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Identification of Factors Causing Changes in Rice Field Ecosystem as an Environmental Service in Sawahan Village, Boyolali, Central Jawa

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ABSTRACT. Rice field ecosystem is one of the environmental services that have a very important role for human life. Over time and in line with the promotion of development, rice fields began to be threatened, especially in Sawahan Village, Ngemplak Sub District, Boyolali Regency. This research aims to determine the factors causing changes in rice field ecosystem services in Sawahan Village. This research was conducted by direct observation in the condition of roce fields in Sawahan Village and a literature study was carried out which then the data was analyzed using a qualitative descriptive method. The result of the data from the research that has been carried are ecosystem servuces (environmental services) contained in Sawahan Village in the room of the availability of food farming, water flow for rice fields, the natural beauty of the village environment, and supporting extensive rice fields that are able to maintain habitat availability. This research also provides factors that cause changes in rice field ecosystem and their impact. Land conversion is the main factor taht cause changes in the rice field ecosystem. The use of non-agricultural land has changed agricultural land by 199.2 ha in 2014-2022. Thus, it can be concluded that the factors causing changes in the rice field ecosystem are chemical use, environmental pollution, and the occurrence of narrowing or land function change.

Keywords: ecosystem, land degradation, rice fields.

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1. Introduction

Indonesia is known to the world as an agrarian country where the population predominantly works as farmers. So, it is not surprising that the development of the agricultural sector needs serious attention in the context of National Economic Development (Marulana et al., 2020). Many Indonesians still depend their lives on the agricultural sector, where over the past ten years, Indonesia's real per capita income growth has reached 4.5% per year (Minot et al., 2015). The agricultural sector is a strategic sector in improving the Indonesian economy because although it contributes very little, the agricultural sector determines the food welfare of the Indonesian people.

In the agricultural sector, land is the most important resource because it plays a role in production activities that are able to produce the food needs needed by every human being (Aryawati and Budhi, 2018). Land is a natural resource that has a very important function for the development of a country. Development process, almost all sectors require land such as the agricultural sector, industrial sector,trade sector and infrastructure sector. The importance of land for various sectors makes the demand for land use increasing, considering that land is the most important factor that can no longer be produced (*non produced input*) (Putri, 2015).

Nowadays, increasing population growth and development dynamics are shifting the function

of agricultural land that was originally for growing crops, gradually becoming a multifunctional utilization (Anggraini et al., 2020). This change in the function of agricultural land to non-agricultural is called land conversion or land conservation. Conversion of agricultural land is the process of transferring the function of agricultural land from use for agriculture to other uses which generally have a negative impact on the environment (Janah et al., 2017). Generally, the negative impact on the environment occurs because natural resources are exploited by draining or over-exploitation.

Utilization of Indonesia's rich natural resources must take place in a sustainable manner, namely to meet the needs of today's generation without disturbing the ability of nature to meet the needs generations to come. Environmental services result from a blend of natural assets, human resource quality, and management technology (Soenarno, 2014). Environmental services are services provided by natural and artificial ecosystem functions whose values and benefits can be felt directly or indirectly by stakeholders in order to help maintain and or improve the quality of the environment and people's lives in realizing sustainable ecosystem management. Services the environment has several functions such as provision Services, Regulatory Services, Cultural Services and supporting services (Rachdian et al., 2016). Millennium Ecosystem

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Assessment divides the classification of environmental services as 4 Basic classifications where the classification will be further divided according to the definition of the classification, namely: provision services, regulatory services, supporting services and cultural services. Provision services include: food, clean water, fiber, and fuel. Regulatory Services include: climate regulation,water and flood management, disaster prevention and protection, water purification, waste treatment and decomposition, air quality and maintenance, natural pollination regulation, and pest and Disease Control. Cultural Services include: aesthetics, recreation and ecotourism, and shelter and living space (Alim, 2019). And the last Supporting Services include: nutrient cycle, primary production,and soil layer formation and fertility maintenance (Setyawan et al., 2018).

