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Smart Agriculture as a Solution to Climate Problems in Indonesia

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Abstract
Climate change is a natural phenomenon that cannot be avoided at this time due to globalization. The effects of climate change as a result of globalization make weather changes that are pretty extreme and affect several sectors of daily life. The vital sector that is affected and can disrupt national food security is the agricultural sector. From the existence of climate change and uncertain weather changes, mitigation and anticipation must be carried out for all risks, such as making irrigation, Sibel wells or deep wells, and planting methods that are more modern and less dependent on the weather. Climate change risk that is not minimized can impact national food security due to crop failure. In addition to the consequences of climate change and weather, food security is also affected by the population growth rate. However, it can be anticipated with appropriate measures to maintain national food security, such as the provision of subsidized fertilizers coupled with the use of modern technology that can help the agricultural sector to be more productive, efficient, and practical, or through intelligent agriculture as a solution in adapting to an uncertain climate.

Keywords: Climate Change, Agriculture, Smart Agriculture, Industrial Revolution 4.0

1. Introduction
Climate is one of the problems in the agricultural sector. Climate change is a threat to the national food supply. During the last century, the earth's temperature has increased by about 0.8°C due to the increase in temperature affecting rainfall in maritime areas, one of which is Indonesia. Greenhouse gases, industrial gases, methane, and carbon dioxide result from modernization, driving deforestation. Climate is also very influential in the agricultural food sector in the future. Extreme weather and natural disasters such as floods/droughts are climate impacts that have changed so much that they become challenges for the agricultural sector. To overcome these problems, it is necessary to take an active role from various parties to anticipate the impact of climate change through Smart Agriculture.
Indonesia is entering a new industrial development stage marked by the use of industrial technology in various fields of life. In revolution 4.0, the agricultural sector carried out the "Smart Farming Precision Agriculture" method, divided into two: Precision Agriculture and Smart Farming. Smart Farming precision agriculture combines an Internet of Things (IoT) based platform with agricultural tools and machinery so that it is no longer controlled conventionally. The uses of technology, such as the Sprayer Drone (crewless aircraft). have to walk through the land, can be controlled remotely, and can cover an area of 5 hectares in 1 hour. The CI Agriculture is a local agricultural startup based on the Internet of Things (IoT). This tool is used to collect data on land, such as weather anomaly data, nutrient status, and soil conditions, as well as from satellite and drone imaging.
The data obtained will then be examined to produce accurate and up-to-date information to help farmers make decisions in production. With the existence of Smart Agriculture in Indonesia, it is hoped that farmers can cultivate their agricultural land as well as possible to achieve sustainable food self-sufficiency.

2. Literature review
Rachmawati's research (2021) [17], published in the Journal of the Agro-Economic Research Forum, discusses Indonesia's preparations for a population surge as predicted by FAO, which says that the world's population will reach 9.6 billion, and agricultural production must increase by 70% in order to meet food needs.
On the other hand, labor in agriculture not only in Indonesia but also in Indonesia is vulnerable to the emergence of the aging farmer phenomenon, when most of the farmers consist of the old age group. Therefore, Smart Farming is here to help elderly farmers in managing agricultural land.
Smart farming is a method based on Artificial Intelligence (AI). Smart farming is part of the Agricultural Revolution 4.0,

namely the Internet of Things, Artificial Intelligence, human-machine interfaces, robotic and sensor technology, and 3D printing technology are the drivers for the development of agricultural innovation. The robotic technology used by Rahmawati in this study is an autonomous machine such as a drone that has been modified for agricultural cultivation purposes, such as distinguishing plant diseases based on physiological appearance to take appropriate action in applying pesticides.

Pesticides can be hazardous if they come into direct contact with humans, either on the skin, inhaled, or in the eyes. Symptoms that arise due to pesticide contamination can include dizziness, nausea, seizures, fainting, and even death. Therefore, using drones to apply pesticides can reduce the risk of contamination. A drone sprayer is an uncrewed aircraft that works according to the pattern desired by the farmer. The pattern can be made through an android device and assisted by GPS.

Another use of drones is to help farmers map plantation land and rice fields, and then they can count palm trees, map project areas, settlements, and even cities. Drones can perform various activities only by air without needing to go to high places or ride a helicopter.

In addition to drones, other technologies discussed in this study are the use of soil and weather sensors (soil and weather sensors) that can detect temperature, soil moisture, soil acidity (pH), soil electrical conductivity (EC), average humidity on air, air temperature, cardinal speed and direction, and rainfall to determine appropriate action on the soil.

