

Adaptation of Wayame village Agriculture in Climate Change Through Innovative Community Development Programs with The SDGs Approach

(Farmer Group Study of CSR Program Guided by PT. Pertamina Wayame Fuel Terminal - MOR VIII)

Ika Bayu Kartikasari¹, Paulus Oberto², Muhamad Jauhari², Dyah Ayu Pujiatikinasih²

¹Environmental Science, Universitas Gadjah Mada,

² Pertamina Fuel Terminal Wayame – MOR VIII, Ambon.

Corresponding Author:

Ika Bayu Kartikasari (ikabayu.kartika06@gmail.com)

Abstract.

Climate change is a phenomenon of erratic weather changes caused by conditions of temperature and rainfall. Based on this phenomenon, agriculture is the sector that has the most impact on climate change due to decreased productivity of food crops. This can be seen from the increasing number of pests and plant diseases being planted. If this problem continues, the economic income of the farmers will decline and tend to experience a food crisis. Therefore, Pertamina MOR VIII entered the community by overcoming problems that occurred through the CSR program. The CSR program carried out by the Kranjang Hamlet farmer group is based on climate change conditions and the SDGs concept. In the agricultural sector, there are several SDGs indicators that intersect, such as freedom from hunger, a healthy and prosperous life, the need for clean water, and the handling of climate change. Kranjang Hamlet, which is located in Wayame Village, is a hamlet located in the Ambon Islands District which is vulnerable to climate change. Because of this vulnerability, Adaptation is carried out to answer problems that occur in the village. By looking at some of these problems, the purpose of this study is to determine (1) community behavior in facing climate change, (2) CSR programs regarding climate change adaptation, and (3) Application of community CSR programs based on SDGs. The results of the research found were (1) The community's knowledge regarding climate change was relatively low, (2) The realization of the achievement of SDGs 1 in responding to community needs, especially for farmer groups (3) To achieve SDGs 2, the Company has provided training to improve community adaptation to climate change such as goat livestock as a substitute for non-organic fertilizers, training in composting from livestock manure, and training in the prevention of agricultural diseases or pests organized by the company. (4) In achieving SDGs 3 and SDGs 6, it is done by making hydram pumps to irrigate agriculture and the community's need for clean water. The conclusion of this study is that the company has provided a CSR program to the people of Wayame Village to meet the needs of the Village farmer groups. So that the community has the capacity to see and understand the climate change adaptation process in the agricultural sector in Wayame Village.

Keywords: Climate change, Adaptation, Agricultural Innovation, CSR Programs, SDGs

1. INTRODUCTION

Climate change is starting to be felt in rural communities today, especially in coastal areas. Climate change is a phenomenon of erratic weather changes caused by

<http://ijstm.inarah.co.id>

temperature and rainfall. Changes in unstable weather can cause precipitation, evaporation, run-off, and fluctuating humidity that can threaten agricultural production [1]. Agriculture is the sector that has the most impact on climate change due to decreased productivity of food crops with increasing attacks of pests and diseases. The effects of climate change can be multidimensional, with the influence of production, food security to the welfare of farmers and the surrounding community [2].

Climate change conditions cannot be separated from the SDGs concept. In the SDGs concept, climate change and environmental damage are crucial because SDGs prioritize social, food and energy security, and development that is more pro-middle-low. In the agricultural sector, there are many parts of the SDGs that intersect, among others, free from hunger, healthy and prosperous life, the need for clean water and addressing climate change.

Wayame Village is a located in Ambon Islands District. The location in the coastal area has a wide influence, especially the possibility of damage to infrastructure and other facilities. Vulnerability that occurs due to climate change experienced by coastal communities requires assistance and guidance in implementing climate change adaptation strategies [3][4]. According to [5], adaptation is a step taken to reduce vulnerability. Adaptations are made because the impacts of climate change are increasingly being felt in all parts of the world. Drought, crop failure and floods affect rural communities, especially agriculture and adaptive behavior will be the community steps in maintaining a livelihood and quality of life. From some of these problems, the purpose of this study is to determine (1) people behavior in facing climate change, (2) climate change adaptation programs, and (3) the application of community programs based on SDGs.

