (Timmer C. P., 2010).

Technological Innovation

Innovation is the acceptance of a new concept, item, or method by a person or organisation. Innovation is also essential for adjusting to the ever-evolving demands of the modern world and the quickly changing environment (Wono et al., 2023). A plan is then required to enhance and effectively utilise the resources, services, and goods that are currently available. Technological innovation is the process of applying new concepts, ideas, or inventions to improve processes or come up with better solutions. A lot of aspects of life are significantly impacted by technological innovation. In addition, technological innovation boosts market efficiency, productivity, and the creation of new jobs. Innovations are typically developed as a means of enlisting cooperation in order to solve group problems that have wide-ranging effects and are connected to particular issues that need to be resolved cooperatively (Sihaloho et al., 2022).

Technological innovation can improve people's lives, decrease inequality, and increase productivity to help solve social problems in the food industry. The following are some ways that technological innovations could be useful in resolving social issues in the food industry (Xiao & Su, 2022):

1. Reducing inequality: The development of digital infrastructure and technological innovation can contribute to a reduction in social inequality, particularly for those who depend on digital networks for access to markets and resources.
2. Enhance quality of life: Through the use of information and communication technology, technological innovation can help people access public services and information more easily, participate more in village development, and have better health and education.
3. Application use to boost the economy: Through the development of application-based villages and the simplification of the ordering and payment processes, technological innovation can assist communities in boosting their economy by bringing village handicraft products to a broader audience.
4. Sustainable village development: Communities can overcome social, economic, and environmental obstacles and enhance their well-being with the support of technological innovation and sustainable village development.

It needs to take into account local issues, community welfare, and development that is in line with community requirements in order to address issues in the food sector. There are various advantages to using technology to increase food safety, such as (Henderson, 2021):

1. Enhanced Safety Protocols: By streamlining and enhancing queue checks, inspections, and auditing, technology helps to enforce safety standards, lowering risks and safeguarding brands.
2. Enhanced Safety, Quality, and Efficiency: By implementing new pandemic procedures and regular safety protocols, digital tools help enhance safety, quality, accuracy, productivity, and efficiency even with smaller teams.
3. Employee Empowerment: Technology places a high priority on education and training, enabling staff members to take charge of safety initiatives and increase compliance.
4. Transparency and Compliance: Businesses can maximise compliance and show that employees are adhering to Standard Operating Procedures (SOPs) by utilising technology, which increases transparency in safety efforts.
5. Cost Reduction: As businesses strive to make a profit again, digital tools can help cut labour costs, which is a big help.
6. Real-time Monitoring and Quick Reaction: Technology offers real-time monitoring, quick incident response, and thorough data management, which greatly lowers the likelihood of outbreaks and incidents involving food safety.
7. Streamlined Operations: Technology saves time and increases overall operational efficiency by automating food safety tasks and procedures, which enhances the dining experience and boosts customer satisfaction.

These advantages show how technology is transforming food safety procedures, lowering hazards, and guaranteeing the welfare of customers and companies.

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Smart Farming

Smart farming, sometimes referred to as precision farming or precision agriculture, is the application of contemporary technologies and data-driven methodologies to improve the sustainability and efficiency of farming practises. Optimising the use of resources, such as water, fertilisers, and pesticides, in order to maximise crop yields and reduce environmental impact, is the main objective of smart farming. Smart farming transforms conventional agricultural methods into ones that are more effective, sustainable, and ecologically friendly by utilising data and technology. Farmers' labour will be encouraged by "Smart Farming 4.0," which will make agriculture more measurable, integrated, and efficient. Farmers can use mechanisation to cultivate instead of relying on the seasons. Starting with labour, planting time, and harvesting procedure, the planting to harvesting process can be completed precisely (Rachmawati, 2021).

