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# CLIMATE CHALLENGES AND AGRICULTURAL DEVELOPMENT POTENTIAL IN INDONESIA

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## ABSTRACT

The type of qualitative research through the phenomenological approach, as well as the results showed that climate issues are a very important problem because associated with agricultural plants, the impact of climate change has also led to Occurrence of changes in the amount of rain and rain patterns that resulted in early shifts in season and planting period. The decrease in rainfall has decreased the potential of a period of rice planting time, the impact of rain pattern changes including the time and season of planting, planting patterns, land degradation, crop damage and productivity, area of planting and harvest area, and Changes and damage to biodiversity. Climate change has an impact on agricultural dissenting, so that if this change continues the earth will be dry until the food is reduced. Indonesia is an archipelago and in the region of the equator is highly vulnerable to climate change in the sea water rise, and the air temperature and drought as serious impact faced in Indonesia.

**KEYWORDS:** Agriculture, climate, weather, condition, change.

## 1. INTRODUCTION

Agriculture sector in Indonesia is the backbone of the economy and national development, it can be seen in the formation of GDP, the acceptance of foreign exchange, absorption of manpower, provision of food, and the provision of industrial raw materials. The agricultural sector also plays a role in developing development through poverty alleviation and public income improvement. In addition, the agricultural sector has also become one of the nation's cultural forming and the balancing of ecosystems.

With the vast land that is neatly arranged by thousands of islands that exist as a stipulate that our country is an agrarian country. It is undeniable, but it is the source of livelihoods of about 60% of its people who then become one of the rill sectors that have a very real role in helping foreign exchange income.

Indonesia's agricultural potential include:
1. Biodiversity and Agro ecosystems
Indonesia has the potential of natural resources, including germless, the abundant (mega biodiversity). Indonesian inland biodiversity is the second largest number two in the world after Brazil, whereas when including the biodiversity of the sea then Indonesia is the largest number one in the world. This can be seen with various types of agricultural commodities such as food crops, horticultural, plantations and farms that have long been cultivated as a source of food and income of society. Biodiversity is supported with a spread of geographic conditions in the form of lowland and high, sunlight and precipitation that is almost evenly distributed throughout the year in some regions, and the diversity of soil types allows The cultivation of various types of crops and livestock native to the tropics, as well as an introduction commodity from sub-tropical regions evenly throughout the year in Indonesia.

2. Agricultural land
Indonesia has the potential to availability of large enough land and has not been utilized optimally. Data from the academic study conducted by the Directorate General of Land and Water management, Ministry of Agriculture in 2006 showed that the total area of Indonesia's land was 192 million ha, divided into 123 million ha (64.6 percent) was Cultivation area and 67 million ha the remainder (35.4 percent) is a protected area. From

ISSN: 2277-9655
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CODEN: IJESS7

the total area of cultivation, potentially for the agricultural area of 101 million ha, covering an area of wetlands of 25.6 million ha, dry land of crops of approximately 25.3 million ha and dry land annual plant 50.9 million ha. Until now, from the potential area for agriculture, which has been cultivated to be a farm area of 47 million ha, so there are still remaining 54 million ha that is potentially for expansion of agricultural areas. The amount of forest, river, swamp and lake as well as high and uneven rainfall throughout the year is actually a natural potential to meet the needs of agricultural water when managed properly. Reservoirs, dams, and other groundwater and surface water are potential to support agricultural business development.

The global climate change is due to the increase in greenhouse Gas (GHG) emissions due to various activities that drive an increase in earth temperature. Considering that climate is a key element in plant metabolic and physiological systems, the global climate change will adversely affect the sustainability of agricultural development.

Indonesia as an island country located in the equator area including areas that are highly vulnerable to climate change. Changes in rainfall patterns, sea-facing hikes and air temperatures, as well as increased incidence of extreme climates in the form of floods and droughts are some of the serious impacts of climate change facing Indonesia.

Climate change has caused some disasters that have the possibility to become worse in the future. Using the assumption of temperature increase in Indonesia between 0.40-30 C in 2030 and 0.90-40 C in 2070, it proved that climate change due to the earth will negatively reduce agricultural production and welfare level between 2.5-18 Percent per year.

Some recent discoveries began to clarify climate influence on agricultural production. The influence on agricultural production can be caused at least by its influence on crop productivity, crop destruction organisms, and soil conditions. Climate and weather are the main determinants for the growth and productivity of food crops. Agricultural productivity changes significantly from year to year. The drastic change in weather, more influential to agriculture than the average change. Plants are very sensitive to weather changes that are temporary and drastic. Weather differences between the years is more influential than the projected climate change (Munawar, 2010).