Regarding agriculture, irrigation is one of the crucial components in supporting smooth irrigation. (Rachmawati, 2021) [17] feels that conventional irrigation used by farmers can waste some of their time just irrigating agricultural land, so it is ineffective if used in large areas.

\The Agricultural Research and Development Agency has developed an intelligent irrigation system (Smart Irrigation). This system automatically has a remote watering feature and can be controlled even if the user is not at the farm location. Smart Irrigation is similar to drone technology. The difference is that the drone work through the air, and the user controls the drone. While Smart Irrigation works over land, in other words, this technology is installed along agricultural land, so there is no need for direct user control.

To be able to control Smart Irrigation, users can access a microcontroller that is connected to a web server and monitor data online through the website www.smart farming.litbang.pertanian.go.id

3. Methodology

The method is a series of processes used by almost all researchers to collect data. Methods can also be generalized techniques accepted or applied in practice or another discipline field (Hebert Bisno: 1968). This method concerns how the work is used to understand the object or focus of the study, which is the related science research goal. This methodology is a mechanism or method of action based on specific rules and a predetermined and limited context. This methodology clarifies a paradigm in the research context and shows the existence of the natural world, which is empirically clear, objective, and can be studied.

In this research and writing, the researcher uses a descriptive methodology coupled with a qualitative approach using secondary data and literature review. In studying the problems or impacts resulting from climate change carried out by the community and knowing more about the aims and objectives, extensive facts and sources are needed to conclude material to describe the problems discussed and assisted by a qualitative approach using secondary methods through studies. References.

Research on the impact of climate change on the agricultural sector and its solutions in the concept of food security is not only about knowing and paying attention to the affected sectors, and how solutions must be carried out through research and which parties should be involved in tackling the effects of climate change with intelligent farming in Indonesia. The modern era 4.0 or the industrial era as it is today. This research will focus on research sources from journals, theses, documents, and articles. The author tries to dig up information about how the development of agricultural infrastructure from the past to the present, then the development of government bureaucracy in the agricultural sector, then the effects of globalization on the agricultural sector that are felt through climate change, and then solutions to adapt to climate change through smart farming.

This study is qualitative research, so the main goal is to find the relationship between variables with other variables, or it can also be called causality (cause and effect). Data were collected using two data sources, namely primary and secondary. Primary data is directly sourced from the public through interviews or questionnaire methods. In contrast, secondary data is data that is taken indirectly, such as sources of literature, books, documents, and journals.

From the steps that have been carried out, the researcher analyzes the facts and data that have been collected. Here the researcher tries to explain by using interpretation-based analysis stages, namely reducing data, choosing main and important things, and separating essential and unimportant things from the study results. By doing this, the reduced data will produce or provide sufficient explanations and descriptions, making it easier for researchers to collect further data. From this viewpoint, a researcher must examine the hypothesis with what has been found in the field.

4. Results and discussion

4.1 Conventional Farming System

The agricultural system in the world globally has undergone many changes or evolutions throughout the centuries caused by advances and developments in increasingly sophisticated and modern technology and is influenced by increasing human knowledge. Historically, from hunting and gathering food, the agricultural system developed into primitive and traditional agriculture and turned into modern agriculture.

The beginning of traditional agriculture was marked by the presence of several people who started farming in one location and settled down. Traditional farming systems are agricultural systems that are still very simple and extensive, never using and maximizing technology, chemical fertilizers, and pesticides. Thus, agricultural yields in traditional systems only depend on soil fertility, soil topography, availability of water and irrigation, and climate. Farmers who use traditional farming systems have problems with a high dependence on natural conditions. Due to increasing population development, traditional agricultural systems are erratic, so the products produced sometimes cannot meet the population's food needs.

