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Article

**Practice Use of Organic Fertilizer in Wonogiri Ethnoecological Perspective
In Science Material on Ecology and Biodiversity**

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ABSTRACT

This article discusses the impact of continuous use of chemical fertilizers on the environment, such as hardened soil, high soil pH, disturbed ecosystem balance, soil pollution, and reduced quality of agricultural land and products. The local knowledge of the Wonogiri community, who practices traditional farming, is explored as they use organic fertilizers like livestock manure to mitigate these issues. The research examines the community's knowledge in relation to the prevention of soil pollution through the use of organic fertilizers. The study utilizes a descriptive qualitative approach with a focus on the ethnoecological perspective. The original knowledge of the Wonogiri community, which includes the use of cow, goat, chicken manure, and dry leaves as organic fertilizers, can be integrated into science education material, specifically in 7th-grade ecology and biodiversity curricula. The research concludes that the ethnoecological practices of the Wonogiri community can be incorporated into the field of Ecology and biodiversity.

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INTRODUCTION

Wonogiri Regency is one of the areas in Central Java Province that has distinctive geographical and ecological characteristics. Located in the southeastern part of the province, the area is dominated by rainfed farmland and varied topography, ranging from lowlands to limestone hills. These natural conditions have caused the people of Wonogiri to develop various adaptive strategies in their agricultural practices, including in terms of fertilizer use (Hilwa et al., 2020). Based on (Humas Wonogiri, 2020) the residents of Wonogiri Regency have their main livelihood as farmers with a percentage of 25.83% in 2019. Where the percentage of this figure is the highest percentage compared to various other livelihood sectors. Based on BPS data from Wonogiri district, individual agricultural businesses in 2023 will reach 97,0091 people engaged in agricultural businesses. With these agricultural businesses, it can be seen that 159,367 individual farms use fertilizers and the remaining 26,972 do not use fertilizers, with the note that fertilizers are only used in the cultivation of annual, annual, forestry, and fisheries crops (BPS Kabupaten Wonogiri, 2023)

Based on this data, it can be concluded that the use of fertilizers is very important as an effort to support agricultural productivity in the Wonogiri district area. Fertilizer is known as a substance that contains one or more nutrients that plants or plants use to support growth (Dewi & Afrida, 2022). However, the use of fertilizers needs to be further studied between the use of chemical fertilizers and organic fertilizers in the agricultural aspect. Based on (Rosalina et al., 2021) chemical fertilizers given to plants continuously will have an impact on the environment that can be observed with several indicators such as hardened soil followed by high soil pH, disturbed ecosystem balance, soil pollution resulting from fertilizer residues, this will have implications for a decrease in the quality of agricultural land and agricultural products. In a study by Muslimah, 2021 in (Saputro & Hadiyanti, 2023) that chemical fertilizers can accelerate plant growth because they contain essential nutrients such as nitrogen, phosphorus, and potassium. However, if it is used excessively and not in accordance with the time, it can cause adverse effects for the soil and the environment.

Therefore, appropriate and sustainable solutions are needed to overcome the above problems with the right efforts. The ethnoecological concept in overcoming the excessive use of chemical fertilizers can be used as one of the efforts to prevent damage caused by chemical fertilizers. A science that looks at how the relationship between nature and humans is through beliefs, knowledge and goals as well as imagination about how to use, manage, and utilize resources is an understanding of ethnoecology (Putri et al., 2023) The purpose of the ethnoecology approach is to examine local knowledge on the relationship between the surrounding community and its environment according to the perspective of the person being researched. It can be said that *ethnoscience* is a "*system of knowledge and cognition typical of given culture*" according to Strurtevant 1964, 99100 in Ahimsa-Putra 1985, 9 in (Umami, 2024)

In a society with traditional life, indigenous science knowledge or can be called *indigenous science* is formed which is shown in the form of customary laws, local culture, religious ceremonies, and social life that can be connected to science in a scientific way that has not yet been patented or formalized (Ihsan et al., 2024). The people of Wonogiri with local knowledge as farmers with traditional farming practices use livestock manure including cows, goats, and chickens as organic fertilizer. This traditional farming method describes the close relationship between society and nature (Kamakaula, 2024) The use of organic fertilizers from animals has various benefits to increase soil resistance to water, microbiology in the soil, and soil fertility due to macronutrients (Arif, 2020).

Native science knowledge in society can be applied in modern science learning. The science knowledge that exists in the community if it is included in learning and used as a learning resource will improve students' ability to think critically (Oxtariani, 2022). The update in this study is in the form of the application of ethnoecology of the use of manure which can be integrated into subjects, especially science. The formulation of the problem that the researcher wants to explore is how to use organic fertilizers in Wonogiri from an ethnoecological perspective which can be related to the science subject of Ecology and Environmental Conservation. Based on these problems, the researcher aims to examine that the local knowledge of the Wonogiri people on the practice of using organic fertilizers is studied through an ethnoecological perspective, environmental conservation efforts on the use of chemical fertilizers in accordance with the Science Subject, Ecology and Environmental Conservation material regarding the prevention of soil pollution using organic fertilizers.

