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Grassroots Innovation in Village-Based Natural Resource Management in Lebak Regency

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Abstract: This study investigates the factors that encourage grassroots innovation that contributes to addressing natural resource management problems in Warungbanten Village. This study was conducted using a qualitative approach with a from the theoretical perspective of grassroots innovation. The primary data were obtained from observation during one-month field study and in-depth interviews with a number of key informants, such as village heads, traditional stakeholders, farmers, representatives of women's groups, and youth involved in the grassroots innovation process. The results showed that the growth of grassroots innovation in natural resource management in Warungbanten Village cannot be separated from three main factors, namely *innovator* aspect attached to the role of the village head as the initiator; *socio-cultural and environmental* aspect that allows the spirit of mutual cooperation and involvement of the parties; and *market* or benefit aspect attached to commercial and non-commercial values of the innovation carried out. Grassroots innovation that took place in Warungbanten Village also contributed to efforts to overcome challenges and problems in natural resource management, namely supporting the village sovereignty over natural resources, developing the sustainable livelihoods in rural areas, and removing administrative constraints in natural resource management caused by village boundary conflicts.
Keywords: grassroots innovation, village natural resource management, village development

INTRODUCTION

Seyfang and Smith (2007) conceptualized grassroots innovation based on its contribution to supporting the sustainable development agenda. They defined grassroots innovation as networking and organizational activities that generate new bottom-up solutions for sustainable development. These solutions are responses to local challenges and interests and the values of the communities involved. Unlike mainstream innovation, grassroots initiatives take place in the civil society arena and involve activists who are committed to experimenting with social innovation and using environmentally friendly technologies.

Furthermore, Seyfang and Smith (2007) suggested that grassroots innovation has a number of characteristics that distinguish it from mainstream or market-based innovation. Grassroots innovation emerges in the context of civil society, not in the context of a market economy. The emergence of grassroots innovation is driven by social and/or environmental needs, not the search for profit. In terms of institution, grassroots innovation takes on diverse organizational forms including cooperatives, voluntary organizations, and community initiatives, rather than companies. This innovation is not supported by investors or commercial activities. Rather, it utilizes resources owned by the community itself or derived

from voluntary donations, grants, exchanges, or reciprocal relationships. Local values and the spirit of collectivity are the foci of grassroots innovation, based on the idea of solidarity, instead of prioritizing efficiency and the search for profit. The actors seek to formulate alternative spaces and values that are oriented towards sustainability and social benefits (Seyfang et al., 2014).

According to Cozzens and Sutz (2014), grassroots innovation emerges and develops through collective efforts or organized citizens, rather than individuals, as an innovative approach to sustainable development led by community activists. In addition, Cozzens and Sutz (2012) emphasized that grassroots innovation is closely linked to livelihood and problem-solving efforts in responding to the challenges of community resilience and socio-economic sovereignty. A more systematic review of various studies conducted over the past two decades confirms the contribution of grassroots innovation to sustainability. Unfortunately, literature on grassroots innovation is often not connected to mainstream innovation (Hossain, 2016).

According to S. Gupta (2020), there are at least three main factors that support the realization of grassroots innovations that are related to each other, namely innovator, socio-cultural environment, and market. *Innovator* refer to the ability of an innovator as a subject/actor of innovation that will certainly affect the extent of the success of the innovation he/she creates. Environmental factor refers to two supporting components, namely conducive local culture and social capital in the form of active and empowering networks and collaborations. Market refers to the commercial and non-commercial value of grassroots innovation. Commercial value is characterized in economic terms, i.e. profitability, sales and revenues, and the like. Meanwhile, the non-commercial value is related to the social and environmental benefits obtained from an innovation, such as social inclusiveness, community empowerment, increased productivity, health, environmental sustainability, and so on. There is potential at every grassroots innovation to produce the right set of sustainable values.

In village and rural development discourses, the potential development of grassroots innovation depends on a number of aspects, both structural (policy), cultural, objective conditions in the field, and market support (S. Gupta, 2020). From a structural or policy aspect, it is actually somewhat dilemmatic because experience shows that there are some grassroots innovations that are hampered by legality so that they are considered illegal and even vulnerable to being criminalized. This is as it is the case with creators/developers of local rice varieties who are forced to deal with the law because the products resulting from the innovation are considered illegal. From this perspective, it is necessary to improve the legal system that is more sensitive and can provide support/appreciation for people's creativity in creating breakthroughs to answer the challenges or problems they face.

