

# The Strategy of Lerep Village Community in Anticipating Climate Change in the Context of Food Security

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## ABSTRACT

The agricultural sector plays an important role in fulfilling food needs and the availability of food reserves. The agricultural sector is also very vulnerable to the impacts of climate change which affect cropping patterns, crop productivity, cropping intensity, and plant pests. The purpose of this research was to examine the climate change anticipation strategy for food security in Lerep Village, Semarang Regency. Qualitative research was conducted to explore and analyze the strategies used by the community of Lerep Village. The research subjects were farmers, while the object of research was the community strategy. The data collection was obtained through observation, documentation, and interviews. Qualitative analysis was conducted through reduction, data presentation, and conclusions. The results showed that food security can be realized in Lerep Village with the existence of a foundation and guidelines for local wisdom, *tunggu gunung kudu wareg*, through a strategy of food sufficiency and sovereignty with an environmentally friendly system, a strategy for managing domestic and household industrial waste, as well as a strategy for implementing conservation and water resources management.

**Keywords:** Anticipation strategy, Climate change, Food security

## INTRODUCTION

Climate change is something that cannot be avoided due to global warming, which can have an impact on various

aspects of life. Climate change is a condition identified by changes in world climate patterns that result in erratic weather phenomena (Muslim, 2013).

The impact of climate change in Indonesia is the occurrence of extreme climatic phenomena, namely the increase in ENSO (El Nino Southern Oscillation) in the form of La Nina and El Nino. The normal frequency of La Nina and El Nino is 5-7 years, with more frequent climate changes being 3-5 years. La Nina causes flooding due to high rainfall, while El Nino causes drought due to low rainfall (Purbo et al. 2016). Climate change, which is a threat to people's lives, has an impact on the basic needs of society, which include food production and distribution. Hence, climate change can affect food security.

The definition of food security according to the Republic of Indonesia Law Number 18 of 2012 concerning food, is the condition for the fulfillment of food for the state to individuals, which is reflected in the availability of sufficient food - both in quantity and quality, safe, diverse, nutritious, equitable and affordable, and does not conflict with religion, belief, and community culture to be able to live healthily, actively and productively in a sustainable manner. The food law not only discusses food security but also defines and strengthens the achievement of food security by achieving food sovereignty through food resilience and food safety.

Food security is multidimensional, which requires a comprehensive measure involving various indicators that are combined to produce a composite value for food security (BadanKetahananPangan, 2018). Food security is the achievement of food needs. Food security can be threatened due to climate change, where there is a decline in agricultural production (Ruminta et al., 2018).

The environment, which is the place or the main media for producing food, has limited sustaining capacity. This condition occurs in terms of the area of productive land, quality of land or soil, land management capabilities, and farmer behavior. However, the human need for food keeps increasing.

Community food needs come from the production of food crops. Agricultural land conditions are highly dependent on climatic conditions. Farmers can identify three climatic phenomena that threaten agricultural production, namely extreme rainfall in its season, a drought that knocked agriculture, and unpredictable climatic conditions (Tubiello, 2007). Farmers interpret climate change as a climate condition that is very threatening to agricultural activities.

The impact of climate change has resulted in a decrease in water availability, changes in crop production, and the loss of biodiversity, which is an invaluable asset in Indonesia (Setyowati, 2013). Climate change can also have an impact on health, mortality, migration patterns, food security, natural ecosystems, and economic well-being, both at the local and national levels (Ruminta et al., 2018).

Joint efforts in dealing with climate change can be conducted at the local level, in which community is expected to contribute to reducing greenhouse gas emissions and increasing the capacity of the community in facing climate change. One of these local efforts was executed by the community Lerep Village. This environmental management carried out by the people of Lerep Village can be

categorized as successful, proven by the award for the climate village by the Ministry of Environment. Environmental management by Lerep Village was also carried out with the involvement of all communities to create a healthy environment and increasing food security.

