Farmer's Adaptation Strategy in Facing The Impact of Ecosystem, Change (Case Study: Neglasari Village, Dramaga District, Bogor Regency)

Mohammad Akbar Fachtur[1], Sephia Ellyana[2], Yulanda Gusminar[3,] Bayu Eka Yulian[4]

{akbarfachtur@apps.ipb.ac.id[1], sephiaellyana@apps.ipb.ac.id[2,] yulanda23gusminar@apps.ipb.ac.id[3]}

IPB University, Kampus IPB, Jl. Raya Dramaga, Babakan, Kec. Dramaga, Kabupaten Bogor, Jawa Barat 16680, Indonesia

Abstract. Ecosystems are reciprocal relationships between living and non-living components. When an element in the ecosystem changes, it requires adaptation by one component to another. Neglasari Village has experienced changes in its ecosystem caused by the reduced availability of non-living components, namely water, as a result of changes in rainfall. Changes in rainfall then have an impact on the growth rate of agricultural crops, resulting in changes in agricultural patterns as a form of adaptation to ecosystem changes. This study was conducted using a qualitative approach. The purpose of this study is to analyze the transformation of agricultural patterns and impacts in Neglasari Village in facing ecosystem problems. This paper concludes that there has been a change in agricultural patterns in Neglasari Village from initially planting rice and secondary crops to planting secondary crops only.

Keywords: adaptation, agricultural patterns, ecosystem change, socio-culture.

1 Introduction

Human life today cannot be separated from natural conditions and its surroundings. Changes that occur in natural conditions can affect the pattern of human life. Therefore, adaptation actions are needed to maintain human harmony with nature.

The most basic concept of ecological analysis is an ecosystem. The ecosystem is a reciprocal relationship between living things and the surrounding environment. The ecosystem can also be interpreted as a unified and comprehensive order between environmental elements that influence each other (Sitanggang & Yulistiana 2015). All definitions of the ecosystem include aspects of the interaction between environmental variables in a transparent way.

Ecological analysis can explain why and how the process of environmental change occurs. The ecological analysis elements of the physical and social environment are included. The interactions can explain the relationship between humans and their culture with the environment and surroundings. Some processes occur, such as development, maintenance, and

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changes in the relationship between components. Therefore, the balance in the ecosystem must be maintained.

In Neglasari Village, several changes occur. In the 1980s, the local community was still growing rice to meet their daily needs. However, at that time, the development of rice itself had various kinds of problems that continued until 2000. In that year, the irrigation system began to experience problems; namely, water could not get to the rice fields, so crop failure occurred. In 2005 the local community began to abandon rice plants and multiply crops. In 2017 rice plants were no longer planted in Neglasari Village. It should be noted that in the 1980s, people had started to plant secondary crops, but not as much as today. Therefore, the authors are interested in examining changes in agricultural conditions in Neglasari Village and the adaptation behavior carried out by the local community in order to be able to survive until now, especially in terms of patterns of utilization of natural resources.

2 Theoretical Approach

2.1 The concept of adaptation

Adaptation is one of the basic concepts in the study of human ecology. Yulianti (2011) explains that adaptation is a process of genetic evolution in the form of reciprocal movements in a population due to environmental interactions (genetic adaptation). According to Yulianti (2011), the definition of adaptation is also related to the behavior pattern of an organism's life in terms of overcoming its environment. Aldrian *et al*. (2011) explain that adaptation is an attempt by living things to adapt to their environment. The UNFCCC also explains that adaptation is an effort to find and apply procedures for adaptation to environmental conditions.

Owombo *et al*. (2014) added that adaptation is a policy option to reduce the negative impact of environmental change. Meanwhile, according to Soekanto in Yulianti (2011), the concept of adaptation is divided into two categories: genetic and somatic. Genetic adaptation is the process of forming specific body structures which are hereditary and permanent from the stimulation of occupants in an environment. Somatic adaptation is a structural or functional adjustment that is temporary. It means that the adaptation process can occur in various ways according to the needs and circumstances of the environment.

2.2 The concept of ecology

The term "Ecology" was first introduced by German biologist Ernst Haeckel in 1869. The word ecology comes from the Greek, namely "Oikos," which means house, and "Logos," which means science. Priastomo *et al.* (2021) define ecology as a science that examines the interactions between living things and the interactions between living things and their environment. Ecology is a scientific study that explores the interrelationships between organisms and their habitat/environment. Ecology only studies what exists and happens in nature and does not conduct experiments (exploratory).

As the needs and interests increase, the ecological theory begins to develop into a science that studies ecosystems' structure and function. These developments enable ecological theory to analyze and answer the many questions from humans regarding various events in nature.

Brahmaiah (2017) explains that ecology has three subdivisions: autecology, synecology, and habitat ecology. Autecology is a science that discusses the life history and adaptation patterns of individual organisms to their environment. Synecology studies groups or groups of organisms that associate together as a unit. Habitat ecology is the study of descriptive organisms with the type of environment or habitat in which these organisms live.