However, in addition to that, there is the Village Law (Law No. 6 of 2014) which opens new opportunities or optimism for grassroots innovation development efforts. This policy, in addition to providing authority to manage their own households as a form of state recognition

of villages, also provides support for the fiscal strengthening of villages from the state through the Village Fund scheme. This law also explicitly encourages the use of appropriate technology to accelerate rural development. This policy certainly has an impact on the creation of conditions that support the birth of various innovations in rural communities (Eko, 2015).

From a socio-cultural aspect, Indonesia has abundant resources, including in the form of diverse *local knowledge systems* embedded in every ethnic community with its distinctive geographical environments. This similar socio-cultural context can be an important basis in the development of innovation rooted in traditional knowledge or the cultural wisdom of the community of its creators (Maemunah, 2015; Palupi & Lopulalan, 2021)

The grassroots innovation in natural resource management discussed in this study took place in Warungbanten Village, Lebak Regency, Banten Province. The village, located in Banten Kidul area, is about 23 km from Bayah Beach on the southern coast of Banten. Natural resource management is one of the central issues in Banten Kidul rural area. The abundant wealth of natural resources and the fact that most villagers make agriculture the main source of livelihood confirm the importance of efforts to optimize the management of existing potential. In that context, grassroots innovation can also be seen as a strategic effort that emerges from below to strike back the current of metropolitanization that are eroding the independence and control of villages over natural resources (Forrest, 2017; 2018) and the socio-ecological crisis in rural areas as reported by a number of recent studies (Luthfi, 2017; M. Shohibuddin et al., 2017; Novrian, 2017)

The village natural resources are entities that have the dimensions of economic and non-economic value. From the economic dimension, the utilization of the village's natural resource potential can contribute significantly to the village income. The Tropenbos study (Purwanto, 2020) noted that the contribution from the utilization of the village's natural resource potential can reach 98.16% in forest villages and 85.32% in non-forest villages from the entire village income. Sources of income from the management of village natural resources include food crops, commercial crops, livestock, river fisheries, marine fisheries, forests, and other village natural resources. Meanwhile, the non-economic value of the village natural resources is infinite. It goes far beyond its economic value. This is because the village natural resources are an integral part of the village community's living space. For example, land is not only economically valuable by making it a commodity. More than that, land is also of social and existential value to humans and other living things living above and below its surface.

Meanwhile, several studies reported that grassroots innovations develop in various countries with wide and diverse field coverage. In Western European countries, grassroots innovation is linked to local food development efforts that are not wasteful of land and more affordable in terms of prices as in the UK (Kirwan et al., 2013) and is related to local initiatives to realize energy independence as an important milestone in the transition to a low-carbon economy as in Germany and the Netherlands (Hoppe et al., 2015) as well as France (Yalçin-

Riollet et al., 2014). Another study showed how grassroots innovation in Ukraine can become a realm for the seedling of critical awareness and its further development (Udovyk, 2017). Furthermore, in Sweden, grassroots innovation is developing and becoming an important part of the eco-village movement to build alternative lives with minimal environmental impact (Magnusson, 2018).

Outside Europe, a number of studies reported that grassroots innovation is also developing in African regions, such as Ghana and Kenya (Muok & Kingiri, 2015). The Kenyan countryside became part of the grassroots community movement as we can see in the *Greenbelt Movement* initiated by a woman named Wangari Maathai who was later awarded the Nobel Peace Prize (Maathai, 2012). As for Asia, India is one of the countries with the most fertile grassroots innovation growth and development. This can be seen from studies showing how grassroots innovation practices are developing in rural India (A. K. Gupta et al., 2003; Kumar & Bhaduri, 2014; Abrol & Gupta, 2014; Ustyuzhantseva, 2015). Similarly to China, history shows grassroots innovation has evolved since the 1970s and triggered local democratization in rural areas. Rural political changes in China are driving institutional, economic and technological innovations in grassroots societies (Zhang, 2012). Other studies mentioned that grassroots innovation in China contributes greatly to inclusive development that is able to reach areas or populations that have been untouched or neglected by the formal sector; something that is possible due to synergies and science and technology policies and programs that support grassroots innovators (Zhang & Mahadevia, 2014).