The agricultural strategy known as "Smart Farming" uses modern technologies to maximise agricultural productivity. There are various kinds of intelligent farms (Dewi et al., 2022):

1. Artificial intelligence (AI) technology: powers agriculture and animal husbandry by collecting and analysing data about plants, animals, and the environment to maximise productivity and reduce waste.
2. Internet of Things (IoT) Enabled Agriculture: Real-time data on temperature, humidity, and disease incidence are collected on plants, animals, and environmental conditions using IoT in smart agriculture. Decision-making and analysis can be done more quickly and accurately with the help of this data.
3. Artificial intelligence and machine learning in agriculture: In smart agriculture, machine learning is used to evaluate data from the Internet of Things, create models that can forecast plant and animal behaviour, and provide relevant recommendations.
4. Satellite technology powers horticulture and agriculture: High-resolution satellite data on plant and animal conditions as well as the environment, such as growing area, humidity, and disease incidence, are collected in smart agriculture. Decision-making and analysis can be done more quickly and accurately with the support of this data.
5. Technology that uses automatic control supports agriculture: Smart agriculture uses automatic control technology to manage various agricultural processes and policies, including controlling feed and water use, monitoring soil moisture content, and managing agricultural policies.

In general, smart agriculture employs a variety of technologies and methods to maximise crop yield, minimise waste, and assist in addressing issues that affect the agricultural sector and agriculture itself, such as the global food crisis and climate change.

There are several advantages to using smart agriculture in agriculture, such as (Rosilawati et al., 2022):

1. Enhance farmers' earnings and profits: By streamlining operations and cutting waste, smart agriculture can assist farmers in raising their earnings and profits.
2. Enhance productivity and efficiency: Smart agriculture can contribute to increased national food security as well as the productivity and efficiency of the agricultural and rural sectors.
3. Enhance food security and the environment: Smart agriculture can contribute to these goals by using water more wisely and applying fertilisers and pesticides more sparingly as well as more efficiently.
4. Enhance people's quality of life: Smart agriculture can help people live better lives by making it easier for them to access public services and information, by encouraging them to get more involved in village development, and by using information and communication technology to improve health and education.
5. Enhance food security: By streamlining processes, cutting waste, and fortifying ties between communities and the outside world, smart agriculture can contribute to a better supply of food.

In general, smart agriculture can enhance national food security, people's quality of life, and the productivity, safety, and efficiency of agriculture and the agricultural sector.

Sustainable Solution

Sustainable solutions are those that address current problems without endangering the ability of future generations to solve their own. These can take the form of policies, practises, or actions. In other words, sustainable solutions are those that, over time, continue to function without posing a threat to local communities or ecosystems by finding a balance between social, economic, and environmental concerns. By creating a structured value chain, the technology-driven Sustainable Solution may be able to preserve food security. In the future, an integrated system can create a technologically driven sustainable ecosystem to increase global food security (Rifainy et al., 2023).

In general, Smart Farming can assist in achieving the food sector's Sustainable Development Goals by optimising productivity, lowering inequality, and enhancing people's quality of life through the use of cutting-edge technologies and ecologically friendly methods. By ensuring food security for both the current and future generations, this strategy helps to create a more resilient and sustainable food system (Karssing, 2022).

Research Method

This research uses a qualitative research and descriptive methodology. Investigating data in a descriptive manner and data that is not directly measurable is known as qualitative research. A thorough and comprehensive depiction of a specific subject, circumstance, or phenomenon is the goal of the descriptive approach. Documents relating to the study's title or correlation are used in data collection, along with articles from newspapers, journals, books, online publications, and libraries (Rusandi & Muhammad Rusli, 2021).

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The aim of researcher is trying to analyse technological innovations in sustainable development and draw conclusions that can be implemented as a strategy to build food security and solve the global food crisis. One of the ideas examined is the idea of "smart farming," which combines sensors, data analysis, artificial intelligence, Internet of Things (IoT), and information and communication technology (ICT) to better manage several aspects of sustainable agriculture.

The researcher uses documentation studies as the method of data collection for this research report. Documentation studies improve the effectiveness of interviewing and observational methods in qualitative research. The credibility of the findings will rise if document studies are included in or utilised in a qualitative research project (Nilamsari, 2014). Researchers also used online media as one of the data sources for this study to collect data about Smart Farming.

Results

Food is a basic need for human survival. From the state's point of view, food is the most basic human need that cannot be postponed. Individuals might not have a decent place to live, appropriate clothing, adequate education, or good health insurance for a while. But there must always be food available to meet needs (Hermawan & Sulastri, 2023). Food Security is literally "ensuring that everyone has equal access to food in order to lead a healthy life." The ability of the community or individuals to meet their food needs at a reasonably affordable price, for both upper-class and middle-class people as well as especially for those from disadvantaged backgrounds, will always be the foundation of the concept of food security. A report from the Food and Agriculture Organisation (FAO), food security can be achieved when every household have access to food for every member of their family, both financially and physically, and they are not in crisis of losing either of their resources (Vuppalapati, 2022). However if there is a food crisis in the world, none of that can come to pass.

