

Rice Farmer Adaptation to Climate Change in South Sulawesi Province

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Abstract:- This type of qualitative research through the phenomenological approach of research results shows that climate change is a multi-dimensional process, required integration of components such as increased awareness, prioritization setting, Voice planning, capacity building, research and technology development and drive sources reduce climate risk and take action adaptation requires the role of all parties both farmers society, government, private, educational world and All stake holders, with integrative cooperation will produce ideas and brilliant thinking to address agriculture issues including climate change

Keywords:- Farmer, Climate, Adaptation, Change, Paddy.

I. INTRODUCTION

Man is a living creature created by Allah SWT. Who need to eat to fulfill his life needs. As known today many people die, because of hunger. The incident is often the case, especially in Indonesia that is due to their laziness to work and also the government's lack of local people.

People need staple food needs, which in every country has different staple foods. But the staple food is quite famous is rice or rice. And the vast majority of Indonesians food is rice. Where originally rice or rice was derived a rice plant such as herbaceous, which is widely planted and cultivated in our beloved country namely the country of Indonesia. Before people get to know the rice, especially in Indonesia, the food is corn, cassava, and sago. For the Sago is the most widely cultivated in Papua, because it is the staple food of the Papuans until today. Rice is a staple food that is easy to enjoy by anyone, not just delicious, but rice contains a variety of food substances that are embraced by our bodies, namely carbohydrates, proteins, fats, crude fiber, ash, and vitamins. So it can make our body or body healthy. And if you want more favours, rice can be mixed with side dishes such as fish, meat, tempeh, and vegetables such as spinach, carrots, and others.

Climate change (Climatechange) is a condition of some climate elements that are magnitude and or the intensity tends to change or deviate from the average dynamic of the condition. The main cause of climate change is the human activity (anthropogenic) associated with increasing GHG emissions. Climate change due to emissions or greenhouse gas release is increasingly threatening the lives of humanity and biodiversity on the

Earth. Signs of this phenomenon are increasingly perceived, as experienced by Indonesia as the archipelago, which is very vulnerable to climate change because it has caused various disasters, such as: Flood, landslide, long drought, strong winds and High sea water waves. Disaster threats that farmers and fishermen communities as well as in communities that live in, rural, and Urban. The more widespread impact not only undermine the environment but the human health, disrupting the availability of foodstuffs, economic development activities, natural resource management and infrastructure. This will be a threat to the success achievement of Indonesia's socio-economic development. The international community believes that climate change is now and is happening and has a broad impact on human life. One of the important scientific foundations discussing climate isubahan is the fourth Assessment report (AR4), published by the Intergovernmental panel on Climate Change; IPCC) in 2007.

The report confirms the role of anthropogenic human activity contributions in increasing the concentration of greenhouse gases (GHG) in the atmosphere, accelerating the rate of global warming and is believed to have resulted in Climate change in various places. The 2018 IPCC report reaffirmed the role of human activity in the past and currently against the improvement of greenhouse gases (GHG) that led to a global temperature rise. Currently, the rate of increase of global average surface temperature has reached 1 °c above pre-industrial time and is expected to reach 1.5 °c between 2030 and 2052, if the GHG upgrade conditions are still the same as the present (IPCC, 2018).

Based on the results of GHG inventories conducted by the UNFCCC (2006), Indonesia is ranked 16th out of the 20 largest GHG emissions countries in the world, with the United States being the largest contributor of emissions followed by Western European countries and China. GHG emissions generated by countries in the world are predicted to continue to grow in the future due to the growing demand for food, marginal land use, increased meat consumption, and international trade policies.

➤ Problem Formulation

1. What are the obstacles faced in planting rice?
2. What factors affect the rice crop?
3. How do farmers respond to climate change as a form of adaptation?

II. FOUNDATION THEORY

A. Theory of Rice Crop

Rice plants are a staple plant for life purposes, but have to face various challenges and obstacles. Both physical, social/economic and biological, which threaten the success of its production. 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 a decline in production quality and quantity, or even natural failed crops. In the event of an explosion, there is a need for routine observation, forecasting and control ways that comply with the concept of PHT.

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 plowed, 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 aquatis 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 Gogo Rice. But the water needs must be fulfilled.

