

## Agroforestry As An Alternative To Facing Climate Change In The Community, Ponorogo Regency

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### **Abstract.**

*Changes in the seasons on earth can cause problems for farmers in determining the planting and harvesting seasons. Management of forest areas with good agroforestry strategy by utilizing it to produce food in partnership with the community effectively inhibits the increasing rate of climate change. The agroforestry implementation strategy with the social and economic conditions of the community is also used to explore how far the impact of climate change on changes in current conditions. . The research aims to formulate strategies that must be developed to adapt to climate change. The AHP results show that the economic aspect has a priority weight of 0.89, the environmental factor has a 0.39 weight and the organizational part has a 0.26 weight. Work steps of the parties involved and priorities in the short and long term. For the parties involved, it is necessary to prioritize its implementation so that the community's economy can run according to expectations. The short-term priorities are training on climate change information and its impacts, group management and administration, entrepreneurship, marketing, and intensive mapping of CSR opportunities. In the long term, the government, academic can provide facilitators and assistance for technology transfer in dealing with climate change.*

**Keywords:** Earth, Community . Environmental, farmer and forest.

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### **I. INTRODUCTION**

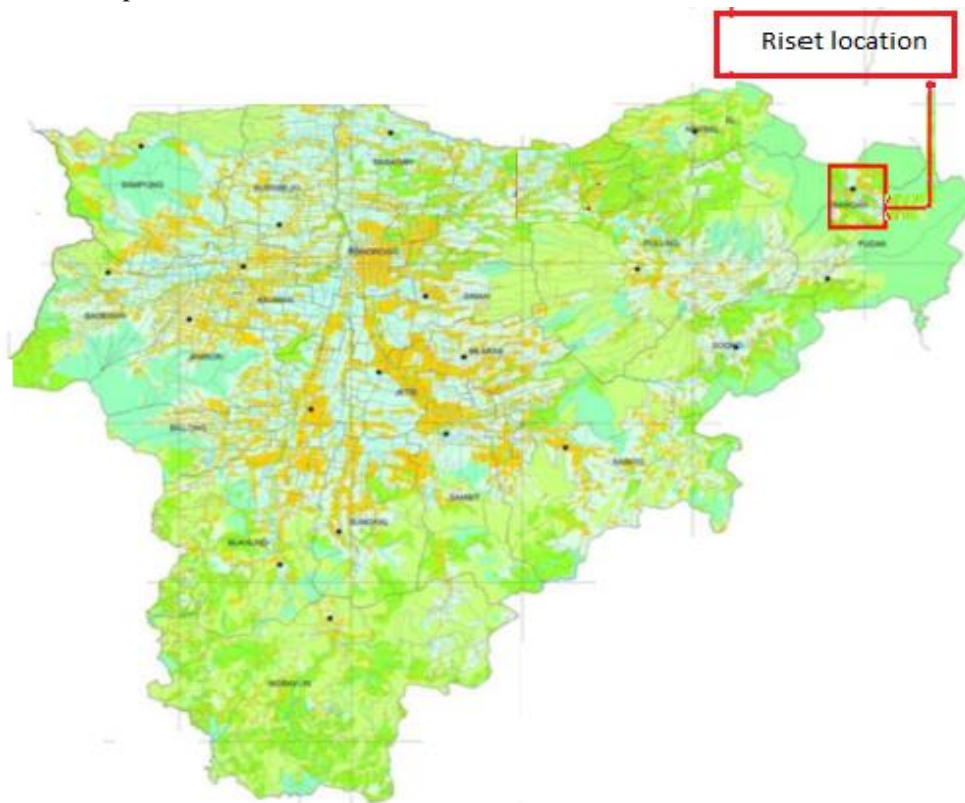
Climate change has impacted various aspects of life and development sectors, including infrastructure, health, marine, agriculture, and forestry [1]. The agricultural framework of land tenure and practice sector is the sector most vulnerable to the impacts of climate change because the farming industry is highly dependent on the climate in its activities [2]. The shifting of the dry and rainy seasons creates problems for farmers in determining the planting and harvesting seasons. Often farmers experience the wrong season or the wrong season when planting or harvesting. In addition, the short duration of the rainy season has caused farmers to experience crop failure due to insufficient water supply for crop needs [4]. This increase dramatically impacts the frequency of weather that occurs in an area. Climate change has a severe impact on life. Humans can slow the rate of change by changing existing habits by conserving forests to reduce climate change mitigation. Efforts need to be made to mitigate the increasing rate of carbon emissions. A very effective solution is to use forest trees to absorb carbon produced by humans, through the process of photosynthesis. The existence of forests can help mitigate climate change. The presence of forests is essential for health, sources of livelihood, and the future of humans. Trees absorb carbon dioxide from the air, gas is converted into oxygen. The sequestration of carbon dioxide helps reduce the presence of greenhouse gases. The more trees there are, the more carbon dioxide is absorbed from the atmosphere and stored for plant growth.