II. METHODS

This research was conducted in Kranjang Hamlet, Wayame Village, Teluk Ambon District, Ambon. The research subject is the Various Business Farmers Group as an illustration of society's adaptation to agriculture through anticipation and community assistance on the basis of sustainable development goals (SDGs) in increasing food security in Wayame Village. Information in the form of secondary data about community agricultural management from related parties and primary data sourced from the community which was conducted through FGD (Forum Group Discussion). Interviews were conducted with stakeholders in the Kelurahan such as the village head, religious leaders, RT, and community leaders.

1) RESEARCH SITE

This research was conducted in Kranjang Hamlet, Wayame Village, Teluk Ambon District, Ambon. The consideration of choosing the research was due to the people's livelihoods which were dominated by farmers of rice, corn, sweet potatoes, types of vegetables such as chilies, mustard greens, long beans, corn and fruits such as pineapples, watermelons and tomatoes.

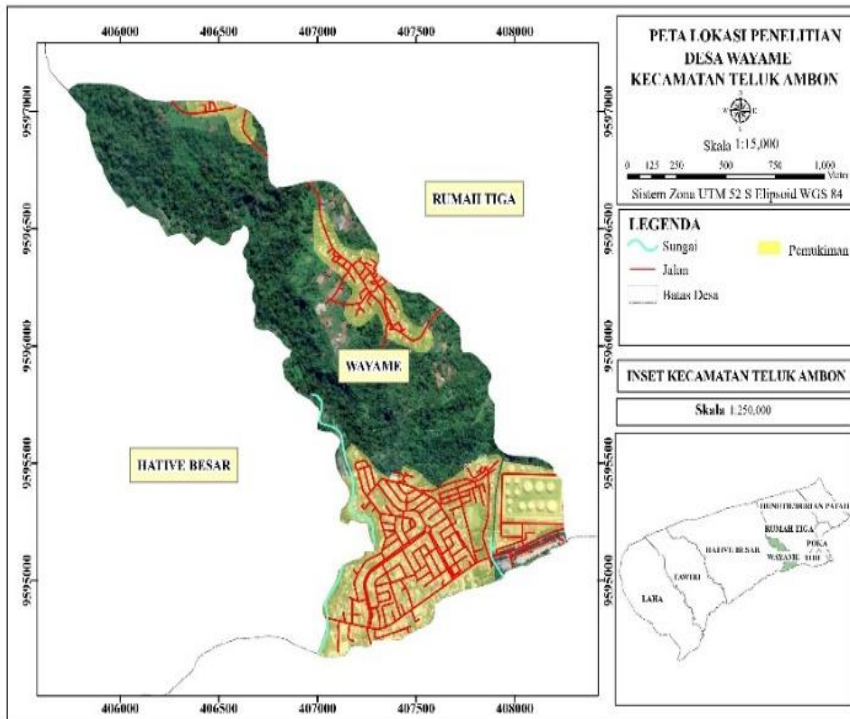


Fig 1. Research Location
Source: Secondary Data, 2020

2) RESEARCH DESIGN

This research was conducted in three stages. Preparation, implementation, and data analysis. The preparation stage with literature studies in order to formulate objectives and research objects and collect secondary data. The implementation stage is an activity to obtain data in the field by conducting interviews and FGDs.

3) DATA ANALYSIS

The data analysis technique that has been used is qualitative data analysis technique, which explains and analyzes the data by describing the results of the research through a number of data that is successfully required by the author, then presenting the results of the research. The qualitative data were obtained by means of in-depth interviews and FGDs. Interviews were conducted with stakeholders in the Kelurahan such as the village head, religious leaders, RT heads, and community leaders in each kelurahan.