Agricultural land in Central Java itself has decreased in number is quite high, the statement is

supported by data from the Ministry of Agriculture where there is a decrease in the area of agricultural land in Central Java in 2014 to 2017 amounted to 14,896.60 Ha. Land area is narrowing and of course trigger changes of rice ecosystem. Changes in the rice field ecosystem that can occur have a negative impact on the sustainability of organisms in it and the imbalance of the ecosystem. Therefore, this study was conducted to determine the factors causing ecosystem changes and ecosystem services (environmental services) available in Sawahan Village. So that in the future it can be used as knowledge for stakeholders so that they can minimize existing factors and can develop or maintain ecosystem services so that they are not damaged.

2. Materials and Methods

2.1 Research Procedure

The location of this research was carried out in Sawahan, Ngemplak Sub District, Boyolali Regency from May to July 2022. Sawahan village is one of the villages that has a lot of rice fields with harvested commodities in the form of rice.

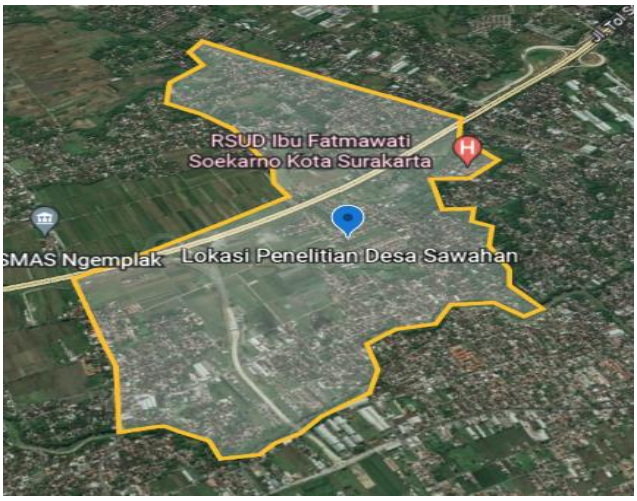

Fig. 1 Location of research in Sawahan, Ngemplak, Boyolali.

The study was conducted with a series of observations on the factors that have the possibility of causing and affecting changes in rice field ecosystems as a provider of Environmental Services in Sawahan Village, Ngemplak Sub District, Boyolali Regency to humans who have a role as recipients of Environmental Services. The analysis is carried out after the results of observations in the field have been obtained and successfully identified which is then processed with the results obtained from the literature study. The Data used in this study were obtained through observation or observation and supported the results obtained from various literature studies or literature reviews of relevant reference sources.

3. Result and Discussion

3.1 Definition of Ecosystem

Ecosystem is a reciprocal relationship that occurs between living things with their environment (Susilawati *et al*., 2016). An ecosystem is formed by various constituent components, both in the form of biotic components and abiotic components. Living things that make up biotic components include green plants as producers, herbivores, carnivores, omnivores, and decomposers. Ecosystems cannot be separated from various ecological functions such as the O2 formation cycle, microclimate creators, and groundwater absorption (Besila and Kusumadewi, 2016). Solar energy, rainwater, and abundant minerals support the high biodiversity of soils in Indonesia (Subowo and Purwani, 2013). Biodiversity is divided into three levels which include genetic, species, and community (ecosystem) diversity (Ganesid *et al*., 2019). The strength of adaptation of the populations that will be part of the interaction of species is determined by the existing diversity. There are two components that make up diversity, namely species richness and evenness. Species richness can be interpreted as the number of species as a whole and evenness can be interpreted as the spread of abundance in each individual (Ludwig in Nahlunnisa, 2016).

