Local wisdom in the preservation and diversification of medicinal plant use (A case study of the Lawu mountainside community on the island of Java, Indonesia)

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Abstract. The Lawu mountainside community uses local wisdom in its preservation and diversification of medicinal plants. The goal of this research is to describe the role of local wisdom in preserving and diversifying the use of medicinal plants. The research uses a qualitative method with an explorative approach to explore local wisdom and the optimization of medicinal plants. The research results show that the Lawu mountainside community, who use a wealth of local wisdom in the preservation and optimization of the diversification of medicinal plant use, supported by the potential of natural beauty, have managed to preserve and transfer this local wisdom to the younger generation and create a tourism site to attract visitors. This has had implications on economic and social cultural aspects. In the economic aspect, it has led to a development in the local economy, while in the social cultural aspect, it has brought about an internalization of ecological values in management of the natural environment.

1. Introduction

Human beings create their own culture to cope with the conditions occurring in their natural environment. On the other hand, nature also shapes the culture of the people living in a particular natural environment. Local wisdom is one of the ways through which culture can be processed to safeguard against unfavorable foreign cultures [1-4]. The conditions of nature affect the way the culture of a community is shaped [4]. According to [5], studies about the wealth of a nation’s culture are an important step for finding a directive to deal with modern development in Indonesia. Local wisdom is a set of life views, as well as the knowledge and life strategies that take the form of specific activities in a local community, and are used to respond to various problems in order to fulfil the needs of the community. Culture is passed down from one generation to the next through a learning process which also involves a process of communication [2,6]. According to Rahyono F X [7], all culture is a huge learning process. Over time, people continuously undertake and study all aspects of life, and discover something that is useful for them in their own lives. People can also pass on their local wisdom to subsequent generations.
Research by Zulharman et al [8] shows that local wisdom in the preservation and diversification of the use of medicinal plants is manifested in the tradition of cultivating “live pharmacies” or traditional herb gardens. Further research by Auliani et al [9] shows that Kampung Penyengat has a high regard for traditional medicine compared with chemical medicine, as seen in the enthusiasm of the local community to participate in a competition to grow medicinal plants in their own yards. The properties of medicinal plants are evident from their continued use by the community, and this is what has preserved the culture of growing medicinal plants on an individual scale up to the present day.

Local wisdom or traditional wisdom is the unique knowledge belonging to a particular community or culture that has developed over a long period of time as the result of an ongoing reciprocal relationship between the community and the environment [10,11]. According to Keraf S [12], local wisdom is also concerned with the knowledge, understanding, and customs of human beings and nature, and an understanding of the relationships that need to be built between all the inhabitants of the ecological community. Meanwhile, Aam Masduki states that local wisdom is a form of environmental wisdom that exists in the life of a community in a particular place or area, while the word “local” refers to the particular locality and community. Furthermore, Pesurnay A J [13] explains that local wisdom encompasses all the forms of knowledge, belief, understanding, insight, customs, and ethics that serve as a guideline for the behavior of human beings living in an ecological community.

The contribution and role of ethnobotany is extremely broad and varied at the present time, and certainly in generations to come, and includes plant conservation and evaluation of plant conservation status, guarantees the sustainability of food supplies, guarantees local and global food security, strengthens ethnic identity and nationalism, recognizes the rights and access of local communities to resource wealth, and plays a role in the discovery of new medicines [14]. In line with this, there is a strong potential in Indonesia for the development of the pharmacy industry to include the utilization of traditional medicinal plants, as indicated by the change in lifestyle currently taking place, in which people are starting to consume medicines made from natural ingredients and reduce the consumption of chemicals, in accordance with the concept of “back to nature”. The Lawu mountainside community possesses its own local wisdom for the preservation of medicinal plants that have been diversified to become a number of different products. The function of local wisdom in regulating the life of a community encourages an ideology that provides a practical or technical understanding of life [15]. Furthermore, Hapsah and Yaya [16] explains that “Natural medicine in Indonesia can be grouped into three categories, namely jamu, which is a traditional concoction that has not yet undergone a clinical trial, herbal medicine, which is made from natural ingredients and has already undergone the stage of a pre-clinical trial, and phytopharmaceuticals, which are medicines made from natural ingredients that have already undergone both a pre-clinical and clinical trial.” Therefore, local wisdom is the main asset of a community to develop itself without damaging the social structure that is adaptive to its surrounding natural environment. Local wisdom is built on social values that are upheld in the social structure of the community itself and its function is to provide orientation, control, and guidance for behavior in various dimension of life, both in relationships with other human beings and the relationship with nature. The goal of this research is to describe the way local wisdom is used in the preservation and diversification of medicinal plant use.

