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Traditional knowledge in land management and utilization of natural resources in Wonogiri District, Central Java, Indonesia

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Abstract. *Afriawan MDAA, Al-Akromi MAI, Andira MHP, Sutrisno MT, Nurwulandari M, Sugiyarto, Nazar IA, Md. Naim D, Setyawan AD. 2024. Traditional knowledge in land management and utilization of natural resources in Wonogiri District, Central Java, Indonesia. Intl J Trop Drylands 8: 21-26.* Traditional knowledge helps farmers cultivate land to be more effective and efficient. It also contributes to maintaining environmental sustainability and reducing the adverse impacts of land management activities due to hereditary teachings about protecting nature. Wonogiri District has great potential for further development, especially in the agricultural and plantation sectors. This potential provides opportunities for economic drivers and the development of a more holistic agricultural sector in the district. Therefore, this study aimed to look at how land management knowledge and the utilization of natural resources in Wonogiri District, Central Java, Indonesia. Moreover, 65 informants were selected to be interviewed to obtain information on land use and land management procedures. This research used descriptive analysis with socioeconomic percentage parameters. The results show that the people of Wonogiri benefit from natural resources in terms of socio-cultural, ecological, economic, medicinal, energy, and construction advantages. The community utilizes agricultural and plantation products to fulfill their daily lives, resulting in a complex relationship between humans and nature that creates a unique agricultural landscape. Agriculture and plantations have become part of the activities of the Wonogiri community. The application of local wisdom that the community has applied can support the management and utilization of natural resources in a sustainable manner.

Keywords: Agriculture, culture, land, local wisdom

INTRODUCTION

Indonesia is known as a mega-biodiversity country because it possesses abundant biodiversity (Dewi et al. 2020). This high diversity has provided benefits to the community throughout their livelihoods. Traditional knowledge is used from generation to generation to support environmental challenges and assist in the management of natural resources (Das et al. 2021). Traditional knowledge and community support for natural resource management plans will shape the future fate in sustainable forestry and resource management (Hoagland 2017).

Wonogiri District is one of the districts in Central Java Province, Indonesia that has promising potential in the agro-industrial sector, strengthened by agricultural land that can serve as the primary foundation for various food commodities. Part of the Wonogiri landscape has limestone soil, so it is sometimes associated with areas of dryness and poverty. The main focus in Wonogiri is producing food crops such as cassava, corn, and rice, which are considered priority sectors for development. This potential provides opportunities to drive the economy and develop the agricultural sector in Wonogiri District more holistically. Based on BPS Wonogiri (2023), in 2022, Wonogiri District cultivated around 20 species of vegetables, of which shallots, cayenne peppers, cabbage, mustard greens, eggplants, tomatoes, carrots, cucumbers, melons and watermelons are the main products with yields more than 1000 tons each. There are around 24 species of medicinal plants, with the main products being ginger, turmeric and galangal, with yields of more than 1000 tons each. There are 22 species of fruit plants, with the main products being avocado, durian, guava, pomelo, mango, jackfruit, papaya, banana, snakefruit, sapodilla, soursop, breadfruit, *jengkol*, gnetum, and *petai* with a yield of more than 1000 tons each. Apart from that, the main ornamental plant product is potted orchids, around 50,000 pots.

The people of Wonogiri utilize their agricultural land by applying traditional knowledge in the arrangement and utilization of land. This plays a crucial role in the advancement of the agricultural sector. However, traditional knowledge also faces limitations when dealing with challenges from globalization, increasing population pressure, and the growing demands of the community. As a result, local knowledge is vulnerable to the increasing economic impact, the rapid development of modern

technology, and rapid population growth (Hidayat et al. 2010). Traditional knowledge has inherent characteristics of dynamism, sustainability, and acceptability by its community (Sinapoy 2018). In local communities, traditional wisdom emerges as a set of rules, knowledge, skills, norms, and ethics that govern the community's social structure. This system continues to live and develop from generation to generation (Toansiba et al. 2021).