One part of the marine ecosystem that has a vital function is the coral reef ecosystem, this is because coral reefs become a source of life for marine life (Arisandi *et al*., 2018). Soil macrofauna plays a role in increasing soil organic matter levels, the abundance of which is influenced by various causes, one of which is cover crops. The existence of fauna is useful as a natural parameter of soil quality, soil fauna which is a bioindicator of soil fertility has a relatively abundant amount (Ibrahim, 2014). The diversity of soil microorganisms is influenced by the physical and chemical properties of the soil as well as the type of land, type of plant, type of fertilizer and type of animal associated with its food (Sembiring, 2020). According to Holing, in Dwi Indrayanti, 2015, it is argued that almost all natural systems have characteristics that are not always the same, and if humans intervene to try to stabilize nature for its sake, it will have the potential to appear stable conditions in the short term and catastrophic in the long term. Biological and non-biological elements have conventional and interrelated relationships and create a system called an ecosystem. If there is something that affects the balance between the constituent components, there can be a problem that affects the ecosystem cycle so that it can have an impact on the entire system either in its functional structure or in its disturbed balance (Muzani *et al*., 2020).

3.2 Definition of Environmental Service

Basically, environmental services are something of use value provided by the surrounding environment for the needs of human life in everyday life. According to Setyawan *et al*. (2018), environmental services are valuation or value given from an ecosystem. According to Zulffikar *et al*. (2018), environmental services are conceptually simple, namely

beneficiary pays. Regional Regulation Number 5 of 2007 in Chapter I on General Provisions in Article 1 paragraph 18 which states "that the use of environmental services is a form of business that utilizes the potential of environmental services by not damaging the environment and reducing its main functions such as the use of natural tourism, water utilization, utilization of beauty and comfort because water is a natural resource that is vital for life and the life of creatures and is very strategic for economic development, maintaining national unity and security so that it must be managed in an integrated manner, wise and professional (Mukaddas, 2019). Environmental services have also been written and regulated in law number. 32 of 2009 on environmental management, environmental services have continuity with the carrying capacity and environmental capacity because it will affect the value of carrying capacity and environmental capacity.

3.3 Classification of Environmental Service

The view of ecosystem services developed by the Millennium Ecosystem Assessment (MEA), is now widely applied in developed countries because it contains the context of "benefits obtained by society from ecosystems" (Aprina and Milla, 2017). According to the Millennium Ecosystem Assessment (MEA), based on its function, environmental services or ecosystem services are divided into several classifications, namely:

a. Environmental Services as Provisioning Services

Environmental services can play a role in providing various products that are useful for life, such as: providing food sources, providing clean water, providing medicines, providing fuel, and providing genetic resources that are useful for life (Titaley *et al*., 2022). According to Febriarta *et al*. (2020), with the knowledge of the provision of services from a region, the carrying capacity and carrying capacity of the physical environment in an area can be known. For example, food provider services that can realize food security in Indonesia usually come from marine products such as fish, forest products such as plants and animals, agricultural and plantation products, and from livestock products such as eggs and meat (Anggrahita and Guswandi, 2018). Water supply services (hydrological function) can be derived from the availability of groundwater including its storage capacity and water supply from surface sources (Budi, 2017). Meanwhile, fuel provider services can come from firewood and fossils (Idrus *et al*., 2016). Based on the results of interviews in Sawahan Village, service providers in the area come from agricultural land because the land is able to produce food in the form of rice, chili, long beans, corn, eggplant, watermelon, and melon depending on the crops grown. This is evidenced from the harvest which is able to produce 2.5 tons of grain. In addition, its fertile soil can also provide clean water for farmers and residents for irrigation and daily needs.

b. Regulating Service

Regulatory services are environmental services that play a role in regulating and maintaining air quality, climate regulation, Water Regulation, erosion control, water purification, and Disease Control. Climate regulation is an environmental service related to the moderation of temperature, atmosphere, ozone layer, weather patterns on a local and global scale, humidity, rainfall, and control of greenhouse gasses and carbon. Regulation of water flow and flooding has a role in the hydrological cycle, natural infrastructure for water storage, flood control, and Water Conservancy. Environmental Services the regulation of water flow and flood management such as the normal hydrological cycle will have an impact on the regulation of good water management in various purposes such as water storage, flood control, and maintenance of water availability, where the hydrological cycle is influenced by the physiographic existence of an area and the existence of land cover (Setyawan *et al*., 2018). The provision of Environmental Services in the regulation of water management and hydrological cycles in watersheds also has a considerable influence from household-scale contributions, such as farmers and ranchers (Sukwika, 2019). Disaster prevention and protection arrangements function on natural infrastructure prevention and protection from land fires, erosion, abrasion, landslides, storms, and tsunamis.