METHOD

The research was carried out in Made village, Slogohimo District, Wonogiri Regency, Central Java. The method used in this study is qualitative descriptive with a focus on an ethnoecological perspective. Qualitative research is a research process to understand human or

social phenomena by describing something thoroughly and complexly presented in words, reporting in detail from informants conducted in a scientific setting (Fadli, 2021). Data collection used an in-depth interview method with two informants (farmers) using interview guidelines. Data collection also uses observation methods and literature studies to complement and strengthen empirical data. The data analysis is carried out continuously using techniques such as those proposed by Miles and Huberman, namely data reduction, data presentation and conclusion. The data obtained is also relevant to the science learning materials for grade VII on the topic of ecology and biodiversity.



Figure 1. Research Location Point

RESULTS AND DISCUSSION OF RECONSTRUCTION OF LOCAL SCIENCE AND SCIENTIFIC SCIENCE

The activity of transforming the knowledge of local communities or indigenous science into scientifically known science with ethnoscience (Oxtariani, 2022). The ethnoscience of local communities that is associated with the activities of the environment with the relationship of humans with all their behaviors is called ethnosocioecology. The natural sciences and social sciences can be bridged with the study of ethnoecology. The scope of ethnoecology is not only related to the natural aspect but also related to the human aspect with various political, economic, social and cultural conditions (Khusniati et al., 2023).

Based on the results of interviews with two resource persons who work as farmers regarding the use of organic fertilizers derived from livestock such as chicken, cow, goat manure and fertilizer derived from dry leaves, it can be reconstructed between original science and scientific science as follows:

Table 1 reconstruction of original science and scientific science

Yes	Types of fertilizers	Natural science	Scientific science
1	Cow manure	Can fertilize plants because they come from farm animals	The nutrient content in cow manure has good benefits for soil fertility. The nutrient content depends on the type of feed given by the cow, the amount of feed consumed, and the breeder himself (Prasetio et al., 2023).

2	Goat manure	It has "hot" properties that are very fertile for plants, and it does not dry out quickly	It has a high nitrogen content, contains macronutrients such as N, P, and K which are important for plant growth (Nuraini et al., 2021).
3	Chicken manure	Chicken manure for organic fertilizer is stored for approximately 4 months. According to farmers, this hoarding aims to make the manure "ripe" or "cold" and not damage the crops. Chicken manure contains protein, so it can nourish plants.	In science, this process of hoarding is known as composting or natural fermentation. The purpose of this composting is to help decompose the levels of ammonia and toxic compounds so that they do not harm the plant. In addition, composting also helps the mineralization process, which is the breakdown of nutrients such as nitrogen (N), phosphorus (P), and potassium (K) into a form that is more easily absorbed by plants. This composting process also helps reduce the pungent odor of chicken manure (Ritonga et al., 2022) Chicken manure contains fairly high levels of nitrogen, phosphorus, potassium nutrients that are useful for plants (Elfina et al., 2024)
4	Dry foliage	Make soil looser, good leaves i.e. dried teak leaves	Contains nutrients that are good for plants such as growth, rooting and photosynthesis processes (Nurkhasanah et al., 2021)

Cow Manure

In the use of organic fertilizers, cow manure from the people of Wonogiri do not provide various treatments to become fertilizer. According to the interviewees, cow dung is only left for some time, about 3-4 months. This process has the purpose of making mushy cow manure into a compact and then it will be crushed to form fertilizer with a size and color like soil. The knowledge of the use of organic fertilizer from cow manure itself has been passed down from generation to generation from grandparents which is used as a basis for rice cultivation, vegetable fertilization and palawija crops. The community believes that the addition of cow manure to fertilization can fertilize the soil and plants to be fertile. The following is a picture of the processing of cow manure into organic fertilizer using the traditional methods of the Wonogiri people.



Figure 1 use of organic fertilizer of cow manure

Based on the original knowledge of the Wonogiri people, the use of organic fertilizer from cow manure is supported by several studies according to Setyaningsih et al, 2019 in (Suhartoyo, 2021) that cow manure is useful for changing soil structure for the better, providing enough nutrients needed by plants, and containing microbes that are important in the process of decomposition and loosening the soil. According to Dewi, et al 2017 in (Junaidi et al., 2023) cow manure contains nutrients that are good for plants such as macronutrients 0.4-1.5% nitrogen, 0.2-0.5% phosphorus, potassium 0.1-1.5%, and 85-92% water. Cow dung also contains micronutrients such as calcium, magnesium, manganese, iron, zinc, and copper. Based on the results of the interview with the informant, it is explained that fertilizer from cow manure is useful for rice, vegetables and crops crops.

