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Local Wisdom in Agriculture of Urug Indigenous Village as an Alternative Biology Learning Resource

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Abstract.
The purpose of this research is to identify and analyze local wisdom in the field of agriculture in Urug Traditional Village, which can be used as an alternative source of learning biology. This research was conducted from December 2021 to September 2022. This research is qualitative research with descriptive qualitative method. This research data collection technique included conducting observations, interviews, documentation studies, and product feasibility tests to several informants. The results show that local wisdom in the agricultural sector of Kampung Adat Urug can be used as a source for learning biology. The biology material in the local wisdom of the agricultural area of Kampung Adat Urug covers KD 3.1 and KD 4.1 topics related to biology, KD 3.2 and KD 4.2 topics related to biodiversity, and KD 3.11 and KD 4.11 topics related to ecosystems for grade 10 students. For grade 12 students, the material covers KD 3.1 and KD 4.1 topics related to growth and development. Future research should aim to develop teaching materials and learning media for biology based on the local wisdom of the Urug Traditional Village, combined with a diversified learning model.

Keywords: urug indigenous village, local wisdom, biology learning resources

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1. INTRODUCTION

Indonesia is a country with a strong agricultural sector, boasting vast land and abundant natural resources [1]. However, the traditional agrarian culture is gradually giving way to a more modern and dynamic way of life, as evidenced by changing behavioural patterns in urban areas [2]. Despite this trend, there are still pockets of local wisdom that endure, such as Urug Traditional Village. Situated in Urug Village, Sukajaya Sub-district, West Bogor, Urug Traditional Village serves as a testament to the preservation of traditional values. The values of welfare, discipline, health, gotong royong, cultural preservation, care for the environment, commitment, and positive thinking are reflected in the local knowledge and practices of Urug Village [3].

Observations of teachers have linked several local wisdom values to the learning process of Biology, including the observation of rice field ecosystems and biodiversity derived from local wisdom. However, schools may encounter difficulties when integrating local wisdom into the learning process. For instance, students may lack interest in participating in the lesson due to their limited knowledge of local wisdom as a valuable learning resource. This lack of interest may stem from taking the customs around them for granted, even though there are many phenomena that can be interesting learning experiences. Multicultural education is an effective way to develop people's ability to live in diverse communities while maintaining their cultural identity and national unity [4]. In Indonesia, the implementation of multicultural education is crucial to educate students with sensitivity and concern for their environment, taking into account ethnic, cultural, linguistic, and religious differences [5]. Local science-based education is an approach that utilizes the local context and resources to enhance students' learning experiences in science. It involves incorporating local knowledge, issues, and examples into the curriculum to make science more relevant and meaningful to students. Research has shown that local-based teaching materials and local potency-based science learning can improve students' scientific reasoning, argumentation, problem-solving skills, and abilities required by 21st-century learning [6]. Additionally, the open science schooling approach, which involves community involvement in the development of science missions, has been found to be effective in promoting contextualized learning experiences and engaging students and teachers in science education [7]. Furthermore, local excellence-based education focuses on utilizing the local potential of a region, such as terrestrial ecosystems and citrus diversity, to enhance science education [8]. Overall, local science-based education recognizes the importance of connecting science to students' local environment and community, fostering a deeper understanding and appreciation of science. The researcher will identify local wisdom from the rice farming system in Urug Traditional Village that can be used as Biology learning resources. The materials related to the data obtained will then be analysed.

2. METHOD

This research was conducted in Urug Traditional Village, Sukajaya District, Bogor Regency. This research used a qualitative approach with a qualitative descriptive method. This research focuses on identifying local wisdom in agriculture in Urug Traditional Village that can be used as an alternative biology learning resource. Data collection techniques in this study were through observation, interviews, and product

feasibility testing. Research activities began with this observation carried out in the Urug Traditional Village area to conduct interviews with several informants as research sources, namely the customary leader, head of the farmer group, biology teacher and urug traditional village farmers as well as documentation studies from observation activities, and interviews. From the data obtained, local wisdom in the field of agriculture of Urug Traditional Village which can be used as a source of learning biology was analyzed. After obtaining results based on KI and KD biology material, a learning resource in the form of a hunt about the wisdom of the agricultural system in the Urug Traditional Village was developed which was validated by 2 media experts and 1 biology teacher using a Likert scale validation measurement scale.