Respondents who took part in FGD activities were members of farmer groups, community leaders and village officials. The people of Wayame Village are dominated by farmers because it is morphologically located in the highlands. Agricultural activities in Wayame Village, after the garden products are collected, are then sold to collectors who will then be sold to markets outside Kranjang Hamlet.

Table 1. Research Method

No.	Method	Data sources / Respondents	Type of Data
1.	Secondary data collection	Local government agencies and Rupa Bumi Indonesia.	<ul style="list-style-type: none"> • Map of Research Locations • Regional and socio-economic description of the community. • Community empowerment program.
2.	Interview	Government agencies, community representatives (26 Informants)	<ul style="list-style-type: none"> • Information on environmental conditions and impacts on farmers. • Community strategies in coping with climate change and crop failure • Information on the role of farmer groups to farmers.
3.	Field Observation	public figures	<ul style="list-style-type: none"> • Observe the planting process to harvest and its problems • Make observations on the socio-economic conditions of the community • Make observations on the condition of plants and their use.
4.	Focus Group Discussion	Related parties (Consists of 11 men and 8 women)	<ul style="list-style-type: none"> • Gather information on land conditions and the impacts of changing seasons. • programs that have been implemented and collect input from related parties.

III. RESULT AND DISCUSSION

Behavior of Farmers Facing Climate Change

Agriculture is the sector most vulnerable to climate change. The agricultural land in Kranjang Hamlet is dominated by food crops which are generally seasonal crops. Annual crops are sensitive to the environment, especially excess and lack of water. The main factors in climate change that have an impact on agriculture include changes in rainfall patterns, frequent climate extremes and increases in temperature and sea level. The influence on seasonal crops is related to water management, land use, cropping patterns and crop varieties [6].

Farmers in Kranjang Hamlet understand that climate change is happening based on local phenomenons. In general, farmers have a certain period of time when they start planting or the type of crop to be planted. However, sometimes the rainy season is too long and results in crop failure due to the high intensity of rain and during the dry season which often experiences water shortages and the types of pests that arise. Farmers feel that climate change is the most threatening condition for agricultural activities. Farmers identified several climatic phenomena that occurred, including: (1) increasingly extreme rainfall in the season, (2) the drought that hit agriculture, and the most troubling was (3) climatic conditions that were increasingly difficult to predict. This vulnerability is closely related to land use systems and soil properties, cropping patterns, soil, water and crop management technologies, as well as crop varieties [7].

Public knowledge regarding climate change is relatively low. Often times farmers are faced with pests (Plant Pesting Organisms) that are difficult to control. Excessive use of chemicals such as chemical fertilizers and insecticides without an optimal dosage will result in damage to soil moisture and make the pest more resistant to the given chemicals. Some respondents did not understand the importance of climate information, so it was often difficult to determine the starting point and commodity to plant. Some other obstacles are knowledge about irrigation water management, as a strategy to face climate change. The community still uses groundwater and water reservoirs created around the fields. In general, the behavior of farmers still does not reflect good adaptation actions in facing climate change.

Climate Change Adaptation Program

The results obtained from the Forum Group Discussion (FGD) required the assistance of farmer groups to support the development of agricultural science and systems supported by technology and innovation. The benefit of this assistance is also to initiate a cooperative that is used to assist farmers in dealing with agricultural problems if there are problems such as crop failure. The objectives of the Farmers Group Assistance Program and the Formation of Cooperatives are; (1) The realization of a strong and independent farmer organization so that it is able to fight for the interests of its members in the framework of managing existing resources in accordance with common principles. (2) The implementation of farming methods that are in harmony with nature, supported by appropriate technology. (3) The realization of organizational capacity in developing an agriculture-based economy so that it is able to answer the needs of its members in providing working capital, agricultural facilities and in building mutually sustainable marketing and information networks. (4) The realization of the capacity of farmer organizations in fighting for farmers' rights. The farmers will be given assistance to the Farmers Group and the Formation of Cooperatives in Basket Hamlet. However, based on information in the field, these farmers also shared and discussed with other farmers to participate in trying the results of the training provided by PT Pertamina (Persero) TBBM Wayame. There is training in agriculture made from organic materials and has received benefits from the results of planting using the organic system. The activities that have been carried out are as follows.