**Problems**
How climate change and agricultural development potential in Indonesia ?

## 2. THEORETICAL BASIS

**A. Theory of Rice Crop**
Rice plants are a staple plant for life purposes, but they have to face various challenges and obstacles. Both physical, social/economic and biological, which threaten the success of Production, 1. One that causes farmers to fail crops is a very important biological constraint is the presence of various species of organisms, which are usually called plant destruction organisms (PEST) that attack the cultivation plants so that it can resulting in decreased quality and quantity of production, or even natural panen2 failure. In the event of an explosion, there is a need for routine observation, forecasting and control ways that correspond to the concept of PHT, 3. Planting rice fields has been ingrained for most farmers in Indonesia. Initially this activity was much cultivated on the island of Java. However, nowadays almost all regions in Indonesia already familiar with rice planting activities in the rice fields. The rice planting system in the rice field is usually preceded by the perfect processing of soil while the farmers do the nursery. At first the rice field was hijacked, piracy can be done by machine, buffalo or through the grafted by humans. After being flowed, the ground was left for 2-3 days. However in some places, the ground can be left for up to 15 days. Next the land is crushed by ploughed again a second time or even the third time 3-5 days before planting. After that the seeds of the seedlings are planted by the processing of rice fields as above (which is often called perfect soil processing, intensive or conventional) many of the weaknesses arising water use in the rice field is wasteful. But water availability is increasingly

limited. In addition to piracy and the ordinary land-feeding done by farmers turned out to cause a lot of fine soil grains and nutrients carried water irrigation. It is less good in terms of environmental conservation.

ISSN: 2277-9655
Impact Factor: 5.164
CODEN: IJESS7

Rice is a plant that needs water quite a lot for his life. Indeed, this plant is classified as semi aquatic suitable planted in a flooded location. Usually rice is planted in rice fields that provide sufficient water needs for growth. However, rice can also be cultivated in dry land or fields. The term is Go go Rice. But the water needs must be fulfilled. Rice is a vital staple food raw material for the Indonesian people. Planting rice fields has been ingrained for most farmers in Indonesia. Initially this activity was much cultivated on the island of Java. However, nowadays almost all regions in Indonesia already familiar with rice planting activities in the rice fields.

The rice planting system in the rice field is usually preceded by the perfect processing of soil while the farmers do the nursery. At first the rice field was hijacked, piracy can be done by machine, buffalo or through the grafted by humans. After being flowed, the ground was left for 2-3 days. However in some places, the ground can be left for up to 15 days. Next the land is crushed by ploughed again a second time or even the third time 3-5 days before planting. After that the seeds of the seedlings are planted by the processing of rice fields as above (which is often called perfect soil processing, intensive or conventional) many of the weaknesses arising water use in the rice field is wasteful. But water availability is increasingly limited. In addition to piracy and the ordinary land-feeding done by farmers turned out to cause a lot of fine soil grains and nutrients carried water irrigation. It is less good in terms of environmental conservation. Rice is a plant that needs water quite a lot for his life. Indeed, this plant is classified as semi aquatics suitable planted in a flooded location. Usually rice is planted in rice fields that provide sufficient water needs for growth. However, rice can also be cultivated in dry land or fields. The term is Go go Rice. But the water needs must be fulfilled. Therefore, there are several cultivation systems known in Indonesia, including

**B. Climate And Agricultural Conditions**

Indonesia's climate variability is closely related to ENSO (El Niño Southern Oscillation) in the Pacific Ocean (Trenberth et al. 1995, Kirono&Khakim 1999; Naylor et al. 2002) and IOD (Indian Ocean Dipole) in the Indian Ocean (Saji et al. 1999; Webster et al. 1999; Ashok et al2001; Mulyana 2001, Jourdain et al., 2013). The emergence of the strong El Niño phenomenon seven times over the last 20 years is accompanied by an almost concurrent positive IOD phenomenon which results in a fairly serious drought. Based on drought events occurring 43 times in 1844-1998, only six drought events are unrelated to the El Niño phenomenon (Allan, 2000, Boer and Subbiah 2005). The condition poses a significant impact on cultural strategy and agricultural production, the main food plant (Hamada et al. 2002; Haylock and McBride 2001; IPCC 2001; IPCC, 2007; Porter and Semenov 2005; Betts 2005; Osborne 2005). The relative impact of climate change on food security differs between regions (Gutman et al. 2005; FAO 2005), both in tropical and subtropical areas. But the impact in the tropics is greater because it has a considerable variation of rainfall (Slingo et al. 2005) which in turn interferes with the stability of the agricultural system (Koesmaryono et al. 2008). The results of the FAO Study (2005) showed that variability and climate change influenced 11% of agricultural land in developing countries that could reduce food production and lower the gross domestic product (GDP) to 16%. Meanwhile, the impact of variability and climate change can also decrease the production of food crops (cereals) in the Southeast Asian region between 2.5% to 7.8% (Fischer et al. 2002). Variability and climate change with all its impacts potentially lead to the loss of food crop production, 20.6% for rice, 13.6% corn, and 12.4% soy (Handoko et al. 2008).