Changes in regulatory services can affect the frequency of occurrence of natural disasters such as droughts, landslides, floods, and others (Zairin, 2017). Water purification Settings play a role in the capacity of water to dilute, decompose, and absorb pollutants. Waste treatment and decomposition has a regulatory service to the location's capacity to neutralize, reduce, and absorb pollutants. Air maintenance regulatory services have a capacity function in regulating air chemical systems. This role can be felt by the presence of patron trees that have a contribution in supporting regulatory services and also increasing vegetation land cover can improve air quality (Hayyun *et al*., 2018). The regulation of natural pollination functions on the distribution of habitats of auxiliary species of the natural pollination process. Pest and Disease Control arrangements play a role in the habitat distribution of trigger species and pest and Disease Control. Various regulatory services in environmental services such as water management, nutrient cycling, CO_2 absorption, and others are functions and benefits of forests and nature in providing various needs (Putra, 2013).

c. Cultural Services

Environmental services as cultural services, meaning that environmental services are able to provide various nonmaterial benefits for human life related to cultural identity and diversity, religious values, heritage and cultural heritage values, knowledge, inspiration, entertainment, social relations, and Recreation (Komarawidjaja, 2017). Meanwhile, according to Hayyund *et al.* (2018), based on the explanation of MEA in 2005 cultural services in ecosystem services can be in the form of educational benefits, recreation, spiritual enrichment, cognitive experiences, and aesthetic experiences. From the various values contained in these cultural services, benefits are obtained in the form of the creation of aesthetic culture among the community, appreciation of the natural landscape of the community, the creation of recreational culture, the emergence of opportunities to hold tourism and recreation activities, and each region will have its own cultural heritage and identity (Mustafa, 2020). For example, in cultural services, aesthetic value can come from natural beauty that has a selling point. Meanwhile, the value of recreation and ecotourism can be derived from the uniqueness of nature and certain values that become the uniqueness of Tourism (Wahyuni *et al*., 2015). Based on the results of interviews in Sawahan Village, Cultural Services in this village are not too prominent, namely the cultural function lies in its location that has natural beauty because it is filled with a very wide expanse of rice fields up to hectares and traversed by the toll road. This view is perfect for people who like the outdoors in the middle of dense urban areas.

d. Support Services

Supporting services are environmental services in supporting the production of key products such as oxygen production, soil resilience, nutrient recycling, pollination, and habitat availability. According to Sari *et al*., (2021), supporting services are ecosystem services that are needed for the production of all other ecosystem services, such as primary production, soil formation, and nutrient recycling services. These services make it possible for ecosystems to provide services in the form of water purification, flood regulation, and food supply (Sjafrie, 2016). Supporting services such as nutrient cycle, soil formation, primary production, $\boldsymbol{CO_2}$ cycle, $\boldsymbol{N_2}$ cycle, and others are needed to produce a variety of environmental ecosystem services (Kusmana, 2015). Soil layer formation and fertility maintenance services play a role in regulating soil fertility. Nutrient cycle is a service in supporting soil fertility and agricultural production levels. Primary production plays a role in the production of oxygen and the provision of species habitat. Biodiversity is a supporting service that plays a role in biodiversity.