From the various obstacles faced when farmers use traditional farming systems, conventional farming systems emerged and developed, better known as modern farming systems. Advances in science also influence humans to manipulate ecosystems to meet their survival. With the rapid increase in population, more and more resources are needed.
Conventional farming systems are agricultural systems that still use extensive methods and do not use and maximize existing inputs. Conventional agriculture relies on inputs from unnatural or inorganic products, such as chemicals, to drive production. Sutanto (2002) explains that modern agriculture or inorganic agriculture uses high-yielding varieties for high yields, chemical pesticides, chemical fertilizers, and agricultural machinery to cultivate the soil and harvest the produce.
A change followed this changing face of agriculture in the face of our agricultural land, which is becoming increasingly critical as a negative impact of the use of inorganic fertilizers, pesticides, and herbicides as well as intensive agronomic actions in the long term (Anonymous, 2010). Because of the intensive and continuous use of chemicals in agricultural production, pesticides and herbicides are the most widely used materials. In conventional agriculture, the resilience of production only lasts in the short term, and it causes a country to be very dependent on imports because the availability and sustainability of agriculture are ignored. Productivity in conventional agriculture is preferred. It is because farmers only focus on cultivation without thinking about sustainable factors.
The " Green Revolution " strategy to modernize the agricultural sector from traditional to agriculture based on advanced/modern technology is known as the “Green Revolution." The green revolution aims to increase agricultural productivity through research and development of agricultural technology to produce superior varieties. It is done to answer the challenge of food insecurity due to the rapidly increasing population. Modern agriculture (green revolution) has brought rapid progress to agricultural development. This system has succeeded in changing the face of world agriculture, including Indonesia. There has been a significant increase in agricultural production in recent decades due to the green revolution.
In Indonesia itself, the phenomenon of the green revolution began to be applied during the reign of President Soeharto, at which time Indonesia succeeded in achieving self-sufficiency in rice. The green revolution process in Indonesia applies four essential things: an irrigation system for water providers, optimal use of fertilizers, pesticides based on the level of pest attack, and the use of quality planting materials such as superior varieties. Conventional farming methods harm the balance of the ecosystem. The imbalance in the ecosystem causes many losses for farmers and the environment, especially long-term losses. One of the main ones is the dependence of Indonesian agriculture on new technologies, most of which are imported from other countries. Whether we realize it or not, this condition will hinder achieving food sovereignty in Indonesia.
Behind its success, it is undeniable that the green revolution also harms the environment. The widespread use of inorganic fertilizers, pesticides, and herbicides and the intensive exploitation of land in the long term brings consequences in the form of environmental damage, ranging from soil, water, air, and living things. The use of synthetic chemicals has implications for the destruction of soil structure and the destruction of soil microbes so that from day to day, our agricultural land is becoming increasingly critical (Bendang, SPI). Modern agricultural practices that are carried out unwisely result in environmental pollution, poisoning, disease, and death of living things, which can lead to disaster and catastrophe (Tandisau and Herniwati, 2009).
Along with the increasing awareness of environmental sustainability, the green revolution has received criticism from various circles. Not only causing environmental damage due to technology that does not look at the established rules, but the green revolution also creates economic injustice and social inequality. Economic injustice arises because of monopolistic practices in providing agricultural production facilities, while social inequality occurs between farmers and communities outside farmers (Sahiri N, 2003).
These dynamics encourage the emergence of ideas to develop an agricultural system that can last to the next generation and does not damage nature. In the last two decades, the concept of sustainable agriculture has developed, which is an implementation of the concept of sustainable development. Sustainable agricultural development aims to increase the income and welfare of the farming community at large through an increase in agricultural production that is carried out in a balanced manner by taking into account the carrying capacity of the ecosystem so that production sustainability can be maintained in the long term by minimizing environmental damage (Fadlina *et al*., 2013: 44).
With modern agriculture, farmers are not independent. The government has determined all the farmers' needs; even the price and sale of grain were determined. Even farmers are forced to grow one type of rice. In modern agriculture, all farming activities are carried out simultaneously so that later they will produce harvests simultaneously. In modern agriculture, the government determines all agricultural programs and stages; even planting capital is lent by the government. As a result, all agricultural land is used to grow one type of crop. Farmers do not have the right to plant varieties different from those required by the government. Modern agriculture is feared to have a polluting impact that endangers environmental sustainability. It is seen as a current agricultural crisis.

4.2 The entry of science and technology into agriculture

The application of innovation in rural areas of Indonesia, including in Bogor Regency, is closely related to the implementation of extension services. At the district level, it is carried out by the Extension Implementing Agency (UU No 16 of 2006), and in Bogor Regency, this agency is called the Food Security and Forestry Agricultural Fisheries Extension Agency (BP5K). At the sub-district level, the extension is organized by the Forestry Fisheries Agricultural Extension Center (BP3K).
Field extension workers are essential in introducing agricultural technology innovations to farmers. The role of extension workers is not only to introduce technology to farmers but also to increase farmers' capacity to run their businesses independently. Capacity is an aggregate of abilities and competencies, which includes adaptive capacity, the ability to perform functions, solve problems, and plan and evaluate a business. The level of a person's capacity will determine his or her independence. The higher

the capacity level, the higher the level of independence.