3. RESULTS AND DISCUSSIONS

This research was conducted in Urug traditional village, which is one of the cultural villages in Bogor Regency that still implements an agricultural system based on local wisdom. This research data was obtained through in-depth interviews (Indepeth interview), aiming to build depth of understanding rather than factual or abstract information. Observation in this study is intended so that researchers can directly observe how the local wisdom of the agricultural system in the Urug Traditional Village. This observation was carried out directly in the Urug Traditional Village and the rice fields in the village area. This observation activity is also complemented by a documentation study of agricultural activities in the village.

Figure 1: Traditional rice farming activities of the urug indigenous community.

The process of rice farming in Urug Traditional Village is still very much in keeping with the existing local culture. Rice planting in Urug indigenous community is done once a year. This is done because the rice planted is a local variety that has a growing period of 5-7 months. When viewed more deeply, planting for one year serves to rest the land or often known as fallow. The fallow system or resting the land without planting for some time is an ancient type of rotation that was often applied by farmers in the past.

This fallow system is very beneficial because it can reduce pathogen populations in the land because the food chain is interrupted. Ecologically, fallow systems restore soil health and fertility both chemically and biologically and can reduce soil erosion rates, manage insect pests and diseases, reduce the need for external nitrogen inputs [9–11] . At the stage of the rice farming process in the urug traditional village is divided into several stages, namely: Pre planting, post planting, harvesting, and post harvesting. Activities in the pre-park include traditional activities of the Urug Traditional Village, namely Sedekah bumi, seed selection, plowing and seeding which then move on to the post-planting stage. In the Pas tanam activity there is a process of planting rice, caring for rice, fertilizing, and eradicating pests. After the planting process continues to the Harvest stage, where at this stage there are activities to harvest the first rice and Seren Taun activities. The series of agricultural activities start from preparing the land, planting, maintaining, until the harvest period. These activities can be categorized into three: land and seed preparation, maintenance, and harvesting [12]. Not stopping at the harvest stage, the stages of the agricultural process in Kampung. Urug also reaches the post-harvest stage which has several activities such as drying rice which is closed by storing rice in Leuit. Leuit serves as a storage facility for rice grains, ensuring long-term food security for the community, contributing to the stability of food supply in the community, maintaining the authenticity of local varieties, playing a role in combating climate change and achieving community resilience [14–16]. Figure 2 explains the rice farming process carried out by the urug indigenous community.

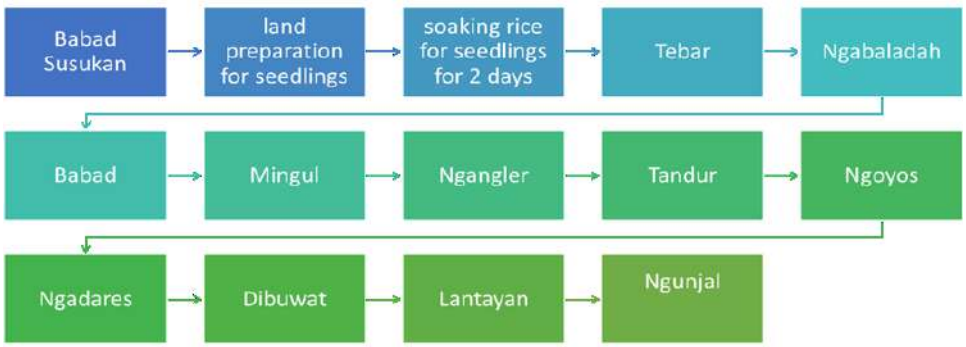

Figure 2: Indigenous urug rice farming process.

In addition to preserving the ancestral agricultural culture, it turns out that the Urug Traditional Village agricultural system, which is an organic farming system, has many benefits. One of them is that organic farming produces quality and healthy food. It also promotes ecological harmony and maintains the health of humans, soil, plants, and animals by minimizing or even eliminating the use of chemicals, conserving organic

components in the soil, reducing production costs, and being environmentally friendly [16].

3.1. Biological materials found in the agricultural field of Urug Traditional Village

The results of the identification of agricultural fields in Urug Traditional Village obtained biology material that can be applied in the learning process. The KI and KD of biology material contained in the Urug Traditional Village Agriculture field can be seen in the following Table 1

TABLE 1: KI and KD of high school biology grade 10.