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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 al. 2001; 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 has a significant impact on cultural strategy and agricultural production, the main food crops (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 waktucropping. 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 CO₂ enrichment in the atmosphere is taken into account, the decrease in productivity ranges from 5-15% of current productivity.

Furthermore, the FAO (2008) declares a dry land farming effort with a condition of moderate moisture stress during the span of a year, requiring a cultivation system and technology that is able to ensure benefits for farmers in sustainable farming systems. 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 modeling 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 Pulunak by integrating attenuation data. In Prototype interactive and conducting simulations with several countermeasures climate change impacts. In the year 2012 the impact information system of food crops climate Change (SIDaPi TaPa) on dry land in Indonesia because of the perspective 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) analyze 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 Gogo rice and corn on the land Dry c) To create simulations with multiple scenarios against climate change impacts on dry land.

III. RESEARCH METHODS

Types of qualitative research through the phenomenological approach

IV. DISCUSSION

A. Constraints Faced in Planting Rice

1. Water

Water is needed for processing and in rice cultivation in the rice paddy fields need to be well-set water. When certain water is inserted, but other times the water actually needs to be added. Continuous flow of water from one map to another map or the suspension in a continuous map of the rice field in addition to water wastewater also results in less good growth of plants. But on the contrary it is usually too little watering weeds will grow rapidly and rice production will be reduced and water intake is very important at the following times:

a. Early Planting

As already done at planting time, water is given as high as 2-5 cm and ground level.

b. Formation of Saplings (Performances)

In this time the water is maintained as high as 3-5 cm water delivery more than 5 cm can inhibit seedlings (shoots)

c. Formation of Grain Shoots (primordia) or Rice Bunting Crops

Water is needed on the establishment of candidates. Candidates for this water are inserted 10 cm high. Water deficiency at the time of formation will result in the formation of children (shoots) because of lack of water can inhibit the formation of malai, fertilization and disposal that can be fatal that is the grain of rice void.

d. Flowering

At this time the water needs to reach its peak. Water face is kept as high as 5-10 cm due to lack of water can also cause empty rice grain. But if the rice crop has issued a flower, map for a few moments need to be dried in order to unison the flowering. The water provided in the amount is actually beneficial also to prevent the growth of weed, banishing the planthopper hiding in the rice stem so that it is easier to spray with pesticides, as well as reduce the attack of rats.

2. Water Production

There are times when rice crops do not need to be given water, for that the rice field is dried at the following times:

a. Before the Plant Bunting

Use to prevent plant tillers from removing the grain.

b. Early Flowering

The use for making plants unison.

c. Initial Seed Cooking

Water needs to be drained today to disperses and accelerate the maturation of rice. This drying action is also beneficial to improve the soil arosi, spur growth of

saplings stimulate disposal and reduce the occurrence of root rot attacks.

3. Fertilization

In rice planting in paddy fields, the dose of fertilization on the rice fields depends on the type of soil, the history of fertilization and rice varieties planted at the location. But fertilization constraints are usually experienced by farmers because farmers are usually administered fertilizer at a dose that is not appropriate. Fertilizer is administered 2 or 3 times during the planting season. Fertilizer is a material that contains nutrients needed by plants and the most important elements and should be available is the N.P.K. element of urea fertilization dose is usually given one-third of the fertilization of the first and second-thirds part of The second fertilization. TSP and KC fertilizer is usually administered simultaneously with the fertilization of the first urea.

When doing fertilization should the entrance channel and water disposal are closed first. The map of the paddy field is in watery condition, spread the fertilizer evenly on the resistant surface. Be careful when spreading fertilizers so as not to be about the leaves of the plant because it can cause burnt leaves.

4. Pest and Disease Control

Pest disease pests are usually vulnerable to pests and diseases in rice paddy plants there are several pests and diseases that often attack rice crops and pests are quite disturbing among others Walang Sangit, Lance, rice borer, planthopper, Rats and birds. The diseases that often attack paddy plants are leaf blight, bacterial spotting, blight, stem rot, brown spots, Blasi, Tungro, hollow dwarfs and dwarf grass.