In fact, in the last two years, there have been a number of food crises encountered by citizens around the world, most of them brought on by significant climate change, the Covid-19 pandemic, and warfare (World Food Programme, 2023). These three factors definitely have a big influence on food stability, which leads to the global food crisis that every nation have to face right now. Prior to the crisis between Russia and Ukraine, a number of factors contributed to the sharp increase in food prices, including the Covid-19 pandemic's chaotic food supply and drought brought on by climate change, which impacted the planting seasons of nations that produced major staples. Global food problems faced by countries in the world include (Nainggolan, 2011):

1. The way people demand food, fuel and animal feed is significantly influenced by the changes, in oil prices. These price fluctuations pose as one of the challenges when it comes to food.
2. It is becoming increasingly evident that climate change has an impact on the capacity and reserves of food production.

3. With the worlds population continuously growing there is a rising need for food in developing regions like Asia and Africa.
4. Both international food price fluctuations and the ongoing global financial and economic crisis have an effect, on food markets and prices.

It is undeniable that the food industry can grow and develop with the help of appropriate technology, which is also crucial to its survival.

One of the ways that technology and sustainability can help us overcome the global food crisis is by increasing agricultural productivity. Technologies like improved crop varieties, astute farming methods, and appropriate fertilisation can help achieve this. Furthermore, sustainable technologies like effective irrigation, wise fertiliser use, and ongoing monitoring contribute to the conservation of energy, water, and other resources (Dewi & Ginting, 2012). Food waste can be decreased in the food supply chain by using technology and sustainability to handle, store, and distribute food more effectively. Sustainable food production and consumption support ecological balance in the environment and promote more ecologically friendly agricultural practices (Universitas Medan Area, 2023).

Smart Farming the solutions to solve the global food crisis

To reduce dependence, on imported food and promote agriculture or what is commonly known as Smart Farming 4.0, Smart Farming 4.0 is crucial for the government to enhance agricultural production and ensure local availability of food during times of potential food shortages. The integration of intelligence (AI), in agriculture helps farmers optimize their farming practices and provides assistance in their operations (Javaid et al., 2022).

The implementation of Smart Farming 4.0 holds significant advantage in augmenting farmers' earnings and promoting agricultural sustainability. Crops and farmland can receive more precise inputs thanks to smart farming. Smart Farming involves multiple high technology for increasing efficiency, sustainability, dan productivity. Multiple commonly (Sari, 2023):

1. Use technologies include sensors that detect temperature, vibration, soil acidity, air pressure, element levels, and other factors that affect plant growth.
2. Linking the tools and farming sensors to the Internet in order to monitor and record farming conditions in real time.
3. Use artificial intelligence (AI) to analyse sensor data, generate more sensible plant recommendations, predict plant performance, and identify problems such as illness and injury.
4. Robotics application in tasks such as cutting, chopping, and cleaning.
5. Using GIS technology can help identify the lifespan of an object and manage various environmental factors that negatively impact it.
6. Use a sensor to provide optimal nutrient delivery to plants, minimise root bruising, and improve soil quality.

7. Food processing techniques like pickling, drying, and packaging cut waste and increase food shelf life.
8. Application of biotechnology and bioprocesses in agriculture and food production.

Drone technology is also used in smart farming. Such drones can be used to efficiently carry out seeding, fertilisation, and pest eradication tasks. The many drone kinds utilised in smart agriculture and their purposes (Azma, 2023):

1. Drone Sprayer: used to water plants on a large scale. With its sprayer, the drone can apply water, fertiliser, and medication to plants.
2. Drones with multiple uses: Used to check the condition of the soil and plants. The drone has a number of sensors, including cameras and infrared to observe mature trees.
3. DJI Agras T10: This drone can spray up to 6.67 hectares in just 17 minutes of flight time, and it can carry a payload or tank capacity of up to 10 litres.
4. DJI Agras T20: This drone can spray up to 10 hectares in just 20 minutes of flight time, and it can carry a payload or tank capacity of up to 20 litres.
5. DJI Agras T30: This drone can spray up to 15 hectares in just 30 minutes of flight time, and it can carry a payload or tank capacity of up to 30 litres.
6. DJI Phantom 4 Multispectral: This drone has a multispectral camera that allows it to monitor the health of plants by taking images of them in various light spectrums.
7. The DJI Phantom 4 RTK drone is outfitted with an RTK positioning system, which is capable of delivering extremely precise location data for the purpose of mapping terrain.
8. DJI Mavic 3 Multispectral: With its multispectral camera, this drone can monitor the health of plants by taking images of them in various light spectrums.