3.4 Rice Field EcosystemConditions in Sawahan Village

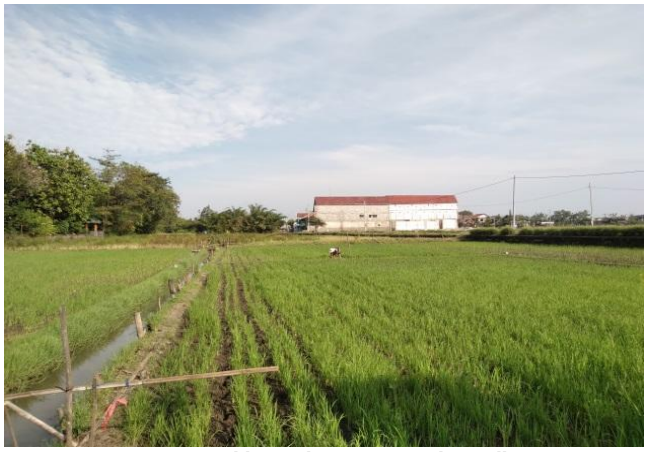

Fig. 2 Rice Fields Conditions in Sawahan Village.

Sawahan village, located in Boyolali regency, was formerly known as a village that has a lot of agricultural land. However, it is currently exposed to land conversion which causes the reduction of agricultural land. The existence of this increasing population growth automatically causes the need to build settlements and other facilities for the benefit of the population (Tulenan *et al*., 2014). According to Adiyaksa and Djojomartono (2020) if an area has a high level of accessibility, the higher the activities that encourage land changes in the region. This is because Sawahan Village is located adjacent to Surakarta. The development of development led to the rapid growth of information and economic growth also increased (Dewi and Sarjana, 2015). Non-agricultural land use has reduced agricultural land by 199.2 ha in 2014-2020 (Rohmah and Jumadi, 2021). Whereas the agricultural sector also has an important role in the economic sector (Kusumaningrum, 2019). In addition, the agricultural sector is also useful as an important resource provider of food needs or as an environmental service. So if agriculture decreases food needs also decrease and changes in the rice field ecosystem.

An ecosystem is a relationship or mutual interaction between living things and their environment. Rice field ecosystem is a very important environmental service for life (Susharyani, 2019). Therefore, the rice field ecosystem must be maintained. However, this land conversion affects the rice field ecosystem in Sawahan Village. The loss of rice fields automatically also eliminates the habitat and biodiversity of flora and fauna that live in rice field ecosystems (Apriyanto, 2018). So that it can reduce the function of rice fields as a provider of food which is the main production (Alamsyar, 2022). This is because the reduction of rice as a producer also leads to reduced eel, snails, and fish as a source of protein (Sudrajat, 2015). The condition of the rice field ecosystem in Sawahan Village is currently declining due to land conversion. Ecosystems that exist today are mice, frogs, snakes, planthoppers, birds, snails, and caterpillars as well as producers of crops planted by farmers such as rice, beans, corn, melons, and cassava. Therefore, this rice field ecosystem is very important so that the balance of the ecosystem is not disturbed. The government has issued a policy in law Number. 41 of 2009 on the protection of Sustainable Food Agricultural Land to control the conversion of agricultural land so as to avoid the extinction of green areas (Ayunita *et al*,, 2021).

3.5 Causal Factors

There are several factors that cause changes in the rice field ecosystem, namely:

a. Use Of Chemical Fertilizers

Pesticides are toxic chemical compounds used for pest control of agricultural crops (Ibrahim and Sillehu, 2022). The use of chemical fertilizers and pesticides in Indonesia is increasing. This is seen from the number of farmers in Indonesia who use it around (95.29%) because it is considered effective, easy to use and economically profitable in controlling plant pest organisms (Andesgur, 2019). The use of chemical fertilizers and pesticides that exceed the needs and standards will cause various problems both short and long term. The use of pesticides that contain active ingredients will cause the possibility of groundwater pollution by a contaminant and toxic to ecosystem safety (Arif, 2015). Pesticides can reduce soil fertility levels because they kill soil fauna.