The agricultural technology innovations applied in the two research villages are different because the agro-ecosystems in the two villages are also different. The land cultivated by respondents in Benteng Village is in the form of dry land, namely dry fields with types of secondary crops, horticulture, and medicine, while in Cibeber I Village is rice fields with the main crop being rice.

Not many technological innovations were applied in the two research villages. In Benteng Village, plant cultivation is only in the form of an intercropping system and the use of polybags as a planting medium, fisheries in the form of seeding, and processing of agricultural products in the form of processing machines. In the intercropping system, farmers plant two or more types of secondary crops or horticulture on one plot of land, For example, long beans with cucumber and cassava with chili. The advantages of intercropping or double-cropping include reducing the number of pests because plant pests do not like intercropping plants (Agrotani 2016). Economically, intercropping increases farmers' income and reduces the risk of loss from crop failure of one crop.

Fish hatchery innovation technology known by farmers in Benteng Village is the use of superior broodstock and broodstock spawning, although not all fish farmers have implemented this innovation. In general, fish cultivators use broodstock not superior but the result of selection from their harvest. In general, fish hatchery carried out by fish farmers in Bogor is done traditionally (Fatchiya, 2010) [6].

In processing agricultural products, respondents have used machines previously done manually with traditional tools, such as cassava and sweet potato cutting machines, instead of manual knives, so that the work becomes more accessible and faster with higher quality results.

The technological innovation applied to rice farming in Cibeber I Village is used jajar legowo system, while the Rice Intensification System (SRI), which has become a world agricultural trend as well as organic farming, is not yet known by the farming community. The jajar legowo system was intensively introduced by agricultural extension workers to farming communities in Cibeber I Village. Farmers were introduced to a specific spacing pattern with straight rows, with the main aim of increasing input use efficiency, facilitating work mechanisms, and increasing rice productivity. Through jajar legowo, rice productivity can increase between 14 to 30 percent per hectare (BBPP Ketindan 2016)

The level of application of the agricultural technology innovation by the respondents is quite good, although not many technological innovations exist. It can be seen in the majority of respondents stating that they always apply innovation, which is 77.5% in Benteng Village and 92.5% in Cibeber I Village. Based on the adoption level, Cibeber I Village is better than Benteng Village. The percentage of respondents in Cibeber I Village who always apply is high, and no one stops implementing the jajar legowo innovation. On the other hand, in Benteng Village, some adopters stopped adopting them. One of the reasons respondents stopped adopting technology was that the selling price of the product did not differ between those using the new or old techniques.

Lippitt (1969) [10] states that nine situations make people resistant to change, namely (1) when the purpose of the change is not clear, (2) when the community is not involved in planning, (3) when the call is not based on personal reasons, (4) when people's norms and habits are ignored, (5) when communication to change very bad; (6) when there is a fear of failure, (7) when the costs are too expensive or not worth the benefits, and (8) when the existing situation is satisfactory, then an extension agent or reform agent needs to take a more intensive approach to this community so that they can explore the "psychological conditions" felt by them which can later be used to make changes in behavior from a traditional farmer to an "entrepreneur" farmer.

According to Rogers and Shoemaker (1993), a person accepts or rejects innovation through the stages of the decision-making process, namely (1) the knowledge or introduction stage, where the target knows about the innovation and has obtained an understanding or perception of how the innovation functions; (2) the persuasion stage, where the target forms an attitude of agreeing or disagreeing with the innovation; (3) the decision stage, where the target is involved in activities to implement or not to implement; (4) the implementation stage, where the target applies in the field what has been his decision; (5) the confirmation stage, where the target, in this case, seeks strength for the decisions that have been taken in implementing or rejecting the innovation. This statement means that in adopting farmers, primary considerations are considered correct, excellent, and appropriate for themselves and the surrounding environment. Farmers still need consideration and validation from other parties, both individually and institutionally, regarding the feasibility of innovation.

The adoption process can occur without sequentially following the stages, meaning that the innovation adoption process occurs so quickly as if it jumps to the condition of understanding or being aware of directly implementing it without careful consideration. On the other hand, some stages stop at a state of interest without continuing to the next stage, namely trying and assessing until applying.

Progress and development in any field cannot be separated from technological progress. The agricultural revolution is driven by the invention of machines and new ways of agriculture. If there is no change in technology, agricultural development will stop. Production stops, and the increase can even decrease due to declining soil fertility or increasing damage by pests and diseases that are still rampant. Examples of technological innovations in agriculture are sensor technology and automation technology.