Once farmers often perform easy actions to eradicate pests and diseases that is by spraying pesticides. But this way is not recommended because the pesticides can pollute the irrigation water or water source around it and many of the pests and diseases are susceptible to or no longer be sprayed.

Pest and Disease Control (IPM) is a management system of pest populations using all suitable techniques in an integrated way to reduce the population of pests and diseases and retain them at a level below the number of May incur losses.

5. Harvest

For rice harvesting farmers is the most awaited problem. Harvest is when farmers feel the success of the hard to plant and take care of crops.

a. When Harvesting

Rice should be harvested at the right time to prevent the possibility of obtaining low-quality grain that still contains a lot of green grains and lime grains. Rice harvested easily if grinded will produce rice rupture. When rice harvesting can be influenced by planting season. Crop

and growth maintenance, as well as dependent on the type. In general, rice is harvested at 80-110 days when the rice crop shows the following features that means the plant is ready to be harvested:

- The grain and the flag has been yellow.
- The stalk is bent because it bears the grain of rice or grain that gets heavier.
- Grain of rice when pressed to feel hard and contain, the peeled Jiak is not greenish or white is slightly mushy like lime.

b. How to Harvest

The right harvesting tool is important for harvesting to be easy to do usually rice harvested with ANI-ANI or Crescent. Ani-ANI is commonly used to harvest the type of rice that is difficult to fall until harvested with its stem, for example the type of fur rice. However, this tool is not suitable for planting rice paddy fields. Sickle is used to harvest rice that is easy to fall, for example Rice Coreh. However, because this tool can pick up the results faster and more easily cut the stem of the rice, this tool is now more widely used for harvesting.

c. The Threshing

This can be done using the Perintah Tresher machine, or using the foot-thresher tresher pedal. Moreover, the simple threshing can be done by hitting the rice bars to the wood or "Gebuk box" where previously spread plastic to hold the grain of rice that is trickle.

d. Drying

The main purpose of drying is to lower the moisture content of the grain can be durable stored. In addition, the wet grain is difficult to process into rice well. The grain is dried on the floor of the cement, and the water can be spread over the plastic as well. In hot weather, sunlight is able to dry the grain within 2-3 days.

e. Grain Skin Separation

The last stage of the rice planting effort is to produce rice that can be taken into rice as a staple food. At first the dried grain needs to be separated with hollow grain or dirt that may be carried away during the loss or drying, the way can be by being stabbed. The separation of grain skin can be done with the huller or machine, this way is practical and quick. But for areas that do not have a huller, separation can be done with the growth of rice using pestle and mortar.

f. Production Centers

In rice paddy plants is very wide area of production centers such as Java and Sumatra. This is because rice is the basic ingredient for rice and rice which is the main food ingredient of Indonesian people containing high carbohydrate although not all food areas are rice or rice.

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B. Failed Harvest for Farmers

Rice farming is not as easy as reversing your palms. Cultivated paddy plants are not necessarily successful because at times it can happen, crop failures resulting in losses are experienced due to various factors that are outside the reach of farmers. Can be due to flooding, drought, or attack of pests and diseases of plants. The loss level is very diverse, from the category of low, medium, to total failure because there is absolutely no result or puso.

For farmers, crop failure can be a little hell. First, they have deployed all of their capital and ability to plant rice planting season, including any loan capital. Secondly, the ability to endure most farmers during each planting season averages between two and three months. In fact, with the rolling of lifestyle and low farmer's exchange rate, that ability becomes even lower.

The survival capability is very at stake, especially during the Paceklik season. The season is characterized by increasingly reduced employment in the agricultural sector or even unavailable at all. While food needs price, especially rice, is increasing due to reduced supply.

C. Factors Affecting Crop Yield

1. Less Good Land Processing

How to cultivate bad farmland can lead to less qualified crops and can even suffer from crop failure.

2. Water Conditions in the Area Surrounding the Agricultural Land

Drought as a result of low rainfall in various places resulted in the discharge of surface water shrinking. The rivers dry up, the dam does not work optimally, and the volume of the reservoir shrinks. The picture is a yellow light cue for the agriculture sector. Water is an important factor in the cultivation of rice crops. Although until now there is no research, water has a contribution that is not small in supporting the productivity level of rice crop, in addition to seedlings, fertilizers, and plant maintenance from pest and disease attacks. Reality in the field shows, without water, paddy plants can die because of drought or at least low productivity.