Increasing food security can be done through a combination of crop cultivation, animal farming, fisheries, plantations, and forestry (Prasetyo, 2018). Lerep Village has natural resource potential, which is supported by suitable land and climate conditions for agricultural development. These potentials support the programs developed in the food crops, plantation, and livestock sectors. All of these were designed to create the fulfillment of food needs for the community and boost the regional economy. Various potential commodities in Lerep Village also include food crops, fruits, ornamental plants, vegetables, and plantations. Most of the land use is used as an area for farming/agricultural activities in the narrow sense as well as in a broad sense which includes agriculture, forestry, livestock and fisheries as the livelihoods of the majority of the population (Banowati et al., 2018).

The study in this research is to examine the impact of climate change on food security and to analyze climate change anticipation strategies for food security by the people of Lerep Village.

## **MATERIALS & METHODS**

This research is qualitative research with a phenomenological approach. The focus of this research is the Lerep community's strategy in anticipating climate change for food security.

The data source of this qualitative research was informants. Purposive sampling technique was used to determine informants. The key informant of this study was the village head because he knew the detailed and comprehensive information about community activities. The main informants were farmers, while the supporting informants were the general

public who has the influence, knowledge, and understanding of agriculture in Lerep Village and residents who frequently participate or are involved in agricultural activities.

The data collection techniques were observation, interviews, and documentation. The data analysis method followed the stages of Miles and Huberman's analysis, where the data analysis used an interactive model and data presentation, which included data reduction, data presentation, and verification.

## RESULT AND DISCUSSION

### Food Sovereignty Strategy

Climate change that occurred has a considerable impact on the lives of farmers.

Changing climate affects environmental aspects, such as waters and food sufficiency. Meanwhile, food security is the fulfillment of food needs. Therefore, climate change that occurs has an impact on people's food security. This is aligned with Purbo (2016)'s statement that climate change has an impact on global food security. In this case, it causes a decline in global food crop production. On the other hand, the strategy of food sovereignty in Lerep Village was carried out with an environmentally friendly cultivation system through verification of food types, manufacturing of food barns, use of organic fertilizers, access to climate information, and fruit and vegetable crops.

Table 1. Strategy of Food Sovereignty in Lerep Village

No	Food Sovereignty Strategy	Utilization
1	Diversification of food types	Fulfilling food needs
2	Food Granary Making	Availability of food
3	Fruit and vegetable crops	Vegetables as food and fruit crops are perennials that produce so they will not be cut down

Source: research data analysis, 2020

### Diversification of food types and Agroforestry

At first, the people of Lerep Village were not prosperous due to food shortages during the dry season. The community then cut and sold firewood for income. From there, a solution emerged to implement an agroforestry system by integrating agriculture, water, and plantations. The people of Lerep Village grow various types of plants in the village. The agricultural land is not only planted with rice, but also corn, cassava, vegetables, young coconut, and cloves. This was done to meet food needs. Therefore, the community maintains food sources by planting several types of food plants as shown in figure 1.

The agroforestry system is employed by combining forestry, agricultural, and fishery cultivation systems in one area. This system can guarantee food availability in an area, even though it is not the harvest season. Agroforestry was chosen to increase land productivity, agricultural quality, and conserve forest resources.



Figure 1. Plant diversity

Source: Research Documentation, 2020

Food crop diversification is administered to overcome crop failure due to the impact of climate change. Through the diversity of food plants, if there is a crop failure in a certain type of plant, other crops can still be harvested. Following Law No. 18 of 2012 concerning food, food diversification is an effort to increase the availability and consumption of food that is diverse, nutritionally balanced, and based on the potential of local resources.

### Food Granary Making

The food barn is located in each resident's house. It means that the rice

produced is not for sale, but personal consumption. The food barn helps the community's income in the form of daily, weekly, and monthly income. Daily income is earned by selling cow's milk, weekly income earned from selling compost used for agricultural land, monthly income earned from biogas sales, and seasonal income earned from agricultural land use. Meanwhile, food availability and food security are largely determined by access to food, namely the level of income and purchasing power of the community (Rosyadi, 2012).

Saliem (2005) explained that community food reserves are a tradition of individual farming communities to set aside their crops as food reserves. The people of Lerep Village reserve food by storing unhulled rice, which will be used until the next harvest.