Therefore, there needs to be an emission strategy to reduce the increase in temperature[5]. How far the human contribution to climate change in the future is seen through certain factors such as Forest management systems, population growth, economic development, and the development of new technologies. The application of the agroforestry strategy by using forests to produce food in partnership with the community effectively inhibits the ever-increasing rate of climate change. The agroforestry implementation strategy with the social and economic conditions of the community is also used to explore how far the impact of climate change is on changing current needs. The selection of future projected planting systems is based

on the time frame of the forestry development system in Indonesia. Agroforestry is an activity that combines the agricultural, livestock, and forestry sectors which are carried out in a mutually supportive pattern so that they can provide more results for the community [6]. Through the concept of agroforestry, it is hoped that farmers can gain economic, social, and environmental (ecological) benefits to support the sustainability of community life. This climate change condition has affected the level of economic, social, and ecological life in rural communities, so efforts are needed to reduce the impact of climate change based on the community's capabilities and available potential. The research aims to formulate strategies that must be developed to adapt to climate change.

## II. MATERIAL AND METHODS

The Place and time of research was conducted in District, Ponorogo Regency. This research was conducted from Juli to September 2021



**Fig 1.** Map Riset Area

Developing climate change mitigation and adaptation strategies began with a Focus Group Discussion (FGD) and in-depth interviews with key persons. FGDs were conducted with information on climate change. FGDs were worked with academics, relevant government agencies, NGOs, and farmer groups. The FGD participants included the NGO Mutiara Hijau, the Wana Lestari Forest Farmers Group, the Ponorogo Agriculture and Forestry Service, and the Ponorogo Environment Service. After the results of the FGD were identified, in-depth interviews were conducted with key persons determined by purposive sampling [4,7]. Key persons come from several related agencies, such as Bappeda Distric. Ponorogo, NGO, Department of Agriculture, Plantation, and Forestry Kab. Ponorogo, District Environmental Service. Ponorogo and the Wana Lestari Forest Farmers Group. The results of the FGD and in-depth interviews with key persons determine what aspects are related to the strategy of adapting to change with sustainable land systems. The results of the FGD and in-depth interviews were then used to develop adaptation strategies and analyzed using the Analysis Hierarchy Process (AHP) formulated [8]. The AHP results are then used to synthesize (reconstruct) adaptation strategies. The reconstruction strategy considers the ecological, economic, and social functions of institutions.

### III. RESULTS AND DISCUSSION

Based on the results of FGDs and in-depth interviews with several key persons, climate change mitigation and adaptation strategies are closely related to agroforestry's three functions: economic, environmental, and community organization. The formulation of the results of the FGD and interviews were then elaborated into alternative strategies based on these three aspects of the function.

a. Economic Aspect: Diversifying results (N1), Conducting land intensification (N2), and Expanding product marketing network (N3)

b. Environmental aspects: Effective use of water (N4), Reducing critical land (N5) and Reducing methane gas (N6). To determine the order of priority scale of the three functions, AHP is carried out.

c. Aspects of community organization: Improving the capacity of communities and farmer groups (N7), Increasing cooperation and partnership (N8), and Support from the government(N9).

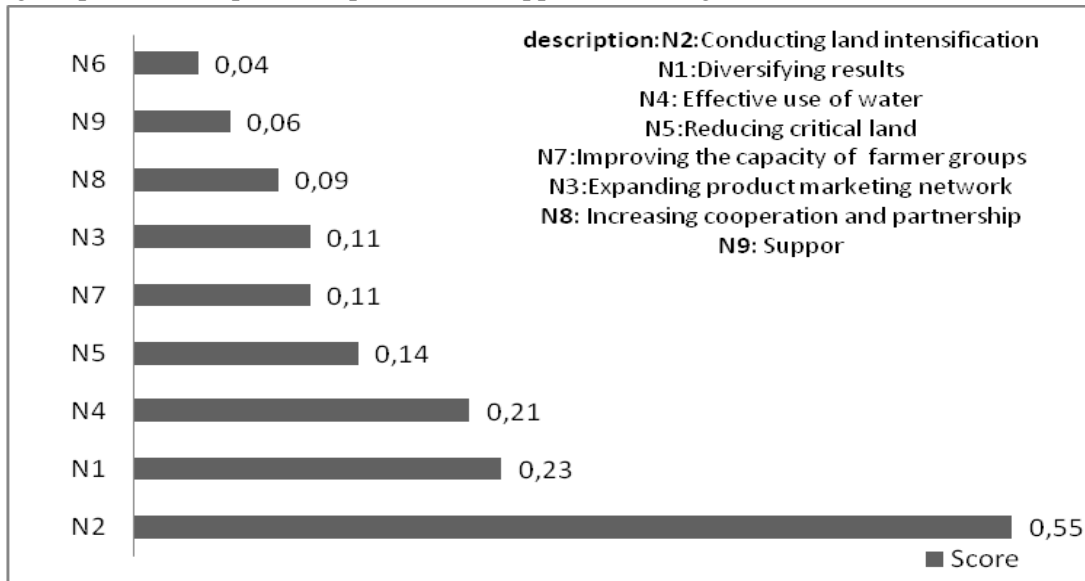


Fig 2. Priority of climate change adaptation criteria and alternatives.