Table 2. Climate Change Adaptation Program

Community Activities Prior to the Climate Change Adaptation Program	Climate Change Adaptation Program
The community raises cows and goats for personal needs, but manure has not been used	Providing training related to the technique of raising goats as a substitute for non-organic fertilizers
The community still uses non-organic fertilizers which have an impact on decreasing the quality of the loose soil	Training on making compost from livestock manure and its application
The community still does not understand how to prevent agricultural diseases / pests	Agricultural disease / pest prevention training
People still use chemical insecticides so that their crops contain chemicals	Training on the use of local materials to make natural insecticides.

Implementation of SDGs Based Community Adaptation Programs

Climate change that occurs will have an effect on Wayame Village, which is an area close to the coast and its ecosystem. Adaptation is needed to deal with climate change as an effort needs to be done with the aim of minimizing the negative impacts of climate change [8]. Adaptation is carried out to maintain human survival and the surrounding ecosystem that meets human needs. The program is associated with sustainable development (SDGs) on several subjects related to community welfare, the need for clean water and community awareness of climate change.

Table 3. Program Implementation

Sustainable Development Goals	Indicator	Community Adaptation Program	Benefits of Program Implementation
SDGs 1: Without Poverty	<ul style="list-style-type: none"> • End poverty in all forms everywhere. 	<ul style="list-style-type: none"> • Through the CSR program, farmers are able to undergo the development of innovations in the group. 	<ul style="list-style-type: none"> • The level of people's economic income is increasing.
SDGs 2: End hunger, achieve food security and improve nutrition and support sustainable agriculture	<ul style="list-style-type: none"> • Utilization of natural resources for natural resource management supports food security for areas surrounding poverty. 	<ul style="list-style-type: none"> • Training related to techniques of raising goats as a substitute for non-organic fertilizers • Training on 	<ul style="list-style-type: none"> • The community understands how to maintain and process animal manure for compost. • Farmers can take measures to prevent diseases and pests in plants using natural pesticides

<p>SDGs 3 Ensuring a healthy life and welfare</p>	<ul style="list-style-type: none"> • Support to increase agricultural production and economic growth. 	<p>making compost from livestock manure and its application</p>	<ul style="list-style-type: none"> • The community is able to irrigate the fields using a hydram pump that comes from a spring that functions in the dry season so that it no longer experiences drought.
<p>SDGs 6 Ensure availability and sustainable management of water and sanitation for all</p>	<ul style="list-style-type: none"> • Provision of clean water and sanitation for community welfare • Manage natural resources for equity. 	<ul style="list-style-type: none"> • Agricultural disease / pest prevention training 	<ul style="list-style-type: none"> • The solar dryer can be an alternative technology for the community for drying cloves and cassava. So that people no longer need to look for wood as fuel, and have to cut down trees, the impact is not environmentally friendly and the original aroma of cloves and nutmeg is lost.
<ul style="list-style-type: none"> • Manage water sources for equity 	<ul style="list-style-type: none"> • Construction of hydram pumps for agricultural agriculture and community clean water needs 		

Source: Research Results, 2020

Training Program

Mentoring for farmer groups and the formation of farmer cooperatives is carried out by companies in Community Development activities. In the CSR program in Wayame Village, the company carries out these activities because the majority of the villagers depend on their sources of income from agriculture and livestock. In general, farming communities use chemical fertilizers and pesticides continuously, because for those who own land near residential areas. In fact, the use of chemical fertilizers (inorganic) is always followed by environmental problems, both on biological fertility and soil physical conditions and the impact on consumers. Therefore, the company held training for mentoring activities aimed at developing organic farming methods, which are natural or environmentally friendly. This method is known as compost which can be made independently and does not damage the soil quality in the future. This aims to improve soil structure, increase soil absorption material for water, increase living conditions in the soil, and serve as a source of food for plants [9].