In addition to the challenges mentioned above, traditional knowledge also faces the challenge of adapting to society's increasingly complex needs. This is driven by lifestyle changes that demand more diverse and high-quality agricultural products. Traditional knowledge needs adaptation to meet society's increasingly complex needs. Traditional knowledge helps farmers to manage. It assists farmers in managing land effectively and efficiently. Moreover, traditional knowledge contributes to environmental sustainability and mitigates the negative impacts of land management activities (Prameswari et al. 2019). The traditional knowledge system develops and shapes the community's habits in caring for natural resources. Traditional knowledge in agricultural land management covers various aspects, such as land selection, planting, maintenance, harvesting, and post-harvest. In managing and developing resources, the role of local communities, especially *adat*, is crucial due to their high dependence on natural resources. Therefore, to preserve sustainability, it is important to maintain the balance between humans and nature by paying attention to tradition, culture, and local wisdom. Community empowerment can also be emphasized to optimize communities' potential. Through empowerment, communities can acquire the knowledge and skills to manage natural resources sustainably (Lakoy et al. 2021). Unsustainable land management activities can cause environmental damage that affects local communities, both economically, socially, and environmentally (Khan and Hanjra 2008).

This study aims to observe land management knowledge and the utilization of natural resources in Wonogiri District, Indonesia. The results are expected to provide useful information for the local government, the community, and researchers to preserve traditional knowledge in the management of agricultural land in Wonogiri District.

MATERIALS AND METHODS

Study area

This research was conducted in Bubakan Village, Semagar Village, and Girimarto Village of Girimarto Sub-district, Wonogiri District, Central Java Province, Indonesia (Figure 1). The research was conducted for one month in October 2023. The districts of Karanganyar and Sukoharjo border Wonogiri District in the north; Indonesian Ocean, namely the South Coast, is in the south; Gunungkidul District is in the west, and the east is by East Java Province, namely the districts of Magetan, Ponorogo, and Pacitan (Figure 1) (Rachmawatie et al. 2022).

Data collection

The method used involved interviews and direct observation of the research object, and data were collected using a questionnaire sampling method (Khoridah et al. 2019) and distributed to 65 informants from the community of Wonogiri District. The informants involved were local people and traditional leaders who manage agricultural land and utilize natural resources in the local area. Furthermore, interviews were conducted with informants by asking for socioeconomic data, such as gender, age, occupation, and latest education. This research collected community knowledge about managing agricultural land and utilizing natural resources.