Goat Manure

In the agricultural practices of the community in the Wonogiri area, the use of manure from goat dung is also carried out traditionally without special treatment. Based on the results of interviews with local sources, goat dung is only collected and left to dry naturally for approximately 3 to 4 months. During the drying process, the dirt that was initially solid will become lighter and easily destroyed. Once dry and loose enough, this fertilizer is ready to be used for fertilizing various types of plants.

The knowledge about the use of goat dung as fertilizer has been passed down from generation to generation from their parents and grandparents. This fertilizer is generally used for various purposes, such as the basis for rice planting, fertilizing vegetables such as chili and tomatoes, as well as for palawija crops such as corn and peanuts. Farmers believe that goat manure has a beneficial effect on soil fertility and accelerates plant growth. The following is a picture of the processing of goat manure into organic fertilizer traditionally by the people of Wonogiri:



Figure 2 use of goat manure organic fertilizer

This local knowledge is also supported by the results of scientific research. According to (Rihanna et al., 2013) goat manure can increase the level of organic matter in the soil,

improve soil structure, and enrich microbial activity that is important in the decomposition process of organic matter. In addition, according to Rahayu et al., 2020 in (Chairinnisa et al., 2024) goat manure contains nutrients that are good for plants, including macronutrients such as nitrogen of 1.0–1.5%, phosphorus 0.3–0.6%, and potassium 1.0–2.0%. In addition, goat manure also contains about 70–80% water, depending on the type of feed and storage conditions. Goat manure is rich in micronutrients such as magnesium, calcium, zinc, iron, and manganese which play an important role in supporting optimal plant growth and increasing soil microbial activity.

Chicken Manure

The use of chicken manure as organic fertilizer is part of the local knowledge (indigenous science) of rural communities, including people in the Wonogiri area. Based on the results of interviews conducted, local farmers said that chicken manure has long been used as a natural fertilizer to fertilize the soil and increase agricultural yields. This practice is carried out without the addition of other ingredients, only by hoarding chicken manure for approximately four months. This hoarding process is a form of natural fermentation or composting. The composting process of chicken manure is one of the methods to decompose the complex compounds in it, so that the manure is safe and suitable for use as fertilizer for plants (Wicaksono, 2022).

Composting helps decompose ammonia and other harmful compounds that can damage plants. This composting process also converts nitrogen (N), phosphorus (P), and potassium (K) into forms that are more easily absorbed by plants, thereby increasing soil fertility and being able to neutralize the pungent odor from chicken droppings, making them more environmentally friendly (Ritonga et al., 2022). After the hoarding period has passed, chicken manure is considered to be "cold" or "cooked" and ready to be used on planting land. Its use is carried out by sprinkling fertilizer into holes or planting rows before the plant is inserted. People believe that chicken manure contains proteins that are able to nourish plants, make vegetables greener and fresher, and produce more fruit. This belief is born from hereditary experience and is empirically proven in their farming practices.



Figure 3 use of chicken manure

In scientific science, this knowledge can be explained through the nutritional content of chicken manure. According to research (Ritonga et al., 2022) chicken manure has advantages over other types of manure because it contains higher amounts of nutrients and organic matter. Chicken manure contains higher nutrients such as nitrogen (N), phosphorus (P), and potassium (K) in greater amounts. In general, chicken manure contains about 1% nitrogen, 0.80% phosphorus, 0.40% potassium, and has a moisture content of about 55% (Hilwa et al., 2020). The high nitrogen content in chicken manure plays an important role in encouraging vegetative growth of plants, especially in the leaves and stems. Meanwhile,

phosphorus supports the development of the root system and flower formation, while potassium contributes to the fruit formation process and increases plant endurance. Overall, scientific science justifies the traditional practice of using chicken manure as fertilizer. Local knowledge of the community that this fertilizer "fertilizes" plants is based on scientific evidence regarding the nutrient content and its positive effects on plant growth and soil health.

Organic Fertilizer From Dry Leaves

The use of organic fertilizer derived from dry leaves is usually carried out by the people of Wonogiri by collecting various kinds of dried leaves such as teak leaves, mahogany, bamboo leaves and so on which are chopped and then spread on plants and left to rot. Applying dry leaves to the soil before processing is believed to loosen the soil so that it is easy to process and fertilize plants. This is in accordance with scientific science where dried leaves can be processed into compost with the addition of bacteria to speed up the fermentation process. Based on research (Nurkhasanah et al., 2021) compost from dry leaves, fermented with the help of microbes, contains macroelements in the form of nitrogen, phosphorus, potassium which function for plant growth, accelerate the photosynthesis process, accelerate fruit ripening, strengthen stems, and accelerate rooting. Based on (Halimatussa'diyah et al., 2023) compost is not only cheap but also useful as an agent to improve soil function, enrich soil nutrients, fertilize plants, and maintain soil nutrients.