To support the supply of natural fertilizers needed by these farmers, training is given related to goat farming techniques so that goat manure can be used for organic

fertilizer. The follow-up of the goat livestock training is composting training. After that, training on disease and pest prevention for agriculture is carried out through a periodic maintenance process that can be carried out by farmer groups. To anticipate damage to garden crops due to pests through early detection, training is given on the use of local materials to be used as a pesticide mixture, such as using banana sap or banana tree sap to be sprayed on plants. Apart from providing training for farmer groups, PT. Pertamina (Persero) Fuel Terminal Wayame - Marketing Operation Region VIII also provides water storage facilities in the fields and the construction of a rest area for farmers which can also be used as a place to plant seeds.

Based on the CSR program aimed at the Kranjang Hamlet farmer group, the formation of cooperatives took place. The formation of this cooperative is to accommodate and show that the garden products they produce are garden products using organic and natural farming systems from Kranjang Hamlet. In addition, with the existence of cooperatives, it is hoped that the group can uphold the values of togetherness and cooperation among its members which are very necessary to realize its main goal, namely improving the welfare of its members and the prosperity of the community [10]. So far, the mentoring and training programs that have been carried out by farmer groups are considered good. This is due to the emergence of enthusiasm and motivation for farmers to innovate their agricultural systems. From the results of discussions and interviews with several people in Kranjang Hamlet, 90% of the benefits of the CSR program in the group have been received by the community. People get new knowledge and product development innovations with an organic system.

Construction of a Hydrum Pump

The hydrum pump was made based on the recommendation of the community who find it difficult to find water for irrigation during the dry season. Two hydrum pump installations were built which were taken from the village forest springs. Hydrum pumps function to irrigate fields belonging to residents. The hydrum pump selection is also based on the conditions of Wayame Village, which is located in the highlands. The advantage of the hydrum pump itself is that it is energy efficient because it does not require a motor that only uses water pressure, runs automatically, and can operate for 24 hours.

Table 4. Water Consumption

Water Usage Status	Rain Resistance	Hydrum Pump	Unit
Number of water reservoirs	816,48	2721,6	m ³
Water use	1390	2230	m³
Irrigation	840	1680	m ³
Community Activities	450	450	m ³

Other Activities	100	100	m ³
Remaining Usage	(Defisit) – 573,52	491,6	m ³
Efficiency Ratio		76,9	%

Prior to the existence of the hydam pump, people used the traditional method by making rainwater catchments. The hydam pump which has been operating for a year, has a larger storage capacity than rain catchment with an efficiency ratio of 76.9%. With the hydam pump, which previously only experienced harvests once a year and often experienced crop failures in the dry season, now people can harvest 2-3 harvests and the impact of the hydam pump increases community income with assistance from the CSR program and farmer groups. The benefits of hydam pumps are felt during the dry season, whereas in the rainy season people rarely use hydam pumps, now the capacity of the hydam pumps is added to speed up the distribution of water to community fields. The community is also given the authority to carry out maintenance by providing assistance to other farmer members. During the mentoring until the end of the program, from the results of the discussion the hamlet community received benefits from the hydam pump installation building.

IV. CONCLUSION

Based on the results of data analysis carried out in this study, the conclusions that can be obtained are as follows.