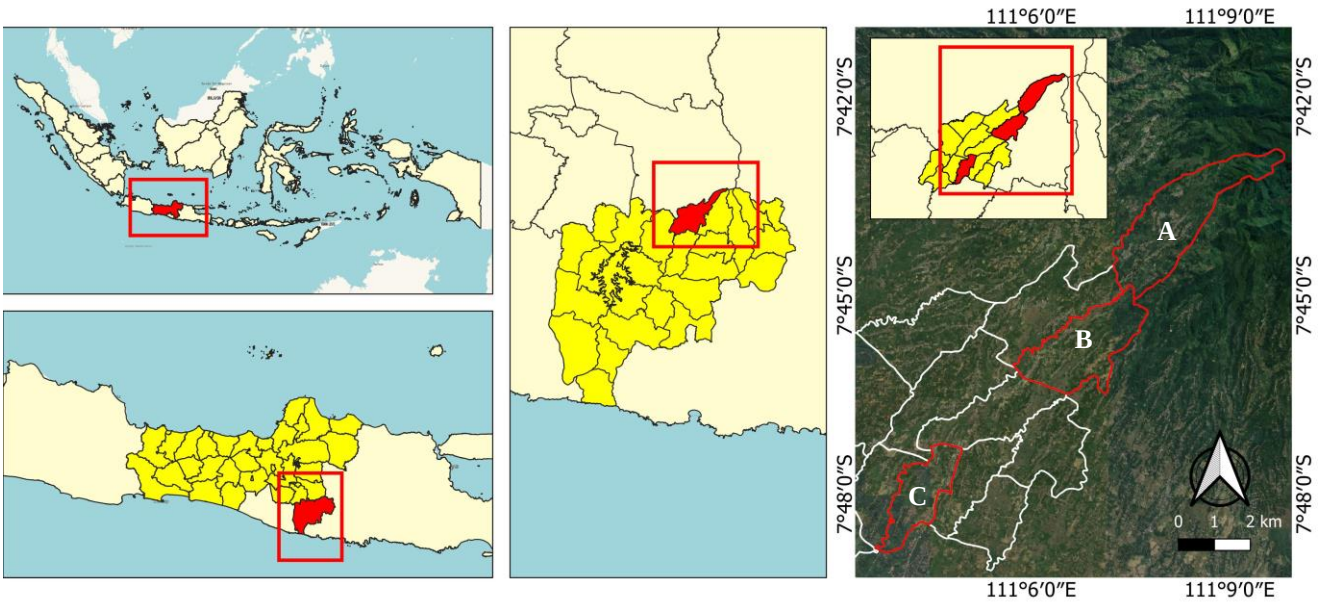

Figure 1. Research administration map of A. Bubakan Village, B. Semagar Village, and C. Girimarto Village of Girimarto Sub-district, Wonogiri District, Central Java Province, Indonesia

Data analysis

The research was conducted using the method of filling in data or information prepared on a tally sheet in the form of a list of questions. Then, the data were analyzed using descriptive analysis, displaying the percentage (%) of socioeconomic parameters describing the number of categories, divided by the total number of informants, as follows (Wasilah 2012):

$$Pi = \frac{ni}{N} \times 100\%$$

Where:

Pi: The proportion of socio-demographic characteristics (gender, education, occupation, and age) in percentage

ni : The number of socio-demographic characteristics (gender, education, occupation, and age),

N : The number of informants

RESULTS AND DISCUSSION

Socio-demographic characteristics

This study interviewed 65 respondents. Table 1 comprises 39 female informants (60%) and 26 male informants (40%). Based on the level of education of the respondents, 8 informants had no education (12.3%), 27 by elementary school (41.5%), 16 by junior high school (24.6%), 9 by senior high school (13.8%), and 6 above high school (9.2%). Additionally, the type of work shows 2 informants are students (3.1%), 23 farmers (35.4%), 13 housewives (20%), 11 laborers (16.9%), and 16 ordinary laborers (24.6%). In the age group that was interviewed, there were 8 elderly informants (60 years), constituting 12.3%, or around 8 people, and 2 informants under the age of 20, constituting around 3.1%. The most dominant age range is 21-60 years, with 55 informants, or around 84.6%.

Table 1 shows that the respondents are predominantly farmers with elementary school as their highest education, and ages range from 21 to 60. The age range of 21-60 years is considered productive for farmers as they exhibit high enthusiasm and have high expectations for farming activities in Wonogiri District (Satriawan et al. 2021). Additionally, there is a high level of innovation among farmers who have been farming for an extended period. A lack of self-awareness influences farmers with elementary school education to pursue further education, and the challenging economic conditions of their families (Khairunnisa et al. 2021). The problem with our agricultural labor force is the changing demographic structure that is unfavorable to the agricultural sector and leads to farmers' aging. In contrast, Indonesia needs productive farmers to maximize food production (Arvianti et al. 2019).

Socio-cultural characteristics

The people of Wonogiri mostly utilize land in the agricultural sector, namely agriculture and plantations. Therefore, an agrarian society has social characteristics, including crop involvement, close family ties, high awareness of mutual cooperation, and creativity in channeling irrigation (Lakoy et al. 2021). In addition, Wonogiri District is a tourist destination for locals and visitors. This tourism potential is at Muncar Temple, an area referred to as a dam located on the slopes of the South Lawu Mountains.

In addition to tourism potential, there are also customs with indigenous knowledge in Wonogiri District that are still believed by the local community, and tourists should be aware of them. Customs that are still strong in local traditional communities can be considered a guideline for the dependence of traditional communities on meeting their needs and preserving the surrounding environment. Table 2 shows local wisdom in Wonogiri District, including *rumah tiban*, *ruwahan*, *bersih desa*, *syukuran*, *kodanan*, *tumpengan*, *kirim kali*, and *ilmu titen* when farming. In addition to the existence of customs and local wisdom, Wonogiri District has the potential to be an agro-tourism site, an irrigated plantation, and an adventure site.