The original knowledge of the Wonogiri people regarding the use of organic fertilizers in agricultural practices is also a conservation effort to deal with soil pollution due to excessive use of chemical fertilizers. Conservation itself has the meaning of an effort to maintain biodiversity, reduce negative impacts on ecosystems, and promote sustainable practices (Angela, 2023). The large-scale and sustainable use of chemical fertilizers has the corresponding negative impact (Umam et al., 2023) that chemical fertilizers cause a decrease in soil quality or soil degradation, environmental pollution, and ecosystem instability. Based on the results of interviews with informants, it is explained that fertilizer from dried leaves is useful for the base of vegetable and palawija plants so that the temperature is maintained and evaporation is controlled.

Relevance To Science Material

With the existence of indigenous knowledge or indigenous science in the Wonogiri community, students can learn to gain contextual knowledge around the community. Based on Sumarni, et al., 2019 in (Abidin & Soewondo, 2025) The implementation of indigenous science during learning can facilitate an active relationship between students and concrete objects that is realized by developing the surrounding environment as a learning resource. Based on Chiapetta & Koballa, 2010 in (Muliadi et al., 2022) science learning has one of the important dimensions, namely to construct knowledge with technology and society.

At the junior high school level in grade VII, there is a KD that discusses the interaction between ecosystem components and population dynamics due to biotic and abiotic factors, environmental pollution and its impact on the ecosystem, and requires students to present pollution management works based on environmental conservation principles. The practice of using organic fertilizers shows how humans as biotic factors play a role in maintaining the balance of the ecosystem and as an alternative to chemical fertilizers. This is a concrete example of soil conservation efforts that are not only supported by science, but also rooted in local culture. This shows that science learning can be integrated to enrich students' understanding contextually.

The original knowledge of the Wonogiri people regarding the practice of using organic fertilizers in the form of cow, goat, chicken, and dry foliage manure can be constructed in the science class 7 of ecology and biodiversity materials where in maintaining ecology to reduce soil pollution due to the use of chemical fertilizers can be replaced with the use of organic fertilizers. And the use of organic fertilizers as a conservation effort to reduce the

environmental impact that occurs. This is in accordance with the sub-material on how humans influence the ecosystem which contains various types of material, one of which is soil pollution. The practice of using organic fertilizers as an effort to prevent soil pollution and in accordance with the sub-chapters and conservation materials where the use of organic fertilizers is also a conservation effort to reduce the negative impact of chemical fertilizers on the environment.

Soil pollution can be characterized by soil that can no longer be used properly according to human needs. Acidic compounds, excessive use of chemical fertilizers and pesticides, industrial waste, factories and nuclear and household waste are all causes of soil pollution. Not only that, the use of excessive chemical fertilizers can also cause water pollution or pollution which is characterized by water that is no longer clean, smelly, colored and causes dead aquatic biota. Waste from agriculture using excessive chemical fertilizers and pesticides will flow into the water and cause pollution characterized by the eutrophication process of excessive algae and algae growth which causes reduced oxygen (Rofik & Mokhtar, 2021).

In practice, the use of fertilizers is also in accordance with the learning outcomes of the independent curriculum, namely the interaction between the environment and living things. From an ethnoecological point of view, this practice suggests the existence of a reciprocal relationship between humans and their environment that is formed through cultural processes and local ecological experiences. The people of Wonogiri not only utilize natural resources, but also maintain the balance of the ecosystem through sustainable practices that are inherited across generations. Thus, the ethnoecological approach is able to strengthen the understanding that local knowledge has an important role in environmental conservation and can be used as a scientific basis in ecological learning in schools.

CONCLUSION

Based on the results of the study, it can be concluded that the local knowledge of the Wonogiri people regarding the use of organic fertilizers from cow, goat, chicken, and dry leaf manure is part of ethnoscience that has a scientific basis. The practice of using this fertilizer has been carried out for generations and has been proven to be effective in fertilizing the soil and plants. Through an ethnoecological approach, this knowledge can be explained scientifically, especially related to the content of nutrients and their biological benefits. This shows that the community has indirectly applied the principles of sustainable agriculture that is environmentally friendly. This integration between indigenous science and scientific science reinforces the importance of contextual learning in science education, especially in ecology and biodiversity materials. The suggestion for the next researcher is to relate other original knowledge around the community with an ethnoecological perspective and associate relevant science materials in accordance with the latest curriculum, and predetermined learning outcomes.

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