First, sensor technology can provide concrete and real-time data to farmers. The sensor technology is currently being developed for plants that use drones to obtain various data, such as the growth of pests, diseases, and other problems. This technology is widely developed in horticultural crop farming on a large scale. With this technology, pesticides and other chemicals can be more targeted and efficient, thereby reducing the negative impact on the environment. The application of automation like this is still relatively simple for both technologies. Nevertheless, a more complex automation system has been developed in the Netherlands.

Aldert Van Henten developed detection technology and automatic harvesting tools for pears, bananas, peaches, and bananas at Wageningen University, the Netherlands. This tool can detect levels of chlorophyll and anthocyanin pigments through a device embedded in the observed fruit. In addition, this tool is also equipped with a color combination detection camera (RGB) to detect color depth so that the size of the fruit can be known. After the data

shows that the fruit is ripe, the tool will harvest the fruit in just two seconds. In addition, all data on fruit and plant health, maturity level, and other statuses will be integrated into the smartphone so that it can be monitored in real-time. With this technology, efficiency will be significantly increased, and punctuality at harvest time will be more maintained.

The application of innovation in rural areas of Indonesia is closely related to the implementation of extension services. Field extension workers are essential in introducing agricultural technology innovations to farmers (Pranadji, 2016) [15]. The role of extension workers is not only to introduce technology to farmers but also to increase the capacity of farmers to run their businesses independently.

4.3 Development in Indonesia

Smart farming technology is arguably a new technology that requires many funds to be developed. Smart farming is a new job for agricultural machinery companies that will develop intelligent farming technology to make applications and equipment easy to use and more interactive for farmers. When viewed from other countries, the success of implementing smart farming cannot be separated from the intervention of startups in the agricultural sector. Many agricultural startups in Indonesia can be a supporting factor in advancing smart farming 4.0.

The main supporting factor for farmers to want to implement an intelligent farming system is the stigma that smart farming can increase productivity and better product quality and reduce production costs. Unfortunately, other things, such as increasing the comfort of working for farmers and preserving the environment, have not been the main drivers for farmers to want to use smart farming. The potential of smart farming to mitigate the effects of climate change does not affect farmers because the main focus of farmers is how much profit they can get when using technology (Pivoto *et al*., 2019) [14].

Increasing human resources is the main factor in developing smart farming. Encouraging farmers to adopt digital technology and mobile devices in agricultural practices has become a significant policy in this country. In addition, policymakers and research institutions should focus on increasing market access to intelligent farming technologies. In addition to farmers, agricultural extension workers as the front line in dealing with farmers can provide impetus to assist farmers in making operational and strategic decisions. Therefore, extension workers also need training and need to get the main focus (Callum Eastwood *et al*., 2019) [4].

The Ministry of Agriculture and Higher Education collaborated in designing a series of intelligent farming training programs to develop human resources aimed at giving trainees a positive attitude and practical competence, as well as increasing knowledge about smart farming. There are four types of training: an overview of smart farming, field visits and training, international visits and training, and individual technical training. In this activity, participants with a higher level of knowledge will think about the importance of adopting innovative technology and better abilities in applying smart farming and vice versa (Chuang *et al*., 2020) [3].

The collaboration between the Directorate General of Disadvantaged Regions (Ditjen PDT), the Ministry of Villages PDIT, and the Situbondo Regency Government, East Java, has tested smart farming 4.0 in Battal Village, Panji District. The technology comes from PT Mitra Sejahtera Build the Nation (MSMB), an Android-based RiTz Agricultural Technology Company. Now, agriculture can penetrate the agricultural sector and attract young people to farm. An increase in agricultural productivity is expected to increase the area's potential (MSMB 2018).

Kemendes PDTT has compiled a Smart Farming 4.0 roadmap starting from (i) testing the deployment of drone sprayers in corn fields in Sleman Regency and checking soil and weather sensors in rice fields in Wonogiri Regency, (ii) Sumbawa Regency, testing the use of drone spray and soil and weather sensors. (iii) East Sumbawa Regency tested spray drones and soil and weather sensors in the rice fields. (iv) Situbondo Regency implemented Smart Agriculture 4.0 and the use of tools (Sprinkler drones, soil and weather sensors, and water discharge sensors), (v) Tabanan Regency has tested the use of tools (Sprinkler drones, soil and climate sensors, and drone monitoring) (Dirjen PDTT 2019). These techniques help create precision agriculture by using satellite imagery and other technologies (such as sensors) to observe and record data to minimize costs and conserve resources while increasing production yields.