The highlands in Wonogiri District use agricultural technology with modern irrigation, including drip and sprinkler irrigation. This technology can increase irrigation efficiency and water use efficiency compared to surface irrigation methods (Kumar et al. 2007). Drip irrigation involves the use of flowing water directly to the roots of plants through pipes or hoses with regular drip outlets. On the other hand, sprinkler irrigation is the application of irrigation that involves spraying water over agricultural land using sprinkler technology, resembling artificial rain with a windmill-like method (Jha et al. 2019). This irrigation also impacts the community, especially the agricultural and plantation sectors, as it can improve the community's economy.

Table 1. Socio-demographic characteristics of informants

Socio-demographic characteristics	Number of informants	Percentage of the total
Gender		
Female	39	60%
Male	26	40%
Education		
No Education	8	12.3
Elementary School	27	41.5
Junior High School	16	24.6
Senior High School	9	13.8
Above High School	6	9.2
Occupation		
Student	2	3.1
Farmer	23	35.4
Housewife	13	20
Laborer	11	16.9
Employee	16	24.6
Age Group (year)		
<20	2	3.1
21-60	55	84.6
>60	8	12.3
Total	65	100

Table 2. Socio-cultural characteristics

Tradition	Description
Rumah Tiban	House that originated from Raden Mas Said's shrine when he fought against the Yogyakarta Palace, which was allied with the Dutch troops.
Ruwahan	The ritual ceremony is mentioned when you want to send prayers to the spirits of ancestors who have passed away.
Bersih Desa	An annual tradition that is routinely held once a year and tradition is carried out in the month of *Muharram* or what the Javanese people commonly call the month of *Suro*.
Syukuran	A ritual that is often mentioned when a prayer request has been granted and carried out.
Kodanan	The community custom in the area around Muncar Temple to accommodate rainwater.
Tumpengan	Yellow cone-shaped rice serving with the intention of requesting the realization of wishes and gratitude.
Kirim kali	Traditional habit by the local community is used in sending prayers to ancestors.
Ilmu titen	Knowledge used in planting, which functions to read natural symptoms and impending disasters

Natural resources and their benefits to local communities

The people of Wonogiri can benefit from sharing natural resources for their socio-cultural activities, such as traditional ceremonies, often called *ruwahan*. The *ruwahan* traditional event is a village cleaning event that is usually held once a year. The local community uses crops such as rice, vegetables, and other dishes in the ceremony. The culture is intended to maintain intimacy and socialization between communities in the area. However, fewer people uphold the traditional culture, especially the younger generation, because many young people, especially those in rural areas, prefer to live outside their villages.

Local communities in Wonogiri District utilize their resources to support their economy, especially agricultural and plantation products, using them as their main source of income. The dominant agricultural and plantation products are corn, rice, vegetables, and coffee. These crops are traded directly in the market or to collectors, usually frequent buyers.

Table 3 shows the utilization of natural resources for treatment by 72% of informants, most of whom were parents. Since ancient times, traditional medicinal plants have played an important role in maintaining health, stamina, and treating diseases (Parawansah et al. 2020). The low dependence of young people on traditional medicinal plants occurs because there are many modern health facilities in the community, such as clinics (*Puskesmas*). These facilities are very helpful for the community because they are easy to access and reachable. Medicinal plants that are still used in traditional medicine are easy to grow and obtain in the surrounding environment, such as ginger (*Zingiber officinale*), *kunir* (*Curcuma longa*), betel (*Piper betle*), and galangal (*Alpinia galanga*). These plants are used only for minor illnesses such as fever, colds, flu, and certain diseases. People prefer to go to existing health services because traditional medicinal plants are not the main treatment to cure diseases but rather companion medicinal.

Despite using natural resources as an energy advantage, the community of Wonogiri District still uses firewood as a companion to LPG (liquefied petroleum gas) (Figure 2). Firewood is the oldest traditional energy source used by humans, especially in rural areas, since ancient times (Syaufina et al. 2020) and is used for cooking and other needs. Furthermore, using firewood is considered much more efficient than natural gas when cooking in large quantities. The surrounding community still uses wood to make tile roof foundations and house ornaments such as doors, windows, and other items such as livestock cages for construction excellence. The firewood and wood supply for construction are obtained from their gardens and the surrounding forest because they are easy to obtain. Most people in Wonogiri still use wood to support their buildings, although not a few houses are built using concrete.