1. Public knowledge regarding climate change is relatively low. Some respondents did not understand the importance of climate information, so it was often difficult to determine the starting point and commodity to plant. Some other obstacles are knowledge of irrigation water management. In general, the behavior of farmers still does not reflect good adaptation actions in facing climate change.
2. In realizing SDGs indicator number 1, the CSR program carried out by PT. Pertamina (persero) Fuel Terminal Wayame - Marketing Operation Region VIII Ambon has been able to answer the needs of the community, especially for farmer groups. This has a positive impact on the increasing capacity of the community and is able to overcome the obstacles that occur, so that with the attention of the company, the income level and economy of the farmer groups can be resolved.
3. To achieve SDGs 2, activities carried out with Community Development guidelines, such as providing training to improve community adaptation to climate change. The training provided includes techniques for raising goats as a substitute for non-organic fertilizers, training on making compost from

- livestock manure and its application, training on the prevention of agricultural diseases or pests, training on the use of local materials to be used as natural insecticides by adding the construction of a hydram pump.
4. The achievement of SDGs 3 and SDGs 6 is carried out by making hydram pumps to irrigate agriculture and the community's clean water needs. From the Community Development activities that have been arranged in the company's CSR program, now people in Wayame Village can benefit from the programs provided and begin to understand the process of adapting to climate change.

V. ACKNOWLEDGMENTS

The authors thank the Pertamina (Persero) Fuel Terminal Wayame comdev for supporting the CSR (Corporate Social Responsibility) program, to the Teluk Ambon local government, especially Wayame Village.

REFERENCES

- [1] Suhaendah, Endah, Fauziyah, Eva, dan Manurung, Gerhard, ES. *Adaptasi Petani Lada Terhadap Perubahan Iklim di Desa Lawonua dan Desa Simbune Sulawesi Tenggara. Prosiding Seminar Nasional Geografi UMS*, 260 – 268, 2016.
- [2] Santoso, Agung Budi. *Pengaruh Perubahan Iklim terhadap Produksi Tanaman Pangan di Provinsi Maluku. Penelitian Pertanian Tanaman Pangan*, Vol 35(1), 29 – 38, 2016.
- [3] Salampessy, Yudi L.A., Lubis, Djuara P., Amien, Istiqlal, dan Suhardjito. *Menakar Kapasitas Adaptasi Perubahan Iklim Petani Padi Sawah (Kasus Kabupaten Pasuruan Jawa Timur). Jurnal Ilmu Lingkungan*, Vol 18(1), 25-34, 2018.
- [4] Subair, Kolopaking, Lala M., Adiwibowo, Soeryo, Pranowo, M. Bambang, *Adaptasi Perubahan Iklim Komunitas Desa: Studi Kasus di Kawasan Pesisir Utara Pulau Ambon. Jurnal Komunitas*, Vol 6(1), 57 – 69, DOI: 10.15294/komunitas.v6i1.2943, 2014.
- [5] Smit, B. and Wandel J. 2006. *Adaptation, adaptive ca-pacity and vulnerability. Global Environmental Change*, 16: 282-92
- [6] Sumarini, Elza, Runtunuwu, dan Las, Irsal. *Upaya Sektor Pertanian dalam Menghadapi Perubahan Iklim. Jurnal Litbang Pertanian*, Vol 30 (1), 2011.
- [7] Salinger, M.J. *Climate variability and change: past, present, and future over view. Climate change* 70: 9 – 29, 2005.
- [8] Kusnanto, Hari. *Adaptasi terhadap perubahan iklim. Pusat Studi Lingkungan Hidup UGM*, 2011
- [9] Dewanto, F. G. *Pengaruh Pemupukan Anorganik dan Organik Terhadap Produksi Tanaman Jagung Sebagai Sumber Pakan. Jurnal Zootek* (2), 2013.
- [10] Pras, P. P. P., & Sumadi, S. (2020). Islamic Microfinance Service Quality and Its Impact on Yogyakarta Customers' Satisfaction and Loyalty. *International Journal of Science, Technology & Management*, 1(2), 127-132.
- [11] Mahri, A. J. *Pelayanan Dan Manfaat Koperasi, Serta Pengaruhnya Terhadap Partisipasi Anggota*. Retrieved from <http://jurnal.upi.edu/file/Jajang.pdf>. 2005.