#### **Fruit and vegetable crops**

Fruit plants were chosen by the people of Lerep Village. At first, the people of Indrokilo Hamlet planted wood plants. However, because of the conservation value, the plants were replaced with fruit trees. This is because wood plants will increase in price if they are marketed. As for fruit crops, the bigger the tree, the more fruitful it will be, and people will not have the heart to sell it. This is aligned with the explanation from Sumariyadi.

“kalau ditanami tanaman buah akan berbuah banyak dan nggak tega untuk dijual karna hasilnya melimpah, sedangkan kalau tanaman kayu misal punya kebutuhan 20 juta akan ditebang satu karna harganya mahal” (research interview)

Fruit plants, apart from being consumed by the community, are also used to increase the income of the people of Lerep Village. Community income has increased with the guideline of local wisdom *tunggu gunung kudu wareg*. Fruit planting was executed because of several considerations, including the topography of the Lerep Village area that is located on the slopes of Mount Ungaran as it makes the village becomes prone to landslides.

Therefore, fruit trees are planted as *paku bumi* that can absorb water and will not be cut down. Besides, if it is used as a rice field, landslides will potentially occur.

Agricultural land management is carried out through traditional methods by maintaining local wisdom. In plowing the fields, the technique used is still traditional, namely by using a buffalo. Buffalo is used for *ngeluku* as this can keep the soil fertile. In addition, buffalo dung in the rice fields is used as organic fertilizer.

On the other hand, the operational costs for rice fields with a terracing system will cost a lot, as Sumariyadi stated.

“Tanah dengan sistem terasering biayanya akan lebih mahal dibandingkan yang lembaran”.

Plantation crops have a higher selling value. Therefore, the land in Lerep Village is planted with cloves using an intercropping system that will produce more than half food crops from rice fields. Referring to this aspect, the community follows the rules of local wisdom, *tunggu gunung kudu wareg* by optimizing land use and preserving the environment.

Fruit crops are planted to increase community income in the hope that the trees will not be cut down to the wood sold, but to be attended for and used. This effort can also preserve nature and reduce the level of illegal logging. Hernanda (2017), established that food security can be realized if the availability of food is supported by an increase in farmer income so that farmers will be enthusiastic in producing plants for profit.

#### **Waste Management Strategy**

Domestic and household industrial waste, if not managed properly, will cause environmental problems that can pollute the earth and lead to global warming. This is aligned with Mustangin's (2017) statement, which argued that one of the efforts to tackle climate change is through environmental management. The people of Lerep Village, however, reduce the impact

by managing industrial and household waste.

Good waste management, through several strategies and efforts made by the

people of Lerep Village, provides economic and environmental benefits. The following table shows the waste management strategy.

**Table 2. Waste Management Strategy**

No	Waste management strategy	Explanation
1	TPS3R waste management	Waste selection and waste recycling
2	Bank Sampah	Utilization of waste and adding the economic value of waste thereby reducing global warming
3	Cattle farm biogas and compost	Cow dung produces methane gas so that biogas / compost can reduce global warming. Compost is used as organic fertilizer for community plants.

Source: Data analysis, 2020

### Waste management through the TPS3R program

TPS3R is a waste management place with the concept of reuse, reduce, recycle. The waste management place is located in Soka Hamlet and was established in 2018. Based on data from the TPS3R manager, the volume of incoming waste is approximately 4.67 m<sup>3</sup> / day. The activities of TPS3R include selecting waste, making compost, and storing waste products. Compost processed with composter is sold and used by farmers to cultivate their agricultural land. TPS3R managers process and separate organic and inorganic waste. Organic waste is used as fertilizer, while inorganic waste is converted into works of art with an economic value, which is sold to visiting tourists, thereby increasing people's income.

### Waste bank “Soka resik”

A waste bank is an effort to utilize waste to increase the economic value of waste. The waste bank is managed by the waste bank community, with approximately 75 customers who regularly save waste. Community waste savings were in the form of inorganic waste, including plastic, used bottles, cardboard, and food packaging waste that is collected every week.