While food needs especially rice continues to increase in line with the increase of population. It is estimated that in 2025 the population will reach 262 million people with a rice consumption of 134 kg per capita, thus the needs of the national rice reaches 35.1 million tonnes or 65.9 million tonnes of GKG (Budianto 2002). The emergence of climate anomalies El Niño and IOD positively simultaneously clear the implications of timecropping. For example, in 1997/98 the two phenomena have shifted the planting time during the rainy season 1997/98, up to 2-3 months (6-9 Dasarian) which also affects the planting time of the next season (Las

2000). This phenomenon decreased rice production by 6.5% which has an impact on increasing rice imports to 3 million tonnes by 1998 (BPS 1998). Similarly to the planting period, there is a shift between 10-20 days from the normal planting period (Linderholm 2006). According to Cline (2007), in the coming year 2080, the decline in agricultural commodity productivity in Indonesia due to global warming ranged from 15-25%. If the

ISSN: 2277-9655
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CODEN: IJESS7

enrichment of CO2di Atmospheres taken into account, the decrease in productivity ranges from 5-15% of current productivity. Furthermore, FAO (2008) expressed the dry land farming with the stress conditions of moderate land humidity over a year span of time requires cultivation system and technology that can guarantee the benefit for farmers in the sustainable farming system The global warming study is closely related to the estimation of how much greenhouse gas (GHG) emissions are in the future. This scenario uses the assumption of future economic growth to take place rapidly, the global population rises until the mid-21st century. In the case of GHG emissions until 2100 has been compiled several emission scenarios, or Special Report on Emission Scenarios (SRES), namely A1, A2, B1, and B2. These four major emission scenarios are compiled using several modelling approaches, resulting in multiple emissions estimates for the same emission-defining data input (IPCC, 2000). In the year 2009, has been built a prototype information system software prediction of rice crop damage due to flooding and drought and its impact on rice production at the district level in the Plunk by integrating attenuation data In Prototypeinteractive and conducting simulations with several countermeasures climate change impacts. In the year 2012 the impact information system of food crops climate Change (SIDaPiTaPa) on dry land in Indonesia because of the prospective for the provision of food, with an area of 88.6% of total land. Outside Java, dry land is vast and not much utilized, especially in the eastern region of Indonesia. The research aims to: a) analyse the impacts of climate change on food crops on dry land, b) develop a prototype for the impact of climate change analysis on food production, especially Go go rice and corn on the land Dry c) To create simulations with multiple climate change impact mitigation scenarios on land.

## 3. RESEARCH METHODS

Types Of Qualitative Research Through The Phenomenological Approach

## 4. DISCUSSION

### A. Climate change and agricultural development potential in INDONESIIA

The global climate change is due to the increase of greenhouse Gas (GHG) emissions due to various activities that promote increased Earth temperature (Las, 2007). IPCC (2007) in Noordwijk (2008). has provided much scientifically strong evidence that the global climate has changed at considerable levels throughout the geological history. The changes occurred due to an increase in the atmospheric greenhouse gas (GHG) concentrations, mainly composed of CO2, CH4 and N2O gases.

The growing main greenhouse Gas is carbon dioxide (CO2). Some of these carbon dioxide can be reabsorbed, among other things through the process of photosynthesis that is part of a plant or tree growth process. However, most countries now produce carbon dioxide much faster than the speed of its absorption by plants or trees, so its concentration in the atmosphere increases gradually. There are some other greenhouse gases. One of them is Metan (CH4), which can be produced from marshland and paddy fields as well as from piles of garbage and livestock dung. Other greenhouse gases, though fewer in number, are nitrogen oxide (N2O) and sulphurHexafluoride (SF6) (United Nations Development Programme Indonesia, 2007).

Some of the atmospheric gas types, such as CO2, CH4, and N2O affect the Earth's surface climate due to its ability to assist the process of transmitting radiation from the sun to the Earth's surface, and also inhibiting some radiation from the Earth's surface. If the concentration of these gases in the atmosphere increases, the radiation coming out of the Earth's surface will be hampered, so that the Earth's surface temperature grows larger. The prediction of increased Earth temperature is not an easy climate in an area is the result of interaction of interconnected physics and mechanical processes. The increase in temperature, will lead to increased evapotranspiration that affects the increase in concentration. When the concentration of these gases in the atmosphere increases, radiation is water vapour, H2O (gas). Water vapour is also a gas to stop radiation from the surface of the Earth, while on the other, the presence of water vapour also raises negative feedback due to increased growth of the cloud, causing the delay of transmission of solar radiation to The Earth's surface (Syarifuddin, 2011).

The activities that produce GHG are industrial, supply of electrical energy, and transportation. While the events in nature also produce/release GHG such as volcanic eruptions, swamps, forest fires, farms until we take out the GHG. The composition and concentration of greenhouse gases located in the atmospheric layer will largely

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CODEN: IJESS7

depend on the emission gases produced by various human activities in the engineering of the ecological order system on the planet (Hamid, 2009).

The United Nations Framework Convention on Climate Change (UNFCC) classifies six types of gases that absorb solar radiation in the atmospheric layer of carbon dioxide (CO2), Dinitroksida (NO2), Metana (CH4), Sulfurheksaflorida (SF6), Perfluorokarbon( PFCs) and Hydrofluorocarbon (HFCs). Carbon dioxide gases (CO2), Dinitrooxide (NO2) and methane (CH4) are mainly produced from the burning of fossil fuels in the energy, transportation and industrial sectors. Methane Gas (CH4) is also produced from agricultural and animal husbandry activities. While for Sulfurheksaflorida gas (SF6), Perflorocarbon (PFCs) and Hydroflorocarbon (HFCs) are produced from the cooling industry and the use of aerosols (small particles/dust) (Hamid, 2009).