3 Methods

The method used in this research is qualitative. Qualitative methods are used to determine the adaptations made by farmers in dealing with changes in the ecosystem around their agricultural land. The approach used is descriptive in the form of a series of words obtained from interviews and literature studies. The qualitative method is used in this study because it is considered more sensitive and can adapt according to the influence of patterns and values faced by the author.

The research was conducted in May 2022 in Neglasari Village, Dramaga District, Bogor Regency. The location selection was done purposively. The data sources used are primary and secondary. Primary data sources were obtained from interviews with the head of the Neighborhood Association (RT) in Neglasari Village. The secondary data was obtained from a literature study conducted to strengthen the foundation and results of this study. These primary and secondary data are then processed, verified, concluded, and presented in the form of study papers.

4 Result and Disscussion

4.1 Initial conditions of agriculture in Neglasari

Village Neglasari village is a low-lying area with an altitude of 206 meters above sea level with an area of about 1.47 km² (BPS 2021). In the north, it is bordered by the Cihideung river, which is the border with Cihideung Ilir Village, Kec. Ciampea, in the east, is bordered by the river/solo Ciparingga, which borders Sinarsari Village, Kec. Dramaga, on the south, is bordered by the Cikeruh river, which borders the Peter Village, Kec. Dramaga, on the west side, is bordered by the Cihideung River, which borders Cihideung Udik Village and Cihideung Ilir Village, Kec. Ciampea.

Neglasari Village is a vibrant village in rice planting activities, especially before the 1980s. Neglasari village even had time to become the most productive village in producing the staple food of the Indonesian nation. Initially, the land owned by the farmers of Neglasari Village was used to grow rice in a rotational pattern with other crops. According to Evizal and Prasmatiwi (2021), rotation in planting patterns can improve environmental dynamics, especially biodynamics on cultivated land, so that it can provide various benefits in ecological, economic, and social aspects, the pillars of sustainable agriculture. In the 1980s, the order of planting on agricultural land was two plantings of rice and then the planting of secondary crops. The order of planting is intended to keep the soil fertile.

4.2 Changes in Cropping Patterns ac an Effort to Adapt in Ecological Changes

In its journey, agricultural conditions in Neglasari Village underwent several changes due to various problems that arose, as illustrated in the following figure:

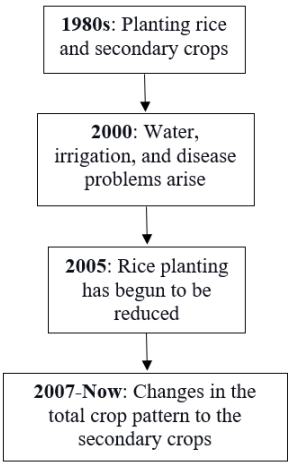

Fig. 1. Changes in agricultural conditions in Neglasari Village.

Based on **Figure 1**, it can be seen that starting in 2000, and there were problems with the irrigation system in Neglasari Village and the "rot of the neck" disease. Neglasari village is a village that is not passed by water flows, such as rivers, plus this village is a village that has a deficiency in the irrigation system. This makes the village of Neglasari depend on the fate of its agricultural success on rainwater that falls in the planting area. This problem began to become the focus of discussion by the farming community in Neglasari Village since the increase in the phenomenon of climate change which caused the uncertainty of seasons and weather in the village. Rice cultivation requires an ample supply of water. With the decrease in rain intensity, especially in the dry season, the water supply for plants will not be enough if only rain-fed water is used. This decrease in rain intensity resulted in drought in the farmers' rice plants, which caused many losses from the inhibition of the agricultural process.

Other problems also emerged and worsened agricultural conditions in Neglasari Village with an outbreak of neck rot disease. The emergence of this disease in rice plants causes the rice to fail. According to Sholeh (2019), neck rot disease or commonly called *blast* is caused by a fungus that arises due to excess nitrogen, lack of water, and excess moisture, and the disease is in the form of gray or whitish spots with brown or reddish edges with a split shape. Diamond with pointed ends. In its development, farmers in Neglasari find it challenging to overcome the disease. During 2000-2005, there was a change in rice seeds and the application of pesticides to ward off pests, but these efforts did not give satisfactory results. Hence, the farmers decided to reduce rice cultivation on their land and switch to secondary crops with less risk.

The change in cropping patterns from rice to secondary crops is the solution and adaptation effort chosen by farmers in Neglasari Village. This is because the water intensity needed in planting secondary crops is much less than that needed for planting rice. Cropping secondary crops is also considered more profitable than growing rice. Secondary crops can be harvested repeatedly, while rice is harvested every three months. In three months, secondary crop planting can produce 3 million rupiahs per plot, while rice planting only produces 1.5 million per plot. Therefore, the cultivation of secondary crops is considered more profitable than rice.

The cessation of rice cultivation caused other problems that arose in the soil fertility in Neglasari Village. However, farmers immediately took adaptation steps by switching to dolomite lime to maintain soil fertility. Dolomite lime is considered more practical in its use to maintain soil fertility. Access to dolomite lime is also relatively easy for farmers in Neglasari Village. This is supported by the supply of agricultural materials from the government given to farmers in Neglasari Village.