3. Rice Seedlings

The harm to the selection of rice seedlings when planting rice parks can do the quality and quantity of rice that is not good.

4. Infected with Pests and Diseases

a. Rice Rod Drilling

Rice stem borer is a very important pest in rice and often inflict damage that decreases crop yields real. There is a large drilling in the field can be seen from the presence of moths and egg groups in the cropping, and the larvae/caterpillars in the trunk. The mechanism of damage is the larvae feeding system of plant vessels in the stem.

b. Blas Disease (*Priculria Grisea*)

Blas disease infects paddy plants at every growth phase, the typical symptom of the leaf is a large rhombus in the middle and tapered at both ends. The spot size is approximately 1.5 x 0.3, 0.5 cm develops grey in the middle. The leaves on the vulnerable varieties can die. The blast disease spotting is often difficult to distinguish from the symptoms of brown Helminthosporium.

c. Tungro

The symptoms of a tungro attack in the form of stunted plant growth, dwarf, and number of saplings reduced, leaves yellow to orange from the bud to the base. Young plants are more vulnerable. The younger the age of infected plants, the plants become dwarfs and the production is getting lower.

D. How to Overcome Crop Failure

The effort to avoid the crop failure is as follows:

1. Soil Processing

The processing of land done by farmers-traditional farmers in Indonesia usually use hoe, tractor hijackers, pirates with pulled buffalo/cows.

First, the land of rice fields that will be plowed in water soak (let it soft and easy Nyangkmake), Kalo is finished plowed, given herbicide, directly planted rice, was allowed to first 5-7 days to eliminate toxins in herbicide.

2. Seed Making and Seedlings.

The seeds purchased in the agricultural stores usually have to be soaked with water for 24 hours, then the spread let me lose the water content, after that in let stand 48 hours, let it germinate first seed, just spread and in fertilizer.

3. Planting

In this phase, many need to be considered such as planting, spacing, number of crops of each hole, and the depth of planting with other landlines.

4. Maintenance

In this phase the longest and most severe, usually 2 months – the new 3 months can be harvested. In this phase much to do, irrigated the rice fields, weeding the grass (weeds), guarding from pests including caterpillars and mice, guarding from birds, and others.

5. How to Give Fertilizer

The need to be considered to reduce the availability of fertilizer is time and fertilizer. Proper fertilizer delivery during rice paddy crop growth can increase the efficiency of fertilizer use. The properties of fertilizer N are generally easily soluble in water so it is easily lost, either through washing or evaporation. To reduce the loss of N, fertilizer N should be administered gradually, namely 1/2 part of the dose N fertilizer and the entire dose of fertilizer P and K administered at the beginning of planting, while the 1/2 dose N fertilizer administered at the age of 40 days after planting. The way of giving good fertilizer is by sowing

evenly on the surface of land/rice field with water condition + 5 cm. The reference arrangement of rice fertilization is based on the results of soil analysis and the results of rice fertilization research by The Research Center for the Agricultural Technology of Sultra and other Balai.

Determination of fertilization recommendation is based on soil nutrient status and crop needs. Filosofinya is on the ground with low nutrient status, very high fertilization response, moderate status of response and on the high nutrient status of the plant is not a response anymore. That is, in soil with high nutrient delivery of fertilizers does not affect production, the status of moderate production affects and on a real low status affects production.

E. Linkage of Climate Change with Rice Field Farming

Climate change has been and is happening in the tropics (Manton et al., 2001; Masutomi, Takahashi, Harasawa, & Matsuoka, 2009). Climate change affects agriculture through its impact on growth, development and crop outcomes. Agriculture is a very vital sector in the development of Indonesia because more than 60% of its inhabitants are highly dependent on agriculture as its livelihood (Central Statistics Agency, 2014). The contribution of the agricultural sector to the Indonesian economy will be challenging due to the risk of climate change.