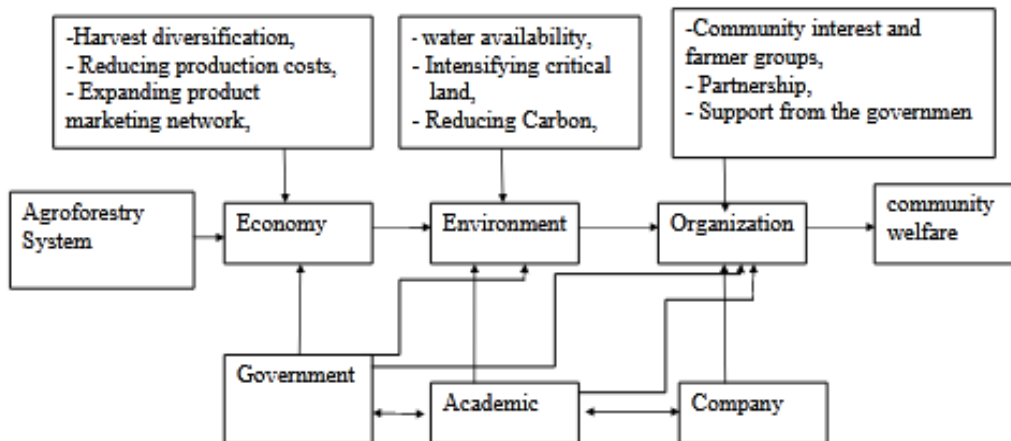


Fig 3. Visualization of adaptation strategies to climate change

The results of the AHP show that the economic aspect has a priority weight of 0.89, the environmental factor has a 0.39 weight and the organizational part has a 0.26 weight. The results of the AHP show that the economy is a priority in the development of agroforestry in Ngebel Sub-district, then the environmental and organizational functions. This is in line with the research by [9], that the fundamental weakness in developing community-based agroforestry is the weak capacity of the community and farmer groups. [10] started that in dealing with these obstacles, policies, and support from the government are needed that function as facilitators in connecting communities with stakeholders and entrepreneurs concerned with agroforestry development. Figure 3 shows that the three priorities in the climate change

adaptation strategy are to increase the capacity of communities and farmer groups, increase cooperation and partnerships, and effectively use water. Based on the results of the FGD and in-depth interviews with key persons and AHP, it was shown that overall, agroforestry has the feasibility to be developed in adapting to climate change. However, the obstacle faced is the level of public perception of climate change is still relatively low. For this reason, efforts are still needed to improve the community's ability to deal with climate change with the involvement of stakeholders. Climate change adaptation strategies for farmers can be done by product diversification, conduct training, counseling, coaching, and business development to ensure the sustainability of farming [11]. States that agroforestry is a compromise solution in reducing emissions between forest and agricultural landscape functions requires a change in perspective on integrated landscape management.

Efforts to adapt to climate change with integrated land management with agroforestry systems require active participation from all relevant parties, including the government, the private sector, company, academic, and farmer groups [12]. Based on the field's reconstruction, findings, and phenomena, this research formulates adaptation strategies to climate change with an agroforestry system that can be visualized, as shown in Figure.3. Following image. The strategy designed in this study was reviewed as a whole (holistic) and integrated [13]. A holistic system includes all aspects of mitigation and adaptation (economic, ecological and social institutional aspects), actions, related parties, and priorities in the short and long term. The parties involved in the adaptation strategy include the government, the private sector, company, and academics. For group institutions to work following expectations, it is necessary to prioritize their implementation. The short-term priority is intensively conducting information training on climate change and its impacts, group management, administration, entrepreneurship, marketing, and mapping CSR opportunities. In the long term, the government, company and academic can provide facilitators and assistance for technology transfer in dealing with climate change and provide input and research on developments so that farmer groups can apply the results. In addition, the government should provide technical guidance and funding support and become a facilitator in community-based agroforestry development.

#### IV. CONCLUSION

The results of the study show that the function of the economy is a top priority in the development of agroforestry in Ngebel District. The parties expected to be involved are the government, companies, and academia. Short-term priorities in climate change adaptation strategies are training on climate change information and its impacts, production management, entrepreneurship, and marketing. The long-term focus is the transfer of climate change adaptation technology through assistance provided by the government, companies, and universities, as well as providing input and research on developments made so that farmer groups can apply the results.

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