4.3 The Impact of Changes in Cropping Patterns on the Social Conditions of the Neglasari Village Community

Based on the agricultural conditions discussed in the previous sub-chapter, namely that rice is no longer planted in Neglasari Village, there are several shifts or changes in farmer culture, as follows:

Table 1. Social Changes in the Community Farmers in Neglasari Village.

Before changes in cropping pattern (rice)	After changes in cropping pattern (secondary crops)
Requires few women farm laborers	Require a relatively large number of women farm laborers
Women plant rice	Women look for grass
There is an earth alms ceremony before planting	There is no special ceremony before planting

Based on **Table 1**, it can be seen that when agricultural land is planted with rice, it requires fewer farm laborers than when planting secondary crops. Rice can only be harvested once, while secondary crops can be done repeatedly. In addition, mothers play a role in transplanting (planting) rice, while when planting secondary crops, some fewer mothers plant crops and turn to grass seekers.

In addition, the rice plant is considered to have a sacred value for farmers. Therefore, the community holds a series of ceremonies when planting (spreading seeds) and harvesting rice. These special ceremonies are now lost because there is no rice planting in Neglasari Village. In contrast to rice, in the cultivation of secondary crops, there are no specific values for farmers, so when planting and harvesting, no special ceremonies are carried out.

5 Conclusion

Neglasari village farmers used rice as a staple product and have experienced changes in their land cultivation patterns since the early 21st century. This is due to the problems in the irrigation system in Neglasari Village, which is not crossed by rivers and only relies on rainwater which often experiences a decline. Intensity, especially in the dry season, so that the supply of water needed for plants will not be sufficient if only relying on rain-fed water. This decrease in rain intensity resulted in drought in the farmers' rice plants, which caused many losses from the inhibition of the agricultural process. Moreover, a disease that afflicts the land called neck rot pest also causes crop failure.

Secondary crops, initially an alternative and a distraction in the rotational pattern of land cultivation, became a new adaptation solution to keep running the wheels of agriculture and the economy. Care for secondary crops is not as complicated as rice. Harvesting more often and generating more profit are enough reasons for farmers to switch from planting rice to planting secondary crops on their lands. The people of Neglasari Village, especially farmers, have adapted to this shift in land cultivation quickly and well. The transition from rice cultivation to secondary crops is a form of adaptation for Neglasari Village farmers in dealing with uncertain climate change.

References

[1] Bennett. John W. (1976) The Ecological Transition: Cultural Anthropology and Human Action. Pergamon Press Inc. New York.

[2] Evizal R, Prasmatiwi FE. 2021. Review: Pilar dan model pertanaman berkelanjutan di Indonesia. *J Galung Trop*. 10(1):126–137. doi:http://dx.doi.org/10.31850/jgt.v10i1.721.

[3] Foster. George M. (1986) Antropologi Kesehatan. Terjemahan. UI-Press. jakarta.

[4] Nasution PPPA, Anggraeni N. 2020. “Skala” sebagai Atribusi Kultural: Kontribusi Antropologi dalam Ekologi Politik. *Community Pengawas Din Sos*. 6(1):34. doi:10.35308/jcpds.v6i1.1513.

[5] Owombo PT, Koledoye GF, Ogunjimi SI, Akinola AA, Deji OF, Bolarinwa O. 2014. Farmer’s adaptation to climate change in Ondo State, Nigeria: A gender analysis. *Journal of Geography and Regional Planning*. 7(2):30-35. doi:10.5897/JGRP12.071.

[6] Priastomo Y, Sitorus E, Widodo D, Marzuki I, Ghazali M, Onasis A, Sari MCM, Tangio JS, Mastutie F, 2021. *Ekologi Lingkungan.* Indonesia: Yayasan Kita Menulis.

[7] Saharuddin. 2007. *Antropologi Ekologi (Fondasi, Teori dan Diskursus Ekologi Manusia)*. Bogor: IPB University. http://repository.ipb.ac.id/handle/123456789/76145.

[8] Sholeh HM. 2019. Penanggulangan penyakit busuk leher padi. [online]. *Pusluhtan Kementan.* URL: http://cybex.pertanian.go.id/detail-pdf.php?id=82594

[9] Sitanggang NDH, Yulistiana Y. 2015. Peningkatan Hasil Belajar Ekosistem melalui Penggunaan Laboratorium Alam. *Form J Ilm Pendidik MIPA*. 5(2):156–167. doi:10.30998/formatif.v5i2.335.

[10] Suganda R, Sutrisno E, Wardana IW. 2013. Handout Ekologi. *J Chem Inf Model*. 53(9):1689–1699. http://staff.uny.ac.id/sites/default/files/Handout Ekologi_0.pdf.

[11] Yulianti Y. 2011. *Perubahan Ekologis dan Strategi Adaptasi Masyarakat di Wilayah Pegunungan Tengger (Suatu Kajian Gender dan Lingkungan)*. Malang: UB Press.