KOMPETENSI INTI 3 (CORE COMPETENCY 3) (KNOWLEDGE)	KOMPETENSI INTI 4 (CORE COMPETENCY 4) (SKILLS)
3. Understand, apply, and analyze factual, conceptual, and procedural knowledge based on their curiosity about science, technology, arts, culture and humanities, with a humanistic, national, civic, and civilization perspective related to the causes of phenomena and events. Also, apply procedural knowledge in a specific field of study according to their talent and interest to solve problems.	4. Processing, reasoning, and presenting in the concrete and abstract domains related to the development of what is learned at school independently and able to use methods according to scientific principles.
KOMPETENSI DASAR (BASIC COMPETENCIES)	**KOMPETENSI DASAR (BASIC COMPETENCIES)**
3.1 Explaining the scope of biology (issues across various biological objects and levels of living organization) through the application of scientific methods and safety principles.	4.1 Use the scientific method to present scientific data on questions related to various biological objects and levels of organizing life.
3.2 Analyzing the various levels of biodiversity in Indonesia, including threats to and preservation of it.	4.2 Presenting the findings of our observation of the varying levels of biological diversity in Indonesia and proposing measures for its preservation.
3.10 Analyzing the components of an ecosystem and the interactions between them.	4.10 Present a work demonstrating the interaction among ecosystem components including food webs and biogeochemical cycles.

In learning high school biology grade 10, there are KDs that are in accordance with the local wisdom in agriculture in the Urug Traditional Village. The material in KD 3.1 discusses the scope of biology where in the field of agriculture in the traditional village of Urug there is the eradication of pests and weeds using natural pesticides made from plants. Pests and weeds are a serious problem in agriculture that can cause significant losses for farmers. As for the application in KD 4.1, students and teachers can design projects on how to make natural pesticides made from plants in the surrounding

environment such as lemongrass stems, neem oil, lavender oil, cottonseed oil, garlic oil, mint oil, garlic, and brown rice vinegar [17] .

This is in accordance with previous research that the role of biological science in agriculture is very real and supports many significant advances to increase agricultural yields, one of which is by making pest and weed eradicators with natural and synthetic insecticides and herbicides. Ecologically, natural repellents are better because they are environmentally friendly, do not damage the environment, are more sustainable and environmentally friendly [18]. Learning science contextually is important because students can integrate knowledge with real life [19, 20]. Studying the nature of science in the context of contemporary scientific practices helps students to comprehend the social and cultural dimensions of scientific knowledge objectively [21]. Overall, studying science in a contextual manner enhances students' ability to apply their knowledge in practical and meaningful ways, preparing them for the demands of a world in accordance with the developments of science and technology [22].

KD 3.2's material covers biodiversity. Under the subfield of agricultural biodiversity, it includes all life forms directly related to farming. This includes various seed varieties and animal breeds, as well as soil fauna, weeds, pests, and native organisms growing within agricultural areas. Biodiversity in agriculture is fundamental to the agricultural food chain and is developed and maintained by farmers, ranchers, forest keepers, fishermen, and indigenous people together. In KD 4.2 of the biology learning process, one can identify various types of biodiversity around the agricultural land of Kampung Adat Urug such as local rice varieties and their preservation methods.

Biodiversity is critical to food security. Plant and horticultural biodiversity provides food, feed and genetic traits for desired traits and helps improve crops [23]. The loss of biodiversity due to population growth, poverty and poor economic development threatens food security [24, 25]. Integrating the agricultural biodiversity of Kampung Adat Urug into the learning process can also be achieved through direct exploration of the environment outside the classroom, allowing students to observe its surroundings firsthand. Previous research has shown various topics related to the integration of local flagship commodities, consisting of different commodities and their aspects, that can be incorporated into Biology education. The topic and information related to local superior biological commodities are diverse and widely spread, necessitating the teacher's aptitude to classify them into high school Biology learning topics. To incorporate superior biological commodity aspects into the lesson, the mind map method may be utilized. Mind maps aid in linking ideas, fostering creative thinking, and establishing relationships between topics. Learning how to use mind mapping is a method aimed at enhancing

creativity, thinking skills, and student engagement in the learning process, resulting in a more enjoyable learning experience [26, 27].