### B. Climate change to crop growth and agriculture.

Global climate change affects at least three elements of climate and natural components that are closely related to agriculture, namely: (1) Rising temperatures that also affect other climatic elements, especially humidity and atmospheric dynamics, (2) Changing rainfall patterns, (3) The increasing intensity of extreme climatic events (climate anomalies) such as El-Nino and La-Nina, and (4) rising sea level due to the melting of iceberg on the North Pole. (Directorate of Water Management, 2009).

**1. Impact Of Increased Co2 Concentration In The Atmosphere.**

CO2 Gas is a major carbon source for crop growth. The concentration of CO2 in the current atmosphere is not optimal, so the addition of CO2 to plants in the agricultural industry inside the greenhouse is a normal activity to increase the growth of plants such as tomatoes, lettuce, cucumber and cut flowers.

The main physiological effect of increase in CO2 is increased assimilation rate (CO2 binding rate to form carbohydrate, photosynthesis) inside the leaves. The efficiency of the use of other growth factors (such as solar radiation, water and nutrients) will also increase.

In addition to the positive influence on the process of photosynthesis, CO2 increase will also have a positive influence on the use of water by plants. Stomata has function as the gateway entry of CO2 and the discharge of moisture to/from the leaves. The large small-opening stomata is the most important regulation done by plants, where the plant seeks to incorporate CO2 as much as possible but by removing H2O as little as possible, to achieve high growth efficiency. If the CO2 in the atmosphere increases, the plant does not require the maximum opening of the stomata to achieve the optimum CO2 concentration in the leaves, so that the production rate of H2O can be reduced. With this condition, the rate of biomass formation will increase (Syarifuddin, 2011).
The direct effect of increasing CO2, positively impacting the growth and development of plants, as described above. However, the impact of the erosion in the form of temperature increases and changes in hydrological cycles has resulted in the positive influence of the increase in CO2 being reduced or hindered altogether (Munawar, 2010).

**2. The Rise Of Air Temperature Also Affects Other Climate Elements.**

Temperature is an environmental factor that affects the growth and development of plants. Air temperature is influenced by the radiation received on the Earth's surface while the low temperature around the plant is determined by solar radiation, crop density, light distribution in the title of the plant, the content of the soil. Generally, the metabolic rate of living beings will increase with increasing temperature to a certain optimum point. Some of the metabolic processes include stomata openings, transpiration rates, water and nutrient absorption rates, photosynthesis, and respiration. After crossing the optimum point, the process began to be inhibited: both physically and chemically, decreased enzyme activity (degraded enzymes)

The effect of increasing temperature can reduce or even reduce the positive impact given by increasing the concentration of CO2 in the atmosphere. The increase in temperature around the plant microclimate will cause

rapid loss of soil damage (groundwater content) due to evaporation. This can negatively affect the growth and development of plants, especially in areas with limited soil.

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CODEN: IJESS7

Each plant has a base temperature which is the minimum temperature for the plant to metabolize. The magnitude of this base temperature affects the amount of Thermal unit required by the plant to pass through each phase of its development. The relationship between thermal units with ambient temperature is proportional while inversely proportional to the age of the plant. This means that the higher the temperature, the shorter the age of the plant will eventually impact the build-up of photosynthesis and the formation of lower biomass (Syarifuddin, 2011).

The effect of increasing temperature on food crops according to Las (2007) is the occurrence of transpiration that decreases productivity, increased water consumption, the acceleration of maturation of fruit/seeds that lowers the quality of results, and the development of several Crop destruction organisms. Even the director general of Irri (International Rice Researh Institute) stated that with an increase in the average air temperature of 1 °c can decrease the world rice productivity by about 5-10%. Increased temperature can lead to a decline in production of various types of food crops, according to Tang et al., (2006) and Weerakoon et al., (2008), in rice plants, the phase of Malay formation is very sensitive to high temperatures. During this stage, stress due to heat is possible for the occurrence of floret sterility, decreased fertility and loss of results. This is largely due to the decrease in activities as well as the pollen, limited growth of pollen tubes, low power of potent dehiscence and imperfect pollination.

In addition, temperature also directly contributes to the development of seeds such as seed filling and the rate of production of dry materials in seeds (Kobata and Uemuki, 2004) high temperature can inhibit the development of beans in rice (Zakaria et al., 2002) Wheat (Hawker and Jenner, 1993). The increase in temperature during the loss can also lead to a decrease in seed quality, especially resulting from the unbearable accumulation of food deposits in the seeds (Zechariah, 2005). The appearance of the "opaque white" that is usually in the form of a less-than-perfect grain in the summer is expected to have a close connection with the transfer system and transport of food reserves during seed formation. This opaque white part is part of the damage caused by high temperature during the decay.