Farmers could boost agricultural productivity and efficiency while cutting down on the amount of time and human labour required for various agricultural tasks by implementing drones into Smart Farming.

The advantages of Smart Farming

There are several advantages to using smart agriculture in agriculture, such as (Rosilawati et al., 2022):

1. Enhance farmers' earnings and profits: By streamlining operations and cutting waste, smart agriculture can assist farmers in raising their earnings and profits.
2. Enhance productivity and efficiency: Smart agriculture can contribute to increased national food security as well as the productivity and efficiency of the agricultural and rural sectors.
3. Enhance food security and the environment: Smart agriculture can contribute to these goals by using water more wisely and applying fertilisers and pesticides more sparingly as well as more efficiently.
4. Enhance people's quality of life: Smart agriculture can help people live better lives by making it easier for them to access public services and information, by encouraging them

to get more involved in village development, and by using information and communication technology to improve health and education.

5. Enhance food security: By streamlining processes, cutting waste, and fortifying ties between communities and the outside world, smart agriculture can contribute to a better supply of food.

The application of GPS technology and sensors, for example, enables farmers to precisely fertilise each plot of land, minimise fertiliser waste, and maximise its use all of which can lower production costs in the agricultural sector. Smart agriculture technology holds great promise for this purpose (Deere, 2020). Water and energy costs associated with irrigation can be decreased by using an automatic irrigation system that incorporates soil moisture sensors and only waters plants when necessary. In general, smart agriculture can enhance national food security, people's quality of life, and the productivity, safety, and efficiency of agriculture and the agricultural sector.

Smart Farming could save cost

Cost savings are substantial in the face of a global food crisis. Because it affects food availability and people's access to nutrition, the global food crisis is a cause for concern (Pratama, 2022). When there is a food crisis, nations must import food to meet their needs. Smart agriculture implementation could reduce some costs (Sari, 2023):

1. Costs associated with fertiliser: By monitoring and fertilising, smart farming can assist farmers in maximising the use of fertiliser. data analysis, cutting down on wasteful spending and fertiliser expenses.
2. Cost of pesticides: Smart agriculture could assist farmers in minimising the overuse of pesticides, which will lower the expense and lessen the harmful effects of pesticides on the environment. This is done by monitoring and forecasting crop conditions.
3. Water costs: Farmers could optimise irrigation water use with the use of smart irrigation technology, which lowers water costs and protects water resources.
4. Labour costs: Smart agriculture could reduce its reliance on human labour by using automation and robotics, which will lower the costs associated with paying workers.

Saves from smart farming implementation and local food diversification are critical in the face of a global food crisis to assist nations in lowering their reliance on food imports and mitigating adverse effects on the environment and society.

Smart Farming does not replace the farmer's profession

The farmer's profession cannot be replaced by smart farming. Smart farming is an agricultural concept that aims to improve crop and livestock production's productivity, sustainability, and efficiency through the use of information and digital technology (Flynn, 2021). Farmers can maximise resource utilisation, boost productivity, and cut costs by implementing smart farming technology. The management of agricultural land and crop care responsibilities by farmers cannot be supplanted by smart farming technology. The

management of agricultural land and decision-making remain largely in the hands of farmers, and smart farming technology does little more than boost agricultural productivity and efficiency (Javaid et al., 2022).

Using smart agriculture requires the involvement of farmers in a significant way. Here are a few of the roles that farmers play in putting smart agriculture into practice (Sari, 2023):

1. Data collection: Farmers can gather information that can be analysed to make better decisions by gathering data from sensors and farm equipment, such as temperature, soil moisture, and nutrient levels.
2. Data analytics: To maximise the use of resources like water, fertiliser, and pesticides, farmers can evaluate data from sensors and farm equipment.
3. Making Decisions: Using information from farm equipment and sensors, farmers can make more informed choices.
4. Farmland management: Farmers are still crucial to crop care and farmland management.
5. Optimise resource utilisation: Farmers can minimise waste and make better use of resources like fertiliser and water.