In 2020 the Ministry of Agriculture will create policies & ways to claim food security. The focus is on implementing 5 Ways of Action (CB), namely 1) increasing production capacity by using accelerated planting of MT II rice covering an area of 5.6 million ha, developing human swamps in Central Kalimantan covering an area of 164,598 ha, Expansion of New Planting Areas (PTAB), & increasing sugar production, beef, and garlic to reduce imports, 2) diversify local food and use home gardens through Sustainable Food Courts (P2L) events for 3,876 groups, 3) strengthen food reserves and logistics systems to stabilize food supply and prices, 4) develop The latest agriculture, such as smart farming, the development and use of screen houses, the development of food estates, the development of farmer corporations, 5) the 3-time export movement (gratieks) is the government's effort to not only boost production in the country but also become one of the businesses to generate foreign exchange.

The specific strategy that the government can do for smart farming is the first strategy is to create a mindset for farmers about the importance of using artificial intelligence (AI) and the digitalization of technology. The opinion of farmers who object because they feel smart farming is difficult to do and requires significant rules and old times must be changed immediately. The submission of information on the achievements of farmers who have previously implemented smart farming is significant in increasing the speed of smart farming implementation. The second strategy is to increase the human resource capacity of farmers using capacity building so that they can adopt & use artificial intelligence & other advanced digital technologies, such as blockchain & Internet of things (IoT), correctly. The third strategy is to implement smart farming in countries as much as Indonesia, it cannot be done at once, but it must gradually use obvious targets and decide which areas will be priorities. The fourth strategy is to implement smart farming that must be built using human resources and technology based on the country itself, for example, the technology established by the Agricultural Research and Development Agency, LIPI, BPPT, or various private universities consultants. Using human resources and technology-based from competent countries will create a port for implementing smart farming

as cheaper and more affordable. Cooperation using related stakeholders or internet providers is one solution to overcome this (Arkeman, 2021).

The initial step towards smart farming 4.0 was marked by the emergence of Minister of Agriculture No. 18 of 2018 concerning Guidelines for the Development of Farmers' Corporation-Based Agricultural Areas and regional competitiveness maps. Their targets are to form agriculture based on eco-regional characteristics. It can be a way to develop and implement eco-regional-based agricultural development policies and programs. The aim of the Ministry of Agriculture No. 18 of 2018 is to 1) increase the added value and competitiveness of regions and agricultural commodities for the sustainability of national food security, 2) strengthen the whole farming business system in one regional management, 3) strengthening farmer institutions to access information, technology, infrastructure, and public facilities, capital and management & marketing.

5. Conclusion

One of the other natural impacts that are no less competitive is the adverse impact that affects rainfall in the maritime area, one of which is Indonesia, and this has been proven by the number of rivers overflowing due to high rainfall and drought in Indonesia also competing to use new technology. It results in the latest accurate information and helps farmers make production decisions, promises that agriculture will achieve sustainable food self-sufficiency. Climate change has many destructive impacts, and one of the significant impacts is on the food agriculture sector.

The agricultural system in the world globally has undergone many changes or evolutions throughout the centuries caused by advances and developments in increasingly sophisticated and modern technology and is influenced by increasing human knowledge. Also, the agricultural system has evolved with modern and sophisticated technology development. With the traditional system, which is still very simple, under these circumstances, the product is erratic, sometimes unable to meet the population's needs.

Another system that is no less important is the conventional system. This system works to input products that are not natural or inorganic. These results prove that they can cultivate the soil and harvest the produce. Dependent on imports. In this case, the green revolution needs to be planted to increase productivity that produces superior varieties. The system changes the face of world agriculture. In the last decade, there has been a considerable increase in agricultural production due to the green revolution and the existence of Smart Farming. It can increase productivity and better product quality, and reduce production costs.

Human resource development is the main factor in developing Smart Farming. Therefore, the Ministry of Agriculture and Higher Education work together to provide an understanding of Smart Farming. So that it becomes the choice of the affected sector to choose a modern system that does not depend on the climate. To overcome this, it needs an active role from various parties to anticipate the impact of climate change through Smart Agriculture. Indonesia is entering a new stage of industrial development. All competing using industrial technology produce the latest accurate information and help farmers make production decisions, promises that agriculture will succeed. It is hoped that the inclusion of science and technology in agriculture will make changes in the agricultural sector and improve food quality in order to achieve food self-sufficiency and sustainability for farmers in Indonesia.

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