**3. Change the rainfall pattern.**

Climate change also causes a change in the amount of rain and rain patterns that result in the early shifts in season and planting period. The decrease in rainfall has decreased the potential of a period of rice planting time (Syahbuddin, 2007). The impacts of rain patterns change include planting time and seasons, planting patterns, land degradation, crop damage and productivity, planting area and harvesting area, as well as changes and damage to biodiversity.

**4. Increasing intensity of extreme climate incidence (climate anomaly)**
**Like El-Nino and La-Nina.**

The change in hydrological cycles is primarily demonstrated by the more frequent La-Nina and El-Nino periods. La-Nina is a natural phenomenon characterized by the conditions of sea level temperature in the waters of the Pacific Ocean Equator is under its normal value (cold), while the sea-front temperature conditions in waters of the Indonesian maritime continent are above its normal value ( Warm). The cold sea-front temperature conditions in the Pacific Ocean cause high air pressure, while the warm conditions of Indonesian waters in the west Pacific cause low air pressure. This condition caused the mass air from Pacific to Indonesian territory. The flow encourages the convergence of air masses rich in moisture. As a result more and more clouds are concentrated and cause more rainfall in the area (more than 40 mm/month above its normal average). The opposite of La-Nina is El-Nino when the sea level temperature in the Pacific Ocean warms up and causes dry and long drought in Indonesia. The decrease in rainfall during El-Nino can reach 80 mm/month (Boer 2002).
Drought disasters often occur in Indonesia. Long-term observations show that the occurrence of a long dry season due to the phenomenon of the global climate anomaly of El-Nino generally occurs periodically every 5 years (Bey et al., 1992). In the year of El-Nino 1991, 1994, 1997 and 2003 the area of rice crop cultivation has

undergone a consecutive drought of 868 thousand hectares, 544 thousand ha, 504 thousand ha and 568 thousand ha with an area of failed crops (Puso) Each of which is approximately 192 thousand Ha (22%), 161 thousand ha (30%), 88 thousand ha (18%) and 117 thousand ha (21%). The decline in crop area due to drought resulted in decreased production or loss of results in 1991 is estimated to reach 1.455 million tonnes of GKG or equivalent

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to 0.873 million tons of rice, while in 1994 and 1997 caused loss Results of 640 tonnes of GKG (Jasis and Karama, 1998).

Drought is a major environmental factor that can inhibit crop growth and reduce production depending on the magnitude of the level experienced and the growth phase of the plant when it gets drought. In prolonged periods of drought will affect the entire process of metabolism me in the cell and result in decreased crop production.
In the event of drought, part of the stomata of the leaves closes so that there is a barrier of CO2 entry and lowering photosynthesis activity. In addition to inhibiting the activity of photosynthesis, drought also inhibits the synthesis of proteins and cell walls (Salisbury and Ross, 1995). The influence of droughts not only suppresses growth and results are even the cause of plant death.

The decrease of photosynthesis due to drought, is a combination of several processes, namely: (1) The closure of a hydro active stomata reduces the supply of CO2 into the leaves, (2) dehydration of the cuticle, epidermis wall, and cell membrane reduces Permeability to CO2, (3) Increased Mesophyll cell prisoners to gas exchanges, and (4) decreased the efficiency of photosynthetic systems related to biochemical processes and enzyme activity in the cytoplasm. Where in the process of photosynthesis there is a hydrolysis process that requires water.
While La-Nina causes crop damage due to flooding, and increases the intensity of pest and disease attacks. La-Nina causes moisture and high rainfall that is liked by crop destruction organisms (PEST). In the flood prone area, La-Nina's presence caused a failed harvest due to the sinking of the plant. The effect of excess water on plants will be more sensitive to young plants than adult plants (Syarifuddin, 2011). Jasis and Karama (1998) said the flood caused the loss of rice crop yield amounting to 214 tonnes of GKG per year.

**5. Rise Of Sea Water Level.**
The impact of rising seawater in the agricultural sector is primarily the breakdown of agricultural land on the coast, damage to agricultural infrastructure, and the increase of salinity that damages plants (Las, 2007).

In addition to the vast expansions of farmland due to sea water, the increase in sea level will also increase the salinity of the land around the coast. Salinity in the soil is toxic to plants to interfere with physiological and physical plants, except marine plants and beaches or adaptive varieties. Salinity on rice is closely related to heavy metal poisoning, especially Fe and Al. Indonesia as an archipelago has a line and a very long stretch of beach, resulting in agricultural land-raising due to increased sea level (Directorate of Water Management, 2009). The effect of dissolved salts on plants is through osmotic because the high concentration of salt complicate the plant to water. The roots of the plant have a semi-permeable membrane that is water-soluble but cannot miss almost any dissolved salt. So the water is osmotic ally increasingly difficult to obtain plants with an increasing level of salt soil solution. Plants that grow on the copy media at a certain level can increase their internal osmotic centration through the production of organic acids or increased salt uptake. This process is called osmotic adjustment (osmotic adjustment). The effect of salinity on plants appears to be a change in energy from the growth process to maintaining osmotic differences. One of the first processes is the diversion of the growth energy for cell renewal. So, to be able to maintain the osmotic difference, the leaf tissue cell divides but does not cause lengthening. Symptoms of occurrence of cell number increase but not followed by cell renewal due to the osmotic stress is the occurrence of the colour of the leaves that become dark green (Anwar and Sudadi, 2007).