In our own society, grassroots innovation is certainly not something odd although it has been better known by other names according to the context that exists. A preliminary study reported that innovation in rural areas with ideas emerging from below has actually been going on since the beginning of the republic. The grassroots innovation manifested in the form of the implementation of village-scale local land reform, as in Ngandagan Village, Purworejo (Wiradi, 2009; Shohibuddin, M & Luthfi, A.N, 2010). The latest study reported the development of grassroots innovation in the country which also contributes to encouraging new agricultural technology and urban farming in the framework of promoting food independence for local communities through a local organization called Joglo Tani (Setiadi, 2020). This study also showed that grassroots innovation is able to bring about a rural social transformation process, especially in the management of resources and the organization of agricultural work systems. Another study highlighted grassroots innovations by the Kulawi-Marena community in Central Sulawesi that revitalized the customary law system to maintain forest sustainability and ensure social order (Wibowo et al., 2021).

Warungbanten Village in Lebak Regency is one of the villages that continues to innovate to answer various problems faced in the management of village natural resources, for example through land use mapping, participatory mapping, natural agricultural development, conservation of village barns and local foods, and clean water management. The various efforts made by Warungbanten Village are certainly closely related to the grassroots leadership model, both attached to the character of formal leadership (village head) and informal leadership (traditional elders) of the local area.

For the Indonesian context, as mentioned earlier, the development of grassroots innovation has been the subject of several previous researchers (Wiradi, 2009; Shohibuddin, M & Luthfi, A.N, 2010; Setiadi, 2020; Wibowo et al., 2021). However, there have been no studies examining how village government institutions organize the residents and optimize the social networks they have with supra-village actors in developing grassroots innovations in natural resource management in response to the threat of ecological social crisis in rural areas. Therefore, this study considers it important to look and explore how the village is also able to create grassroots innovate as a local initiative that emerges from below to maintain control over natural resources that have been the basis of livelihood of the village community, as in Warungbanten Village. Based on the above explanation, this study aims to identify and map the factors that support the growth of grassroots innovation and its contribution to overcoming natural resource management problems in Warungbanten Village.

METHODS

This study used a qualitative approach. Creswell and Creswell (2018) suggested that qualitative research is an approach to explore and understand the meaning that individuals or groups give to social or humanitarian problems. To explore various new information and understand the complexity of the meaning of social interactions in Warungbanten Village community groups in the management of village natural resources, this study used an in-depth interview instrument conducted openly and semi-structured. The data collection was also carried out through observations and document studies. Field research was conducted in two visits, namely in September and November 2021.

Interviews were conducted with a number of key informants consisting of village leaders, both formal (village head) and informal (traditional elders), village community elements consisting of farmers, farm workers, Islamic clerics, youth groups, members of Family Welfare Program (PKK), and supra-village actors, namely the Regency Government apparatus or, in this case, the Village Community Empowerment Office, and civil society organizations that focus on rural development issues, such as the Participatory Mapping Network (JKPP) which has been collaborating with Warungbanten Village Government.

Observations were carried out to obtain ethnographic data through direct observation or participant observation on daily activities among villagers and village officers. In this case, the researcher lives with the residents (live in) for a certain period of time in the village that was the locus of research. Through observations, the researcher can cross-check or add the data and information obtained from in-depth interviews or document or archive searches so as to obtain a more complete picture of the conditions in the field. Document study was carried out by searching, collecting, mapping, processing, and analyzing secondary data, including: 1) village archives; 2) statutory documents; 3) results of previous research in the form of previous research reports; 4) other relevant documents, such as mass media coverage and articles/reports/manuscripts obtained from the media.

The data collected were then analyzed. The results of the analysis provided a foundation for the researcher to interpret the data to deeply understand the implied meaning of various social interactions and processes that reflected the reality in the field. Furthermore, processing and analysis of the field data were carried out through organizing and sorting the data. The qualitative data analysis technique in this study adopted the analysis stage model suggested by Yin (2011), namely data compilation, data sorting and classification, data rearrangement, data interpretation, and conclusion.

RESULTS AND DISCUSSION

Warungbanten Village and Its Natural Resource Potential

Warungbanten Village is one of 22 villages in Cibeber Subdistrict, Lebak Regency. With the topographic characteristics of the area at an altitude between 400-700 meters above sea level, the village is on a plateau, with the contours of hills and abundant groundwater content. The air is relatively cold. The average air temperature is 18-35 degrees Celsius and the average rainfall is 1,000-4,500 mm per year.

With its fertile soil character and abundant water availability, it is no wonder that Warungbanten Village has a high level of biodiversity. The biodiversity of the flora and fauna in this village is not only based on the typical vegetation of the highlands, but also on the type of local rice varieties cultivated by the community, both dry fields (*huma*) and paddies. The local community cultivates more than 40 types of local rice varieties. Local rice varieties usually have their own advantages over non-local rice varieties, such as pest resistant, can be stored for a long time, and is a symbol of farmers' sovereignty over seeds (seed freedom) (Shiva, 2016).