Table 3. Natural resources and traditional plant usage of informants' knowledge

Age	Number of informants	The number of traditional plant users	Percentage
<20	1	0	0
20-40	23	13	28
>40	41	34	72
Total	65	47	100

Figure 2. Transportation of firewood

Traditional agricultural practices as primary natural resource management

By incorporating different types of crops, managing natural resources, facing challenges, applying different farming methods, and utilizing local wisdom, these traditional farming practices reflect the complex relationship between humans and nature from farmlands and plantations. This realization is evident through different crops grown, such as rice, coffee, cassava, corn, and bananas. The diverse choice of crops not only reflects adaptation to local conditions but also creates variations in farming methods based on possible weather conditions and the preferences of local people. There are criteria for agricultural landscape features and rural panoramas based on the type of agricultural products grown, resulting in a unique and distinctive landscape panorama. The creation of terraces (*sengekdan*) and mounds (*guludan*) parallel to the land contour, as well as the planting of trees between agricultural crops (agroforestry), shows a community's deep understanding of soil and water conservation, a traditional knowledge passed down from generation to generation. (Figure 3.A). Some locations also have panoramas of irrigation systems and waters influenced by geographical factors (Dahlan et al. 2020).

Most natural resources in Wonogiri District as agricultural land, are managed privately, but some obstacles, such as limited planting media, less than optimal management, and the use of traditional tools, persist. In addition to being used for agriculture, some land in Wonogiri is utilized for plantations, settlements, and Muncar Temple as a tourist attraction, which showcases efforts to diversify land use (Figure 3.B). Many challenges in managing agricultural land are pests, landslide risks, scarcity of organic and inorganic fertilizers, and seasonal changes. However, the community still maintains traditional farming practices using hereditary teachings called *ilmu titen*, which involves planting with a certain consideration derived from ancestors and intercropping systems (Figure 3.C; planting several types of plants on the same land and time to use nutrients more effectively and reduce the risk of crop failure) (Utami et al. 2023). Land management is also adjusted to the season and land altitude, such as vegetable cultivation as the main crop because it does not depend on a particular season; planting cassava, corn, bananas, rice, and yams as intercrops because it adjusts to the existing season. Tobacco and coffee cultivation also require planting them in the highlands in the middle of the dry and rainy seasons. The farming method of the Wonogiri community can be categorized as mixed farming, reflecting a strong cultural heritage. The conventional agriculture application is considered the correct alternative and solves the world population's food and nutritional shortages and food security (Indahyani and Maga 2023).

Figure 3. A. Agricultural land use, B. Muncar Temple in Wonogiri District, C. Intercropping system, D. Traditional selling place of crops

Therefore, the community of Wonogiri District applies various organic and inorganic fertilizers to increase agricultural yields. In particular, most respondents use chemical fertilizers, rely on chemical pesticides, and practice crop rotation, a sustainable farming technique. Only a small percentage of the farmers use organic fertilizers, citing low labor intensity and longer harvests (Arifin et al. 2023). Furthermore, agricultural produce is mostly sold directly to traditional markets (Figure 3.D), and fewer are left for personal use. The central government also created a protected forest area in the form of pine trees around Muncar Temple to drive local people to be aware of the importance of protecting the ecosystem. This awareness follows the existence of protected forests in some areas, but some people do not realize the policies for protecting these forests.

Moreover, the above analysis results show that the people of Wonogiri benefit from natural resources in terms of socio-cultural, ecological, economic, medicinal, energy, and construction advantages. The community utilizes agricultural and plantation products to fulfill their daily lives, resulting in a complex relationship between humans and nature that creates a unique agricultural landscape. Agriculture and plantations have become part of the activities of the Wonogiri community. Local wisdom practices, such as *bersih desa*, *ruwahan*, and *kirim kali*, are still practiced by the people of Wonogiri today, reflecting the deep connection between the community and the surrounding environment. The potential of Muncar Temple is not only as a tourism area but also as a benefit to the economy through irrigation and market facilities; some communities propose restructuring to maximize this potential, affirming their involvement in sustainable development. Thus, traditional farming practices become a tangible representation of human efforts to manage natural resources sustainably while balancing local values and ecosystems. The application of local wisdom that the Wonogiri community has applied can support the management and utilization of natural resources in a sustainable manner.

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