### C. Agricultural Potential In Indonesia

Indonesia has the potential of natural resources, including, the abundant (mega biodiversity). Indonesian inland biodiversity is the second largest number two in the world after Brazil, whereas when including the biodiversity of the sea then Indonesia is the largest number one in the world. This can be seen with various types of agricultural commodities such as food crops, horticultural, plantations and farms that have long been cultivated as a source of food and income of society. Biodiversity is supported with a spread of geographic conditions in

the form of lowland and high, sunlight and precipitation that is almost evenly distributed throughout the year in some regions, and the diversity of soil types allows The cultivation of various types of crops and livestock native to the tropics, as well as an introduction commodity from sub-tropical regions evenly throughout the year in Indonesia.

### D. Farmland

ISSN: 2277-9655
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CODEN: IJESS7

Indonesia has the potential to availability of large enough land and has not been utilized optimally. Data from the academic study conducted by the Directorate General of Land and Water management, Ministry of Agriculture in 2006 showed that the total area of Indonesia's land was 192 million ha, divided into 123 million ha (64.6 percent) was Cultivation area and 67 million ha the remainder (35.4 percent) is a protected area. From the total area of cultivation, potentially for the agricultural area of 101 million ha, covering an area of wetlands of 25.6 million ha, dry land of crops of approximately 25.3 million ha and dry land annual plant 50.9 million ha. Until now, from the potential area for agriculture, which has been cultivated to be a farm area of 47 million ha, so there are still remaining 54 million ha that is potentially for expansion of agricultural areas. The amount of forest, river, swamp and lake as well as high and uneven rainfall throughout the year is actually a natural potential to meet the needs of agricultural water when managed properly. Reservoirs, dams, and other groundwater and surface water are potential to support agricultural business development.

### E. Agricultural development in Indonesia

Indonesia's economic growth in the agriculture sector decreased in the first quarter of 2016 compared to the first quarter of the year 2015. The Central Statistic Agency (BPS) presents data indicating Indonesia's agricultural growth rate in the first quarter of this year only 1.85%. This growth rate has decreased significantly when compared to Indonesia's agricultural growth rate in the same quarter of 2015 is 4.03%. Declining agricultural growth has been quite serious in Indonesia's economic growth considering the Indonesian trade sector is still a lot in the agriculture sector. Declining growth in agriculture is regarded as the effect of global climate change as well as the obstructed banking factors.

Until now, Indonesia still strives to increase the productivity of its agricultural sector, especially food crops. This is done to support the self-sufficiency of sustainable food through the increase of national rice production. The increasing population demands the agricultural sector to continue to be more productive in the needs of food. In 2017 the national rice production experienced a growth of 2.56% compared to the previous year. Corn production also increased 18.55%. This improvement can occur because the irrigation system continues to develop for the existing rice fields so that it is no longer a rain field. From the last data the vast percentage of irrigated rice field has reached 58.41% or about 4.78 million hectares and the rest is still a non-irrigated rice field. In 2017, Indonesia has managed to stop importing some food commodities to meet national needs. Commodity rice, chili pepper, and shallots are currently not dependent on imports anymore. In 2019 Indonesia also plans to self-sufficiency in garlic and sugar consumption. But still this year there are some commodities that experienced a lot of the decline in production, such as soybeans that experienced a decline of 36.9% and groundnuts by 15.8%. This shows still a lack of equitable efforts to increase the productivity of all agricultural commodities.

Indonesian agriculture can be said to continue to develop. But if it is seen deeper, there are still some problems that continue to hamper, one of which is the decline of agricultural labour. In 2016 then Indonesia lost 0.51% of agricultural power and this year lost 2.21%. In addition, the problem that inhibits the development of agriculture this year is the lack of seed of various commodity food crops, both in quality and quantity. Until October 2017 the Inbred Rice seed production experienced a decline of nearly 40 thousand tons and hybrid rice only climbed about 15 tons. Indonesia was born as an agrarian country and has several advantages one of them is the layout of the area that exactly lies in the Equator line and has a tropical climate with two seasons, so that various types of plants can easily in In Indonesia, in addition to various types of livestock will be very easily cultivated because insufficient the availability of cattle food. In addition to the geographical location, the Indonesian people since the first largely chose a farming business as its main livelihood.

Although the natural resources are very supportive and the livelihood of the community is farming, but Indonesia is still not able to prosper and enrich the population. The Indonesian nation has not been able to realize the food sovereignty for all its people, when viewed in terms of its supporters, Indonesia has been able to become a country capable of producing, distributing and consuming food independently, but it this is not yet materialized in the Indonesian people themselves.