This village is also the habitat of 72 types of animals, which are divided into groups of primates (4 types of animals), amphibians (4), poultry/birds (19), mammals (16), fish (16), and reptiles (13). Some of them are rare animals. In terms of vegetation, Warungbanten Village is a habitat for 93 different types of plants, both woods/trees and fruits (41 types of plants), tubers (15), flowers (28), and palm trees (9). Some of them are wildly grown plants or non-cultivated plants. For example, aren, manglid, cempaka, rasamala, and other flowers. Others are plants cultivated by the local community, such as petai (bitter bean), jengkol, durian, cloves, agarwood, sengon, albasia, bamboo, and most tubers.

Warungbanten Village unfolds on a land area of 1,336.84 ha or 133.684 square km. The village area has been divided into several forms of land use according to the designation by referring to the village land use that has been set forth in the land use map. Based on the map, land utilization in Warungbanten Village is divided into several types of utilization. The most extensive land utilization is for agriculture, both in the form of agricultural fields (762.72 ha or 57.05%) and rice fields (286.88 ha or 21.38%). Meanwhile, other forms of land use are retention basins (0.21%), settlements (1.68%), customary forests (0.54%), graveyards (0.11%), mining sites (4.13%), and set-aside lands (14.90%) (see Figure 1).

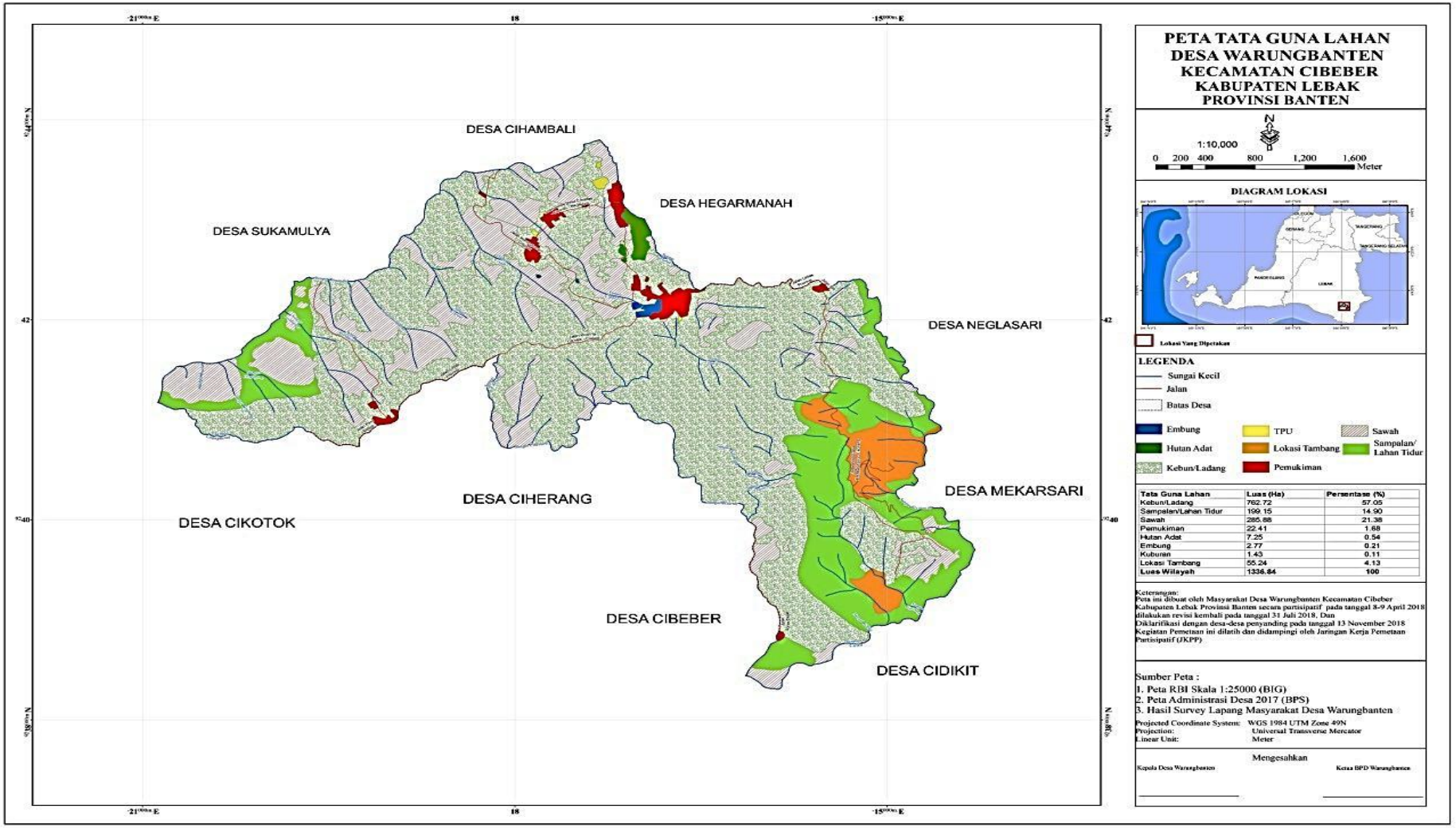

Figure 1. Land Use Map of Warungbanten Village
Source: Warungbanten Village Government Document, 2018

Problems in Natural Resource Management

In terms of natural resource management, Warungbanten Village faces three problems. *First*, there are obstacles in utilizing the potential of and protecting the natural resources**.** Warungbanten Village has abundant natural resource potential. However, this potential has not been optimally unlocked. This is the main problem in managing natural resources in Warungbanten Village. Why is this happening? According to Jaro Ruhandi, Head of Warungbanten Village, this is because the village government itself has not had an adequate database and information about the potential of natural resources in detail for a long time. The implication is that due to the database deficit, natural resource management has never been accommodated in village development policy or planning.

Second, there is a threat to village sovereignty over natural resources. Symptoms of this problem can be seen from the lobby of gold mining investors who want to expand their concessions in the Warungbanten Village area. This is seen as a serious problem for at least two reasons: 1) land and natural resources are the main source of livelihood for the majority of Warungbanten Village residents, namely farmers and farm laborers; 2) the damage caused from mining activities is difficult to recover and has the potential to interfere with the preservation of village nature and productive green landsz that residents work on. Apart from that, the threat of mines or extractive industry exploitation is now a scourge for almost every village in the southern part of Lebak Regency.

Third, there are administrative constraints, namely village boundary conflicts. Village boundary conflicts indirectly impact natural resource management, especially in areas around location points that are the subject of claims between disputed villages. Because of the conflicting land status, the management of natural resource potential in the area cannot run optimally.