Agriculture as a human activity (anthropogenic) will have an impact on increasing greenhouse gas emissions, increasing greenhouse gas emissions will cause climate change, namely the condition of several climate elements whose magnitude and or intensity tend to change or deviate from the dynamics and average conditions (Sudarma and As-syakur, 2018). According to (Wisnujati and Sangadji, 2021). There are three dominant environmental problems in agricultural land after the Green Revolution in the late 1960s, namely: 1) the impact of the use of input means of production on agricultural production and the environment, 2) the impact of agricultural systems on greenhouse gas emissions, and 3) the impact of industrial activities and urban expansion on agricultural land. These things must be considered because only about 20% of pesticides are on target on plants or are really effective, while 80% are actually wasted falling to the ground and if excessive, it will pollute the soil environment (Himmah et al., 2021).

b. Environmental Pollution

Environmental pollution according to Government Regulation Number. 22 of 2021 is the entry or inclusion of living beings, substances, energies, clans/or other components into the environment by human activities so that they exceed the established environmental quality standards. The existence of environmental pollution indicates conservation efforts against ecosystem services is still low (Bayu and Prabawa, 2013). Thus causing degradation and loss of Natural Resources and decreased soil productivity (Hadi *et al*., 2013). Environmental pollution occurs because pollutants cannot be

neutralized by the environment, although naturally ecosystems have decomposers that can degrade these pollutants (Rochmad *et al*., 2006). According to Riastika (2011), environmental pollution can be overcome by prevention, countermeasures, and recovery.

Environmental pollution can be water, soil, or air pollution. Where all three affect ecosystem changes such as rice fields because according to (Febriarta and Oktama, 2020) this affects the carrying capacity and carrying capacity. This condition can be seen in Sawahan village, where the use of chemical fertilizers and farmers ' knowledge of rice field ecosystems are indicators of environmental pollution (Mamondol and Taariwuan, 2015).

Ecosystem changes that occur as a result of anthropogenic activities are mainly increased economic sectors and environmental awareness is still low (Budhiawan *et al*., 2022). Where there is a change in the rice field ecosystem can be seen from the many phenomena of land conversion into non-agricultural functions (Apriyanto, 2018). This ultimately results in ecosystem degradation, disruption of hydrological functions, decreased land productivity, hydrometeorological disasters, and affects social and economic aspects of the community (Sukwika, 2019).