**Food Production Constraints**

The existence of people's prosperity and well-being can be seen from the extent of the country's ability to fulfil food needs for its citizens, so it can be called a sovereign state in the food sector. It is not as easy as reversing

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CODEN: IJESS7

the palms to create a food sovereignty for a country, because many factors affect it, both from within the country itself and abroad.

Factors that need to be considered in realizing food sovereignty and food security is the production factor because of the availability of adequate food production for the whole people is the absolute requirement of fulfilment of the basic needs of the people. Indonesian farmers have not been able to provide the maximum yield of agricultural production due to several reasons including crop pests, the availability of excellent seeds, the availability of agricultural needs such as fertilizer and medicinal drugs, the availability of irrigation water enough. For example, rice farmers in the Java area are less passionate about increasing the yield of agricultural production especially rice, this happens because when planting, rice at the age of 30 days (after experiencing breeding shoots) changed colour to red then To be yellow and ambles, the main cause is the pests that are in the body of the young rice. Various steps to overcome these pests are often done by farmers, but the actions performed are still manual, such as drying the land some time then reprocessed in the hope that the next crop will be better. However, the fact experienced by farmers is experiencing similar things as in the previous crop period.

The problem faced by farmers in addition to unresolved caterpillars is another problem causing declining farmers ' passion in increasing food production, namely seed varieties that fit the planting site of rice crops, this Important because for one type of superior seed will not be obtained the same result if planted on different land, this is due to nutrients in the soil is different. For example, for the rice type IR 64 The result will be different if planted in the area of West Java and Central Java. In addition, the type of seed that is not adjusted to the condition of the land turned out to be expensive seed prices, so farmers are reluctant to buy seed seeds but to make their own seeds derived from the previous harvest. The next problem that always arises is the lack of availability of fertilizer and medicinal drugs, scarcity of fertilizer becomes an indication of rising fertilizer prices at the farmer level and this is utilized by business people. Limitation of the type of medication needed in planting and expensive price and the type of pests that are difficult to be washed with the existing drugs make the farmers increasingly less the spirit of increasing the yield of rice production. In addition to the problem of limitations of fertilizer and drug supplies, other problems faced by farmers especially in the dry season i.e. lack of adequate availability of irrigation water.

Irrigation water problems arise because of the behaviour of farmers and the conditions of the season affecting the availability of water less can be utilized optimally. Indeed, water will naturally be available throughout the year which distinguishes its quantity, which in the rainy season the amount of water will be very abundant because in addition to water from the ground, the volume of water added from the rain, while in the dry season, The rain intensity decreases so that water only comes from the water in the ground. If in the use of irrigation water in the dry season, the behaviour of farmers in the envy of land/rice fields following the law of gravity, then land/fields will be irrigate evenly, but if the farmer scramble to gain water, then what happens is the loss of water Before the land was unreeled.

So quaint and winding problem experienced by farmers and will be less passionate again when the harvest of the resulting grain price is not in accordance with the total funds incurred, this is what is one of the triggers farmers prefer to Urbanization. By working in the city, farmers are not burdened by a variety of agricultural problems that tip the end is less profitable in terms of revenue. Turning into workers in the city caused the pattern of people's think changed, especially with the import of cheap rice resulted in the dependence of the nation of Indonesia on the import of rice. Dependence on imported Rice this is what he changed the concept of agriculture to agribusiness, so that it is not the prosperity and food equality for the people of Indonesia but the effort to make a profit of the magnitude made by the perpetrators Business. This sense of dependency is not separated from the habits of Indonesians who have "not eaten if not eat rice", this is what he has forced the State should be able to fulfil the needs of rice for its people. If this principle starts to be dikes and switches to the type of food substitute rice may burden the state will decrease.

Food sovereignty to build food sovereignty in Indonesia, a strategy step will be needed, among them: first, improving the eco-friendly Eco farming cultivation system and integrated with local wisdom at each other. Areas in Indonesia, in other words the government should be able to involve young scientist in agriculture to explore problems that occur in the field of agriculture and local location conditions and members of solutions

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CODEN: IJESS7

found. Scientists are in charge of researching to create seeds of a type of featured varieties according to the location of planted planting with attention to nutrients, the degree of soil acidity on different areas, so that the results to be obtained only experienced failure With very small presentation and farmers do not suffer any major losses, so that the farmer Amino increasingly greater in the processing of his land.

In addition to the seed seeds, scientists have also researched about the types of pests that attack rice crops, so it will cooperate with the producers of agricultural drugs to create new types of drugs that suit the needs of plants and types of pests that Attacking crops. In addition to drugs, scientists also have to be able to create new types of fertilizers that fit the character as well as soil conditions, so that soil fertility will remain awake. Secondly, the government's firmness in fertilizer distribution. For the issue of fertilizer distribution policy, the steps that may be taken is that farmers should be able to calculate the need for fertilizer per hectare for one year, so that when the fertilizer will start to stock is available. The ability to calculate this will be very effective to anticipate the high purchase of fertilizer, meaning that a farmer must understand the needs of fertilizer for land per hectare. The average farmer's habit of buying fertilizer is when rice crops begin to sprout (rice age 50 days), this is what resulted farmers are scrambling each other. Therefore, the real action that the government needs to do is to know the total number of planting land, the total production of fertilizer produced for one year of planting, the total number of farmers and land area that is cultivated so that the government will be able to Controlling the use of fertilizer for each farmer, in addition to avoiding the action of the manure of fertilizer done by irresponsible person. For fertilizer distribution, the Government should focus on one formal institution designated by the State, such as the KUD.