2. Research method
The method used in this research is qualitative, with an explorative approach that is used to investigate local wisdom and the optimization of medicinal plants. According to Creswell [17], qualitative research is a series of practices of material interpretation. These practices transform the world into a series of representations which cover various kinds of field notes, interviews, conversations, photographs, recordings, and personal notes. A research method with ethnographic communication is used to explain the relationships between the different categories in the research. According to Kuswarno [18], ethnography of communication discusses the connection between language and communication or between language and culture, as well as discussing all three of them together. In the opinion of Endraswara [19], ethnography is a study about the life and culture of a particular community or ethnicity.
The data for the research was collected using a method of Walk in the Wood [20,21], which includes interviewing and direct observation in the field. The key informants used were members of the community who could provide accurate information, or had good knowledge about the preservation and use of plants for medicine. The data analysis used a procedure which included evaluating the data and information, reducing the data and information [22], arranging the data and information, categorizing the data and information, and describing and discussing the data and information. The data analysis used a descriptive ethnographic method which aimed to describe the research subjects, and the way the research subjects spoke and conveyed information. The data analysis also evaluated all the data obtained from various sources [23], which included in-depth interviews, field observation notes, focus group discussions, website data, and other sources.

3. Results and discussion

3.1. Local wisdom of the Lawu mountainside community in the preservation of medicinal plants

| Stakeholder | Description | Contribution to the preservation of medicinal plants |
|-------------|-------------|-----------------------------------------------------|
| Farmers     | Growing medicinal plants is a legacy passed down from past generations | Innovations in cultivation of medicinal plants |
|             | Growing medicinal plants on farmland has become a habit at the start of the rainy season | Growing medicinal plants is not only a side job |
|             | Farmers always try to use good quality seeds to increase production | Medicinal plants thrive well |
|             | Growing medicinal plants on farmland has become a habit at the start of the rainy season | Medicinal plants are not only for personal use |
|             | Increase in types and area of planting of medicinal plants | Increase in types and area of planting of medicinal plants |
| Women Farmers Group | Growing medicinal plants in polybags in people’s own yards has become a habit | Various kinds of medicinal plants are grown in people’s own yards |
|             | Broad scale socialization and training about growing traditional herb gardens | Medicinal plants thrive and are well looked after |
| Traders     | Purchase medicinal plants cultivated by farmers | Introduce different types of medicinal plants to the local community |
|             | Provide information about medicinal plants with high economic value | Add new types of medicinal plants to the market |
|             | Stock production yield to safeguard continuity of seeds | Make available production yield of medicinal plants at all times |
|             | Help to find quality seeds of medicinal plants | Make a contribution towards plant breeding |
| MSME practitioners | Process products to become various kinds of drinks | Introduce different medicinal plants to the general public for consumption |
|             | Create job opportunities for the local community | Preserve the sustainability of medicinal plants |
| Counselors  | Provide training in medicinal plant cultivation | Develop the diversification of medicinal plant types |

Data source: Analysis of primary data through in-depth interviews

Local wisdom is not only limited to the relationships between different human beings but also extends to much broader vertical and horizontal relationships, including relationships between living creatures (human beings with fellow human beings and human beings with the environment) and spiritual relationships (human beings with their beliefs). The table 1 below illustrates the role of stakeholders in the implementation of local wisdom.
3.2. Local wisdom of the Lawu mountainside community in the diversification of medicinal plant use

The local wisdom implemented in the community in the cultivation and utilization of medicinal plants is interesting to observe, for the transfer of knowledge from one generation to another. There are numerous examples of the local wisdom that has grown and developed in the mountainside community, such as: when growing galanthus, it should be planted close to a cowshed so that it grows well and produces a good yield. Ginger, on the other hand, should not be planted close to a cowshed because it will prevent the ginger from growing properly and the plant may die. Cultivation of medicinal plants is more efficient because it does not require a large area of land and plants can be grown at the edge of rice fields or in polybags outside people’s houses. Plants can be looked after quite easily by treating them with animal manure. In spite of the mountainside location, information technology is still widely available to the community. This became evident at the time when red ginger was being widely promoted as medicine to fight the coronavirus, leading many people to purchase and plant red ginger seeds, which caused the price to soar to around 80 thousand rupiah per kilogram.