As a result, farmers are crucial to the application of smart farming and the enhancement of agricultural productivity.

Plantations, horticulture, and food crops are just a few of the food types to which smart agriculture can be applied. The following foods are some examples of how the idea of smart agriculture can be applied (B, Muslim et al., 2022):

1. Rice: By using smart agriculture techniques, rice farmers can increase yield quality and productivity while making the best use of fertiliser and water.
2. Vegetables: By monitoring crop conditions in real time and optimising the use of resources like water and fertiliser, smart farming can help farmers increase productivity and efficiency.
3. Fruit: By using real-time crop health monitoring, smart farming can help farmers maximise resource utilisation and increase productivity and efficiency in fruit production.
4. Plantation crops: By monitoring crop conditions in real time and helping farmers make the most efficient use of resources like water and fertiliser, smart farming can raise crop productivity and efficiency.

Therefore, smart farming is suitable to grow a variety of foods, assist farmers in raising productivity and efficiency levels while lowering production costs.

Countries that implement the concept of Smart Farming

Smart Farming implementation collaboration between Vietnam and South Korea

Vietnam's farming sector contributes 21.8% of the country's GDP, making it a very significant industry. In Vietnam, agriculture uses 80 percent of the country's total water production. Farmers in Vietnam who overwater their plants lose money as a result of their wasteful use of water resources, contributing to this massive water consumption. By applying smart agriculture technology, the Smart Agriculture team hopes to improve the sustainability and efficiency of water use for small-scale farming in Vietnam and overseas (Arizona State University, 2023).

Vietnam is implementing the idea of smart farming into practice through a number of collaborations and projects. Nearly 100 smart agriculture application projects have been implemented throughout the nation in places like Bac Ninh, Hanoi, and Lam Dong. These initiatives make use of cutting-edge digital technologies like blockchain, the Internet of Things (IoT), and artificial intelligence (AI) to give farmers timely access to comprehensive knowledge, expertise, and methods so they can decide more wisely when it comes to trading and production. Furthermore, Vietnam has worked with nations such as South Korea to establish smart farms, which enhance crop productivity and preserve human resources by utilising contemporary technologies (The Anh & Cong Nghiep, 2022).

South Korea and Vietnam have worked together to advance smart farming in Vietnam. The Vietnam Academy of Agriculture is home to the more than 1.2-hectare Korea-Vietnam smart farm. By utilising contemporary technologies, the smart farm maximises crop yield while preserving human resources. South Korea supplied all of the machinery and equipment needed for the Korea-Vietnam smart farm. Additionally, South Korean businesses are collaborating with Vietnamese farmers to develop farming techniques and assist export-oriented manufacturers. From now until 2025, the project will keep growing crops like peppers, tomatoes, and strawberries, register trademarks, and issue food safety certificates for different products. Additionally, the centre will perform data analysis, optimise digital management applications, improve technological workflows, disseminate information, and run training and trade promotion initiatives (Achard, 2023).

In addition, the government has started funding research and development as well as offering training programmes to encourage the use of smart farming technologies. Private businesses, such as startups and tech companies, are also looking into opportunities in Vietnam's smart farming market and providing farmers with products and services. These initiatives demonstrate Vietnam's dedication to using smart farming to overcome obstacles in its agriculture industry and enhance global food security. The following are the goals of Korea and Vietnam's collaboration in the development of smart agriculture (Hau, 2023):

1. Enhance effectiveness and productivity: In Vietnam, smart agriculture is becoming more and more popular, and the government has been trying to encourage farmers to use this technology. Vietnam wants to increase the agricultural sector's efficiency and productivity by incorporating smart agricultural technologies.
2. Reduce the risk of loss: Real-time monitoring and prediction of crop conditions by smart farmers enables them to promptly address issues and lowers the risk of losses brought on by pest attacks.

3. Simplify financial management: Farmers can more efficiently manage their finances, including human capital, by implementing smart farming practices. This can lower production costs and increase the sustainability of agriculture.
4. Enhance product quality: Vietnam can anticipate and monitor crop conditions with the help of smart agricultural technology, which maximises the use of resources like pesticides, fertilisers, and water. This can lower the chance of loss and enhance product quality.
5. Increasing competitiveness: Vietnam can produce higher-quality, more ecologically friendly agricultural products by utilising cutting-edge technology, which will make it more competitive in the global market.