Formal appointment should be integrated and always monitored, because in practice there are some business people who use this opportunity, so when farmers want to buy fertilizer in the KUD, fertilizer stock has been sold out so that it forces Farmers buy fertilizer on the middling with a slightly expensive price. Third, alternative solutions to irrigation problems. The involvement of young scientists is great for the adaptation and mitigation of global climate change sustainably, thus creating a "upstream – downstream" ecosystem in the basin of the watershed (DAS) to the shallow sea coast. It aims to keep the volume of water stable, so that water is not only in direct exhaust to the river if the land is finished in the Airy. This method can be done by creating a puddle irrigation system with the method of following the water law that is appropriate gravitational force, so that it will create a puddle that is structured like a chain of sustainable ecosystems from the high inland areas (Mountains) to shallow coastal areas.

Fourth, paradigm change think will dependence on rice, cannot be denied the fact that the principle has not eaten but has not eaten rice is already ingrained in the people of Indonesia, nowadays, people who care about how to reduce the consumption of rice It's still a little too for fear of fat or for health. However, for most Indonesians the population still thinks that rice is the main source for eating. This fact should be addressed by the upcoming government by the socialization of the appropriate consumption pattern for the community with a variety of sources, so it is not focused on rice and raw materials are easily accessible locally. Agricultural crops ranging from sweet potato, cassava and various tubers and a wide variety of vegetable vegetables, however, the community has not seen it as a staple. If this socialization is intense and with the approach to people's prosperity, chances are successful. The habit of processing food derived from non-rice into hawker food should begin to be transformed into processed staple food so slowly the public will think it turns out staple food is not just rice, it is necessary because People mostly think if it is dealing with food, it will think not a basic necessity for his life.

## 5. CONCLUSION

Climate change affects agricultural dissenting, so that if this change is continuous, the earth will have problems so that food is reduced. Indonesia as an archipelago and in the area of the equator is very vulnerable to climate change changes in the sea water rain pattern, and air temperature and drought as serious impact faced in Indonesia. Climate change is not only influential To plants but also affects human health of all kinds of diseases in climate change, increased respiratory diseases, heart, and allergies due to poor air quality, for example, as a result of frequent forest fires occur.

## REFERENCES

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[1] Balitbang Pertanian. 2010.Road Map, the agricultural sector strategy confronts climate change. Kementan. Jakarta.
[2] Hidayati, Rini. 2001. Climate change problems in Indonesia, some examples of cases. Graduate Program. Dissertation. IPB.
[3] Husin, YA. 1994. Methane Flux From Indonesian Wetland Rice: The Effect Water Management And Rice Variety (dissertation). Postgraduate Program, IPB. Bogor.
[4] MakarimAK.,SetyantoP.,FagiAM.1994. Methane Flux In Rain fed Lowland Rice Field At Jakenen, Pati, Central Java. Paper Presented At The Planning Meeting Of Methane Emission From Rice Fields. Conducted By Irri-Epa-UndpSemarang, 5-8 Desember 1994.
[5] Murdiyarso, D. 2003. Kyoto protocol. Its implications for developing countries. Series on climate change. Jakarta. Compass Book publisher. Jakarta.
[6] Nashrullah, Nashih. 2014a. Islamic food security system according to Islam. Republika, 26 Oct 2014, Hal 15.
[7] Nashrullah,Nashih.2014b.Protect our farmers. Republika, 26 Oktobe 2014, Hal 14.
[8] Republika, 2011. Rice production still low. Daily Republika, 18 November 2011 Hal 14.
[9] Santoso,Budi.2005. Linkages between national economic growth, agricultural sector and greenhouse Gas emissions. Dissertation. IPB graduate Program. Bogor.
[10] Setyanto, Prihastodan Suharsih.1999. Mitigation of methane Gas from paddy fields. Annual Report of food crops Research in Jakenan. Balingtan, agricultural R & D agency, Deptan.
[11] Setyanto, Prihasto. 2008. Need technological innovation reduce greenhouse Gas from farmland. Balingtan, agricultural research agency, Deptan. Agricultural newspaper 23-29 April 2008.
[12] Sudjana.1988.Statistical method. , Singapore
[13] Sutopo, G.N., J.Lumbanraja, H.Suprapto, Sunyoto, W.S. Ardjasa, Etc. 1995. Metanae Emission From Wetland Rice In Lampung. Paper Precented At Nations Workshop On Inventory Of Emisssion And Sink Of Greenhouse Gases In Indonesia. Conducted By Ministry Of Environment Indonesia, Bogor, Agustus 1995.