Material KD 3.10 Ecosystem components. Teachers can use this material to discuss the ecosystem of rice fields. Teachers can identify rice field ecosystems around the rice field area near the school. As an application of KD 4.10, students can create works that show the interaction between the components of the rice field ecosystem. Agricultural ecosystems are systems in which humans manipulate the environment to produce food and raw materials. These ecosystems are characterized by low biodiversity, low autonomy, and short trophic chains [28]. The environmental conditions of the Urug Traditional Village can be utilized as an interesting source of learning for students, as it holds suitable local potential for educational purposes. The potential of biology learning resources for the ecosystem topic of grade X high school students meets the two required criteria for a learning resource. The vast agricultural potential of rice paddies offers a diverse ecosystem with numerous integral components. The curriculum's objective, aligned with the 2013 standards, aims to equip students with the knowledge to identify and observe the rice paddy ecosystem effectively. Students should be able to recognize the various ecosystem components, understand their interdependencies and be able to construct an accurate food web based on their observations. Learning and teaching processes are not limited to classroom settings, but can also take place outside the classroom. The potential found in agricultural areas can be utilized as a suitable learning resource for students, enabling them to directly observe the abiotic and biotic components present in an artificial ecosystem such as a rice field ecosystem. Learning that involves the surrounding environment enhances students' understanding of environmental sustainability and continuity, thereby fostering students' character development [29].

In the 12th-grade biology curriculum, there is one learning objective that is relevant to the local agricultural practices in Kampung Adat Urug. This objective is KD 3.1 and 4.1, which focuses on growth and development. Under KD 3.1, the learning process of growth and development can be applied to observe the growth and development process of rice in Kampung Adat Urug. The traditional agricultural system upheld by local residents possesses unique characteristics not found in paddy growth in other areas. Participants can observe the factors contributing to the difference in paddy growth and development in Kampung Adat. To apply this knowledge to learning standard 4.1, the instructor can prompt learners to conduct a paddy planting experiment in the Kampung Adat Urug paddy fields and submit a report on their results for presentation.

Table 2: KI and KD of high school biology grade 12.

KOMPETENSI INTI 3 (CORE COMPETENCY 3) (KNOWLEDGE)	KOMPETENSI INTI 4 (CORE COMPETENCY 4) (SKILLS)
3. Understand, apply, analyze, and evaluate factual, conceptual, procedural, and metacognitive knowledge based on a desire to learn about science, technology, art, culture, and humanities with a humanistic, nationalistic, and civilized perspective related to the causes of phenomena and events, and apply procedural knowledge to a specific field of study in accordance with their talents and interests to solve problems.	4. Processing, reasoning, presenting, and creating in concrete and abstract domains related to the development of independent learning at school while effectively and creatively employing scientific methods.
KOMPETENSI DASAR	**KOMPETENSI DASAR**
3.1 Explain the influence of internal and external factors on the growth and development of living things.	4.1 Write a report on the results of the experiment on the influence of external factors on the process of plant growth and development.

The rice farming system is integrated into the biology curriculum as a source of learning for high school students, covering the topics of growth and development. Therefore, the traditional knowledge of agriculture in the Urug village can serve as a resource for students. Local wisdom as a source of learning enhances students' love for their local culture, improves their understanding, and develops their creative thinking skills [30]

4. CONCLUSION

The rice farming system in Urug traditional village involves several stages, including babad susukan, land preparation for seedlings, seeding, ngabaladah, babad, mingul, ngangler, tandur, ngoyo, ngadare, dibuwat, lantayan, and ngunjal. This local wisdom can serve as an alternative source of learning biology, due to its unique and specific practices. The biology material found in the local agricultural knowledge of Kampung Adat Urug encompasses KD 3.1 and KD 4.1, which cover the scope of biology, as well as KD 3.2 and KD 4.2, which focus on biodiversity. Additionally, class X material includes KD 3.11 and KD 4.11, which cover ecosystems. For class XI material, there is KD 3.11 and KD 4.11, which also cover ecosystems. Finally, for class 12 material, there is KD 3.1 and KD 4.1, which cover growth and development. Future research should aim to develop teaching materials and learning media for biology based on the local wisdom of Kampung Adat Urug, combined with various learning models.

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