The Javanese community have a great deal of knowledge about the utilization of a wide range of plants with medicinal properties for making jamu (herbal medicine), not only to maintain good health but also to cure a variety of diseases or illnesses. This is an interesting phenomenon to understand because herbal medicine is the product of knowledge of the Javanese community about the utilization of plants that grow in the surrounding environment as a means of traditional medication, which many people continue to use to this day. Based on the statement of Maggio et al [24], diversification will lead to a sustainable harvest if there is excessive rainfall, as well as ensuring that the community still has crops or plants to be harvested when rainfall is scarce. This diversification system is highly beneficial for soil nutrient content. If only one type of plant is grown repeatedly on farmland, it will cause an imbalance of nutrients in the soil, because a single nutrient profile will be absorbed over and over again by the plant. In addition, diversification can increase crop yield and optimization of the diversification of medicinal plant utilization, supported by the potential of the natural beauty and local wisdom in the area, has been proven to have the ability to preserve and transfer local wisdom to the next generation, and to become a tourist object that attracts a large number of visitors.

The cultivation of medicinal plants is considered to be more efficient since it does not require a large area of land, and plants can be grown at the edge of rice fields or in polybags outside people’s houses. Plants can be easily looked after with the application of animal manure. There are a set of unwritten rules that are used as a reference for the community in their cultivation activities, as well as covering all other aspects of life. These rules also concern relationships between people, such as the social interaction between individuals and groups in the village community. Regarding the consumption of medicinal plants today, they are used as herbs and spices in cooking, processed (through pounding and crushing and adding water) to become herbal medicine, or used to add flavor, as ingredients for vegetable dishes, and in certain cases to make hot drinks to warm the body.

The local wisdom that is implemented in the utilization of medicinal plants consists of three categories: (1) the way to collect the ingredients, (2) the way to combine the ingredients, and (3) the time to consume the concoction. Examples of local wisdom implemented in the collection of the ingredients include: using only certain parts of the plants (leaves, stalks, roots, bark), picking a specific size or amount of ingredients, such as an odd number of leaves, picking leaves that are facing upwards, steeping/boiling 1 handful/1 bundle of ingredients, picking a particular colour of bark (dark or light), and collecting ingredients in the early morning when they are at their freshest. Examples of local wisdom used in processing the medicinal plants include: boiling the ingredients until only half a glass of water is left, combining the ingredients with pure coconut oil, or combining several different parts of a plant and treating them in a particular way before processing.

The local wisdom of the Lawu mountainside community in the utilization of medicinal plants includes using beluntas leaves (pluchea indica), reeds, and sappan wood as ingredients for herbal medicine. The beluntas leaves are processed by boiling and straining the leaves, and are used to solve problems such as body odor, aches and pains, bloating, and yeast infections. Mango ginger rhizome and black turmeric are pounded and boiled, and used to prevent liver disease, hypertension, and hepatitis,
and to increase appetite. Dried reeds and sappan wood are boiled and used to treat common colds. The unique ways these medicinal plants are used to make herbal medicine in this area include using several types of leaves, such as katuk (sauropus androgynus), which are boiled and strained and consumed to improve the production of breast milk, and beluntas leaves, which are boiled and strained and used to treat body odor, aches and pains, bloating, and yeast infections. The morinda citrifolia (noni) fruit is also consumed, after boiling and straining, to lower blood pressure, while the hibiscus (rosella) flower is dried, pounded, dissolved in boiling water and then strained and consumed to treat cancer and lower blood pressure. The bark of the sappan tree is also boiled and consumed to warm the body and prevent the common cold. This area is also known for its clove plantations, and the leaves from the clove trees are boiled and strained, and the remaining water is then drunk to warm the body. Another plant grown in this area is known as cengkir (coconut flower), which is pounded, boiled, strained, and consumed as an antioxidant.

3.3. Impact of the development of medicinal plants on the economy

| Stakeholder          | Description                                                                 | Economic benefit                                                                 |
|----------------------|------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Farmers              | Grow medicinal plants not only for consumption by their own family but with a commercial orientation | Medicinal plants are a source of income for farmers, Farmland becomes productive, area and intensity of harvest increases |
| Women Farmers Groups | Women are active in the cultivation of medicinal plants                      | Land in people’s own yards becomes productive, The community becomes more productive, medicinal plants can be taken care of at home while cooking and doing other tasks, Increase in community participation in the development of productive economic enterprises |
| Traders              | Create job opportunities for the local community                            | People who were previously not productive are becoming more productive, People who are involved receive a wage |
| MSME Practitioners   | Process medicinal plants to become products with economic value              | Business owners receive a profit, Safeguard the routine supply of raw materials from farmers (farmers receive market guarantee) |
| Counselors           | Provide ongoing training about cultivation of medicinal plants              | Play a role in growing productive economic enterprises for the local community, Facilitate partnerships between stakeholders |