Inorganic and organic waste are selected and processed at TPS3R. Plastic, paper, and cans are transformed into handicrafts while cooking oil waste is sold to oil collectors. On the other hand, organic waste is processed into compost, while rice and vegetable waste are used to feed chickens, worms, and catfish. Furthermore, solid waste that can still be used is

transformed into works of art that have economic value.

### Construction of a biogas digester for cattle farming

The people of Lerep Village are also cattle breeders, totaling around 238 cows. People get additional income by selling cow's milk. Also, cows produce large amounts of dung waste. Biogas is a gas mixture of methane (CH<sub>4</sub>), carbon dioxide (CO<sub>2</sub>), and other gases obtained from the decomposition of organic material such as animals, human waste, and plants by methanogens decomposing bacteria in a biodigester (Widjayanto, 2010). Biogas is used by the community for cooking. With biogas, fuel costs become more efficient. There are also other factors that biogas have economic value and environmentally friendly. The community is also not dependent on gas from outside parties because the biogas is directly flowed to residents' houses and used for cooking.

### Strategies in Implementing Conservation and Management of Water Resources

Water is a vital necessity for human life as a fulfillment of household needs and irrigating agricultural areas. Currently, the air resource crisis occurs in various regions due to drying up of springs (Setyowati, Juhadi, & Kiptida'iyah, 2017). Effective management of water sources will reduce the impact of climate change, where during the dry season, water sources become less, and when the rainy season becomes abundant.

The United States Global Climate Change Program (in Okoli&Ifeakor, 2014) stated that climate change is an extreme

reaction to weather phenomena that create negative impacts on agricultural resources, water resources, human health, the ozone layer, vegetation, and soil which causes two times the amount of carbon dioxide concentration in the ecosystem. The

following are the strategies implemented by the people of Lerep Village in managing water resources so that they are not affected by climate change, and that food security can be achieved.

**Table 3. Water Conservation Strategy**

No	Strategy	Explanation
1	Embung Sebligo	Collecting rainwater and springs to reduce runoff or flooding and provide water for the dry season
2	Biopore	Absorb water into the soil
3	Menajan	Collecting rainwater for non-household activities and watering plants during the dry season

Source: Research Data, 2020

*Embung* becomes a container for rainwater in Lerep Village. *Embung* Sebligo has a depth of 4 meters and a volume of about 4000 meters<sup>3</sup> with a size of 60x80 meters. This artificial *embung* is purely a rainwater reservoir which is also used for the fishery sector, namely fish cultivation, fishing, water tourism, and as a water supply for community plants. The following is the appearance of *Embung* Sebligo shown in Figure 2.



Figure 2. *Embung* Sebligo  
Source: Researcher's Documentation

The water in *Embung* Sebligo is used to irrigate community farms and a durian farmer empowerment center, which has around 3000 durians on 20ha of land owned by residents with 120 farmer members.

Biopore are infiltration holes that are made vertically in the soil whose function is to absorb water into the soil. Bio-pores were constructed so that water does not pool on the ground when it rains. The bio-pores

were placed in several locations in Lerep Village.

*Menajan* is an activity to collect rainwater carried out by the people of Lerep Village by using water drums with a capacity of  $\pm 200m^3$ . The rainwater storage activity is carried out so that rainwater is not only wasted on the surface of the ground, which can cause flooding but can also be used by the community during the dry season, usually used for watering plants in the yard or for other purposes besides for cooking.

## CONCLUSION

Based on the results of research, data analysis, and discussion, it is concluded that climate change has a significant impact on farmers and food security. The resulting impact is a change in crop yields, which raises a strategy to anticipate climate change in the context of food security, namely through (1) a strategy of food sufficiency and food sovereignty with an environmentally friendly system by diversifying crops and agroforestry systems, making food barns and planting fruit and vegetables; (2) domestic and household industrial waste management strategies through the TPS3R program, waste banks, and biogas; and (3) strategies for implementing water resources conservation and management through *Embung* Sebligo, bio pores, and collecting rainwater.

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