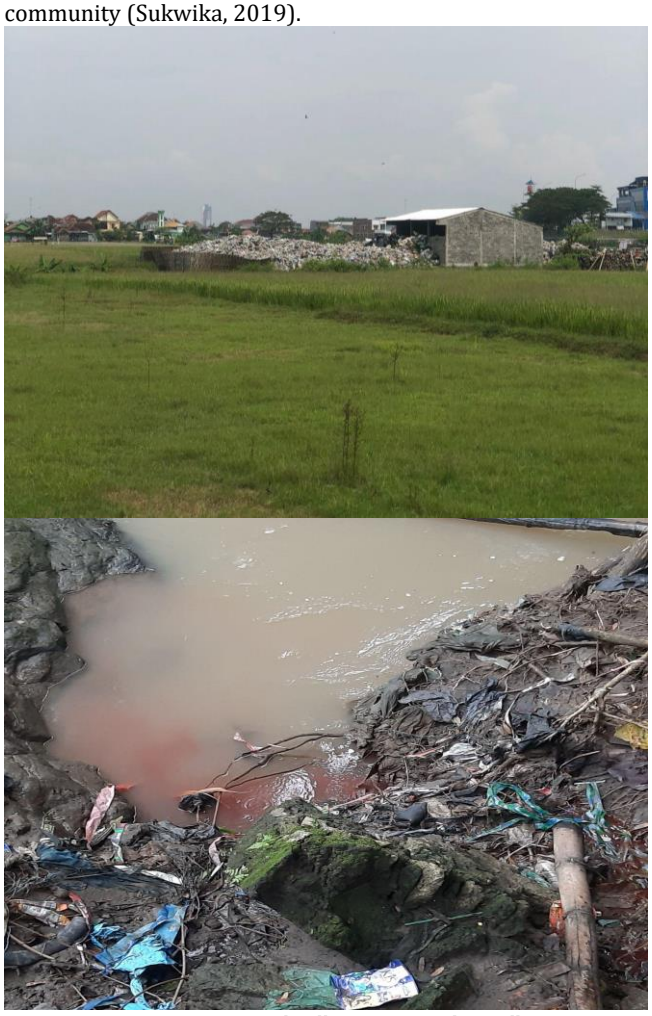

Fig. 3 Environmental Pollution in Sawahan Village

At Figure 3 presents a picture of environmental pollution conditions in Sawahan Village. Sawahan village itself has a temporary landfill located in the rice field area. The condition of the temporary landfill caused the surrounding region to become polluted. Where soil pollution occurs due to piles of garbage that mount, water pollution occurs because leachate water enters the flow of rivers near temporary landfills, and air pollution occurs piles of organic waste in landfills releasing methane compounds into the air. This condition causes environmental degradation and increases climate change factors and ultimately impacts the existing rice field ecosystem. In this case, the pollution causes a reduction in rice field ecosystem services provided to the community including provision services, regulatory services, supporting services, and cultural services (Zairin, 2016). So that people ultimately have to pay environmental costs to reduce the environmental burden due to pollution and create a healthy, natural, and productive rice field ecosystem environment (Hadi *et al*., 2014).

c. Land Narrowing/Land Conversion

Population growth increases the number of diverse needs both primary, secondary, and tertiary (Angraini *et al*., 2020). It encourages humans to exploit natural resources to meet their needs (Sriartha dan Windia, 2015). The organization of the population has implications for natural resources, the more the population the more environmental needs that must be met (Maryunani, 2019). This results in environmental degradation, namely the decline in environmental quality that has the potential to harm human life (Moersidik, 2014; Santoso dan Nurumudin, 2020). The rate of conversion of agricultural land is associated with the rate of population growth resulting in increased fulfillment of land use-based needs such as settlements and other public facilities (Jannah *et al*., 2017). Conversion or narrowing of rice fields can lead to a decrease in rice and rice production. If the conversion or narrowing of rice fields can not be controlled, it will be able to threaten the food security of the population. Land conversion from paddy fields to settlements is driven by low income factors of rice farming and tend to choose to work in the non-agricultural sector (Dewi dan Rudiarto, 2013). Land prices and accessibility also affect the price of rice fields and rice fields will begin to rentam to land conversion (Kurniasari and Ariastita, 2014; Sitorus, 2015). The total population density in Sawahan village with an area of 2.658 km^2 2hich has increased every year.

Table 1
Total population density in Sawahan village in 2018 until 2020

Population	Year		
	2018	2019	2020
Men	5.556	5.663	5.753
Girl	5.525	5.558	5.684
Total	11.081	11.221	11.437
Population density (Souls/Km^2)	4.17	4.22	4.302

Source: BPS Boyolali Tahun 2019, 2020, 2021.

The narrowing of rice fields in Sawahan village is in line with the development of the number of residents in Sawahan Village. There is a functional conversion of agricultural land into non-agricultural into housing and shopping buildings. The increase in population led to an increase in the rate of conversion of agricultural land into built-up land, especially settlements (Lamidi *et al*., 2017). Infrastructure development such as toll roads crossing Sawahan Village, and other infrastructure due to toll roads crossing Sawahan village resulted in increased land needs. And this resulted in the conversion of agricultural land to non-agricultural functions. This land conversion is permanent where agricultural land that has been converted to other uses outside agriculture is very

unlikely to turn again into agricultural land, especially in land use for infrastructure (Sunartomo, 2015; Dewi and Syamsiyah, 2020).