The primary goals of Vietnam and Korea's cooperation in the development of smart agriculture are to improve financial management, lower the risk of loss, enhance productivity and efficiency, and become more competitive in the global market.

South Korea supplied all of the machinery and equipment needed for the Korea-Vietnam smart farm. The smart farm adapts cutting-edge Korean smart farm management technologies to Vietnamese conditions, such as greenhouse cooling. Smart agriculture depends entirely on greenhouse cooling, particularly when it comes to controlling the environment in which plants grow. Greenhouses can regulate temperature, humidity, and sunlight with the use of cooling technology. These factors affect the amount of water needed for irrigation, fertilisation, and pest control.

This improves agricultural productivity and efficiency while lowering the need for manual or repetitive labour. Furthermore, using greenhouse cooling systems can contribute to a decrease in greenhouse gas emissions, which will promote environmental sustainability (Do, 2023). Many more procedural technologies, such as the Internet of Things (IoT), sensors, robots, and data analytics, are also supplied by South Korea for the implementation of smart agriculture in Vietnam.

According to a spokesman for the digital transformation centre, strawberries, peppers, and tomatoes have been planted in 5,700 square metres of greenhouses that have been built using South Korean technology. In addition to developing the ViKo-Farm brand, the centre has scheduled two long-term courses and six short-term training sessions for over 150 students. The farm attempts to showcase a smart farming idea that applies cutting-edge, South Korean-developed smart farm management technologies and customises them for Vietnamese conditions (Do, 2023).

Viko Farm is a company or product associated with smart farming. It is brought up in relation to Vietnam's smart farming initiatives, especially those in Da Lat. The ViKo-Farm brand is linked to a smart farming model that makes use of cutting-edge technologies in smart farm management. This includes growing a variety of crops, including tomatoes, peppers, and strawberries, registering trademarks, and obtaining food safety certificates for the products.

The premium organic fertiliser manufactured by VIKO FARM is one of the products that the company produces. This organic fertiliser is composed of (35%) organic matter. It contains (3%) total nitrogen to assist increase protein content and speed up the growth of fruits and vegetables (Tajer, 2016). Then contain (2%) effective phosphorus to control protein synthesis (International Plant Nutrition Institute, 1999). And contain (30%) moisture to keep plants healthy because plants become stressed out in extreme humidity conditions, which could threaten their survival (Parent, 2023).

This organic fertiliser serves the following functions (Nguyen, 2023):

1. Suitable for all kinds of plants
2. For plants to grow as healthily as possible, add trace, organic, inorganic, and direct elements.
3. Assists in the growth of robust stems, deep green leaves, and strong roots in plants, all of which enhance the quality of agricultural output.
4. Enhances resistance to weather, aids in long-term, steady plant growth, and uses less chemical fertilisers.
5. Soft floor renovation and restoration.
6. Encourages concurrent fruiting and flowering plants.
7. Sufficient supplementation of 100% active ingredients will enable plants to reach their maximum efficiency and productivity.

In order to increase production efficiency, Viko Farm strives to assist farmers in making the best use of resources like water, fertiliser, and pesticides. Furthermore, smart agricultural technology lessens the chance of damage from pest attacks, forecasts crop conditions, and reacts swiftly to new issues. Therefore, increasing agricultural production efficiency can be facilitated by implementing smart agricultural technology into the Viko Farm brand (Hau, 2023).

Conclusion

Smart farming is a development economic innovation that uses cutting edge technology in the agriculture sector to address the world food crisis. Smart farming improves farming's productivity, sustainability, and efficiency by utilising sensors, artificial intelligence, and weather monitoring. Smart farming helps ensure more stable prices, more reliable food supply, and higher-quality products by diversifying production, optimising resource use, and improving supply chain transparency.

Smart farming maximises the use of resources like water and fertiliser, minimises waste, and builds a more sustainable agricultural system by utilizing sensors, GPS technology, and artificial intelligence. Other benefits include increased product quality, food safety, and production diversification, which guarantee a varied and high-quality food supply for consumers. All things considered, smart farming is a way to boost agricultural output while also promoting economic growth and global food security.

The Smart Farming programme requires the following in order to be used correctly and appropriately: industry partnerships, digital infrastructure development, affordable technology accessibility, farmer education and training, monitoring and evaluation systems, continuous innovation, community awareness, and farmer empowerment. These actions will encourage the use of sustainable, efficient, and smart farming practices.

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