Data source: Analysis of primary data through in-depth interviews

The motivation of the community in growing medicinal plants has changed since the onset of the Covid-19 pandemic, becoming more profit oriented rather than solely for their own personal consumption. The development of the cultivation of medicinal plants in the local community has been proven to increase the community’s productivity, which in turn has led to an increase in income (table 2). This condition has contributed to the development of the local economy. This is in line with the statement of Meyer [25] that local economic development empowers and ensures local participation, since the local community can play an active role in planning its own economic future and developing the local economy to make sure that local businesses are involved in the process and become more open to establishing partnerships with the local community. In addition, local economic development ensures
that local based development which focuses on local comparative advantage enables a stronger local economy, and development of the local economy can create local opportunities and jobs, thereby improving the quality of life of the local community. Diitmika et al [26] states that Local Economic Development (LED) is a process which endeavors to formulate the local institution of development, to increase the capacity of human resources to create better products, and to encourage activities of industries and businesses on a local scale. This is also in line with Mustapita and Slamet [27], who states that Local Economic Development (LED) based on village funding is one of the strategies used to create economic growth, while at the same time encouraging economic independence and resilience through the use of village funds. Likewise, [28] states that an increase in local economic development can be achieved by exploring and developing different regional potentials.

3.4. Impact of the development of medicinal plants on social and cultural aspects

The development of medicinal plant cultivation and processing has an impact on the social and cultural aspects of the community since it brings about an internalization of ecological values in the management of the natural environment. The community has made medicinal plant cultivation a habit that is able to strengthen the values of social capital in the community. The table 3 shows the impact of the development of medicinal plants on social and cultural aspects.

| Stakeholder          | Description                                                                 | Social and cultural benefit                                                                 |
|----------------------|----------------------------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Farmers              | Farmers share their thoughts and experiences about medicinal plant cultivation | Cultivation of medicinal plants strengthens the values of social capital in the community    |
| Women Farmers Groups | Regular women’s meetings are held as a form of rotational savings          | Emergence of a sense of togetherness and mutual cooperation in resolving problems related to the cultivation of medicinal plants |
|                      | Socialization and training to develop life skills for women                | Women exchange ideas about cultivation and processing of medicinal plants                   |
|                      |                                                                            | Improvement in women’s life skills to support their lives                                   |
|                      |                                                                            | Increase in participation of the community in developing life skills                       |
| Traders              | Create job opportunities for the local community                          | Help the government to create job opportunities                                            |
|                      |                                                                            | Help the government to eradicate poverty                                                   |
|                      |                                                                            | Business owners receive a profit                                                          |
| MSME Practitioners   | Create job opportunities for the local community                          | Safeguard the routine supply of raw materials from farmers (farmers receive market guarantee) |
|                      |                                                                            | Play a role in growing productive economic enterprises for the local community            |
| Counselors           | Provide ongoing training about cultivation of medicinal plants             | Facilitate partnerships between stakeholders                                                |

Data source: Analysis of primary data through in-depth interviews

Research by Wibowo and Wahono et al [29,30] shows that the internalization of ecological values that are contained in local wisdom can help create human awareness in management of the natural environment, which in turn helps to form a good ecological attitude. Local wisdom is related to life patterns in the local community in the way people form relationships with other individuals, as social creatures, as well as with nature, and with the Creator [31]. The ecological perspective of the community shows the interaction and interrelation between the local community and the environment [32]. The environmental elements involved in this interaction and interrelation include the physical environment, the social environment, and the cultural environment. In this context, forests and fields become vital, and may even be said to be a sign of the origin of the cycle of life. In patterns of local wisdom that place
importance on the unity of life with the natural ecosystem, the spiritual, ecological, economic, and social dimensions exist side by side and cannot be separated from one another. Therefore, United Nation [33] emphasizes the importance of making the public more aware of local wisdom in order to increase and change human activities to become more environmentally friendly and in line with Sustainable Development Goals (SDGs).

4. Conclusion
The Lawu mountainside community has a wealth of local wisdom in the preservation and optimization of the diversification of medicinal plant use, which is enhanced by the extremely supportive natural and environmental resources. The potential of the natural beauty and local wisdom in this area has been proven to have the ability to preserve and transfer this local wisdom to the next generation, which synergizes with tourist objects to attract visitors. This has implications on economic, social, and cultural aspects. In the economic aspect, it leads to a development of the local economy, while in social and cultural aspects, it leads to an internalization of ecological values and a strengthening of values of social capital in the sustainable management of nature and the environment.

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