3.6 Impacts of Rice Field Ecosystem Changes

Land use change is the increase or shift of a land use from one side of the use to another followed by a reduction in other types of land use from one time to the next, or it can also be interpreted as changing the function of a land in a certain period of time (Martin, 1993 in Wahyunto *et al*., 2001). Changes in land use have a large potential impact or influence on the physical and social environment. Changes in land use can change the ecological system of the environment, including the problems of water pollution, air pollution, local climate change (Mahmood *et al*., 2010; Coskun *et al*., 2008; Hu *et al*., 2008; Wu *et al*., 2008; Kalnay and Cai, 2003), reduced biodiversity (Sandin, 2009), and fluctuations in the release and absorption of CO, (Canadell, 2002). The decline in rice production is one of the factors of conversion of paddy fields to the non-agricultural sector of residential sprit. This can happen because the land is a major factor in the process of farming is a place of implementation of farming (Karini, 2013). If other factors are considered constant, then a decrease in planting area can lead to a decrease in the level of rice production in rice fields.

3.7 Efforts to Prevent the Occurrence of Causal Factors

Many factors cause changes in the rice field ecosystem. There are 3 major factors that cause this to happen, among others: the use of chemical fertilizers, environmental pollution and narrowing/land conversion. These three factors are common in Indonesian Agriculture. The impact of these three causes is massive and has a lasting effect. Therefore, there must be efforts that need to be applied in preventing the occurrence of these causative factors. In the use of chemical fertilizers there are many alternative substitutes such as the use of green manure made from green organic matter from the rest of the harvest or decomposition of plant residues. Green manure is also one of the potential sources of sustainable because it comes from plants that are able to recover the physical, chemical, and biological properties of the soil. This fertilizer in particular also does not have a negative impact because it does not leave residues like other fertilizers (Dahlianah, 2014).

Cases of environmental damage or pollution literally start from the occurrence of a development and/or destruction of existing natural resources. Industrial and technological activities that exist today will create environmental pollution if not followed by waste treatment and the environment both at the beginning and at the end of development. In this case it is necessary to make efforts in preventing the occurrence of the causes of environmental pollution. According to Law Number. 32 of 2009 on the environment, it has been explained that efforts to deal with a pollution problem consist of prevention and control measures. Some of these efforts are to organize from the beginning of the waste installation system so that unexpected events such as leakage of waste will cause environmental pollution (Kertiyasa, 2018). Perform maintenance and supervision on every activity carried out. Incorporate legal instruments in the system so that there are penalties or sanctions against violators. Conduct environmental counseling and socialization to the surrounding community regarding environmental protection.

In the case of narrowing/land conversion in Indonesia itself has a high contribution to economic growth. However, this still often happens because there are several problems such as: too fast turnover (conversion) of agricultural land into non-agricultural; vulnerable land tenure problems due to property rights; from time to time limited land resources that are suitable by agricultural aspects; increasingly narrow Indonesian per capita agriculture (Firmansyah *et al*., 2021). Infrastructure development also has a big impact because of the more advanced civilization and technology. Therefore, efforts are needed such as narrowing the opportunities in land conversion by processing land tax progressively, applying the principles of saving and efficiency of existing land (Isa, 2005). Implement control instruments on land conversion with equivalent sanctions and penalties. This regulatory instrument should be tightened by protecting agricultural productive land.

4. Conclusion

Factors that cause changes in the ecosystem of Sawahan Village are land conversion such as residential development or housing and toll road construction, increasing the number of residents accompanied by increased needs. Non-agricultural land use has changed agricultural land by 199.2 ha in 2014-2022. Ecosystem services (environmental services) available in Sawahan village include 4 services, namely: (1) service providers in the form of availability of foodstuffs such as rice; chili; long beans; corn; eggplant; watermelon; melon and clean water providers, (2) regulatory services in the form of regulation of water flow because of the rainy land rice fields so that the possibility of flooding is very little, (3) cultural services, namely the value of natural beauty and healing places from the beautiful rice fields, (4) supporting services because the vast rice fields are able to maintain the availability of habitat for several types of animals and food supplies.

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