Climate change is a threat to people who are the livelihood of rice farmers and threaten the food security of a country (Government of Republic of Indonesia, 2007; UNFCCC, 2007). The impact of climate change has become a reality in the agriculture sector in Indonesia (Handoko, 2007; Naylor et al., 2007). Indications of climate change are among others by the rise of air temperature, drought, flood disaster, the rolling of the rainy season (the rainy season is getting shorter) (Aldrian, 2007) increased sea water advance, and the increase in extreme climate occurrence (Ruminta & Handoko, 2016). In recent years the rainy season shifts caused the growing season of planting and harvesting food commodities (rice and Palawija). While floods and droughts cause failed planting, crop failure, and even cause damaged (Ruminta & Handoko, 2016).

Over the last century, climate change has led to a global rise in temperature, shifting rainfall patterns, rising seawater, as well as the frequency and intensity of extreme weather increases. According to the study of the Intergovernmental Panel on Climate Change (IPCC, 2007), during the period from 1899 to 2005 the average global temperature increase of 0,760C; During the period from 1961 to 2003 the global average sea water increase of 1.8 mm per year; Rainfall and flood intensity increases; Increased frequency of drought and erosion; and extreme weather phenomena (El Nino, La Nina, Cyclone, nipple, and hailstone) have also increased. Climate change severely affects water/water resources (Runtunuwu & Syahbuddin, 2007) dan pertanian serta ketahanan pangan (Challinor et al., 2007; Kang, et al., 2009).

According to the study of Syahbuddin et al. (2004) on 13 klimatology stations in Indonesia, showing there has been climate change, in eastern Indonesia there is a tendency to increase the amount of annual rainfall ranging from 490 mm per year (South Sulawesi) Up to 1400 mm per year (East Java) and day and night temperatures increased between 0.5-1, 1oC and 0.6-2, 3oC. However, on the contrary in Western Indonesia there is a tendency to decline annual rainfall approximately 135 mm per year to 860 mm per year and day and night temperatures increase between 0.2-0.4 oC and 0.2-0.7 oC. In line with the indication of climate change, another indication is the rapid the El-Nino period that occurred in Indonesia that originally occurred every 5-6 years once changed to 2-3 years (Aldrian, 2007; Runtunuwu & Kondoh, 2008).

The agricultural sector is very vulnerable to the impacts of climate change because its activities are highly dependent on weather and climate conditions. In addition, people who are livelihoods in the agriculture sector tend to be poorer than those who work on other sectors in the city (Aggarwal, 2008; Jin & Zhu, 2008; Kang et al., 2009).

Indonesia, which is an agrarian region, climate change (rain) is the biggest threat, because many agricultural activities in the rice fields are very dependent on the rain, any changes in rainfall can pose a big risk (Ruminta, 2016). Agricultural systems in the rain land are very vulnerable to climate change, if the cultivation technique does not change (Ruminta et al., 2009). The increase in temperature will interfere with plant physiology. High temperatures during critical phases interfere with the development and flowering process of plants. High temperatures coupled with drought cause major disasters on farmland. Increased temperature and humidity can also encourage explosive pests and crop diseases. Drought and flood disasters can decrease agricultural production. Drought and prolonged flooding due to climate change and the management of the water is not good so that groundwater capacity too low or too high causes rice production to decrease significantly (Ruminta & Handoko, 2016).

The assessment of climate change impacts on agriculture can be examined through the analysis of potential hazards (hazard), Vulnerability (vulnerability) and risk (Metternicht et al., 2014; Wolf, 2012). Danger is the danger of climate change is the potential decrease in agricultural production as a result of decreased productivity, crop failure, failed to plant, and the area of agricultural land. While the vulnerability is the ability of farmers or farmer groups to anticipate, overcome, defend, and save themselves naturally from the impact posed by the hazard is climate change. Risk is the magnitude of the risk posed by climate change against the decline of agricultural production that implicates the food supply and food security. Risk analysis of declining agricultural production that is vulnerable to the threat of climate change hazards is carried out using a quantitative approach in order to predict and anticipate it.

The information risk level of climate change impacts can be used as a consideration in drafting guidelines for adaptation and anticipation at the local level (Reid et al., 2007; Runtunuwu et al., 2011). Given this, information about accurate indications of climate change and how it impacts the decline in agricultural production in the region as inputs for strategic adaptation so that further decline Agricultural production can be prevented. This paper is intended to provide information on indications of climate change and its impact on the decline in rice production in the Indonesian region.

The impact of climate deviation on cultivation land utilization, in the form of decline or even the failure of production of agricultural enterprises, such as:

- Failure to harvest food crops due to drought.
- Failure to harvest food crops due to flooding
- Decreased horticultural production due to climate deviation affecting the fertilization period.
- Forest fires that affect wood production and forest products.
- Failure of production of freshwater aquaculture activities due to water scarcity or even flooded.

Santoso (2005) stated that the agricultural sector in Indonesia is a vital sector because it serves as the largest labor container, foreign exchange producer, and is primarily a producer of rice staple food which is largely produced from Paddy fields. On the other, rice farming farm business also has a negative impact on environmental damage, Metana is one of the gases that causes the Earth's ozone depletion. Therefore, the greenhouse gases to watch out for emissions from the rice field is Metana (Moerdiyarto et al., 1995). Research on CH₄ emissions from many rice fields is done by Balingtan. The methane emission range that is released varies greatly depending on the processing of farmland rice fields. For mineral soil in Java Island ranged from 57-347 kg per hectare per planting season. Gupta (1997) in Setyanto and Suharsih (1999) made a scenario of environmental impact in Indonesia in 2070 when greenhouse gas emissions were not pressed, which is (1) The rise of sea level of 60 cm which will cause 3.3 million inhabitants of the coastal coast Evacuation, (2) Increased malaria cases, (3) 1000 km of roads will disappear along with five seaports, (4) 800,000 ha of paddy fields will undergo drainage and rice production decreased by 2.5%, corn 20% and Sochee 40%. Total loss in agriculture reached Rp. 23 trillion/year and (5) 300,000 ha coastal fisheries will be lost, and 25% of mangrove forests will be damaged. All this led to an estimated loss of US \$113 billion.

An increase in atmospheric CH₄ gas content may impair the stratosphere ozone layer. It will ultimately affect the lives of people on Earth. There are several sources and evidence of the CH₄ gas, one of which is a rice field. Emissions of methane gas from paddy fields can be influenced by cultivation techniques. The technique of rice cultivation is commonly done by farmers is the result

of adaptation to the environment of his life. In environmental components of chemical physics, among others, soil type, irrigation, fertilizer, soil processing, planting, geographic location, rainfall and so forth. In biological environmental components there are microorganisms and macroorganisms including rice varieties planted. In socio-economic environmental components, such as the habit of planting farmers, the price of production facilities and government policy indirectly affects the emission of CH₄ gas from paddy fields (Moerdiyarto et al., 1995).

F. Mitigation and Adaptation of Climate Change

In recent years the world community is increasingly troubling the effect of global warming and in the early 1990s has already contracted the United Nations Framework Convention on Climate Change (UNFCCC), which was implemented in 1994. In this concept they propose two main strategies: mitigation and adaptation. Mitigation involves finding ways to slow down greenhouse gas emissions or holding them down, or absorbing them into forests or other carbon 'absorbent'. Meanwhile adaptations, covering ways of dealing with climate change by making appropriate adjustments — Act to reduce their negative influences, or utilize positive effects (UNDP, 2007; The World Bank, 2008).

Santoso (2005) explained that the efforts of mitigation of methane gas emissions in rice cultivation can be done through four ways of setting rice cultivation technique: (1) water management Arrangement, (2) nutrient management arrangement/fertilizer, (3) selection Varieties, and (4) appropriate planting techniques. These four ways are relatively effective in controlling or reducing emissions of methane gases.

This global warming looks like its shape as an increase in the Earth's temperature which causes extreme climate change such as rainy season or prolonged dry season, and will further effect back to farming activities such as Changes in planting patterns, improving pest control, fertilizing patterns etc. Increased greenhouse gases affect social aspects through the cost of externalities.

V. CONCLUSION

Climate change adaptation is a multi-dimensional process, required integration of components such as increased awareness, prioritization, voice planning, capacity building, research and technology development and sourcing The drive reduces climate risk and takes adaptation action requires the role of all parties ranging from Individual collective action, by including private, educational, community and government, in order to achieve agricultural development approach, participatory development approaches are needed. In agricultural development, participation is necessary to enable greater changes in the human mindset so as to make the best decision.

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