Grassroots Innovation Practices in Natural Resource Management

The problems of several areas in natural resource management, as explained in the previous section, actually shows that the renewal of resource management in Warungbanten is an urgent agenda due to the demands of conditions in the field. This urgency underlies the emergence of the initial idea of grassroots innovation carried out by Warungbanten Village in natural resource management. The initial idea arose when Jaro Ruhandi was elected as the Head of Warungbanten Village in 2015. In his early term, Jaro Ruhandi saw a number of challenges that needed to be responded to immediately, especially in relation to the exploration of potential and the management of natural resources. This cannot be separated from the dynamics of spatial planning in Warungbanten Village. The village has a rich and fertile natural resource potential. The majority of the population lives as farmers or other activities that depend heavily on the fertility and natural friendliness of the village.

Grassroots innovation in natural resource management by Warungbanten Village is carried out through participatory mapping. In other words, participatory mapping is the main activity in the renewal process that has an impact on the protection, utilization, and sustainability of natural resource management in the village. Therefore, this section elaborates the significance of participatory mapping as an innovation, form of activity, process and stage, and output.

The participatory mapping activities were carried out through field surveys and taking coordinates of village boundaries, public facilities, and social facilities in a participatory manner by involving the Warungbanten Village community as the main actors of the activity. In its implementation, participatory mapping refers to a specific set of processes and stages, as well as *outputs*, which will be described in the following section. This activity involves both the Village Government (village head and apparatus) and the Warungbanten Village community itself as the main actors. Therefore, based on the elements involved, this activity is said to fulfill the element of participatory mapping as an innovative step taken in natural resource management.

Participatory mapping was carried out by collaborating with the Participatory Mapping Network (JKPP), a civil society organization that is a strategic partner of Warungbanten Village. This activity also involved approximately 50 people, which included local community residents and village government administrators (village apparatus and Village Deliberation Agency). In the implementation process, there were at least five main stages in this activity. *First*, planning. At this stage, the community came together to build a mutual understanding of the mapping needs, processes, budget, team, time, and management of its activities.

Second, the preparation of field surveys. At this stage, the community involved equipped themselves with a set of technical knowledge through training. There were two things learned in the training. There were at least two things learned in this training: 1) introduction of and learning to use the Global Positioning System (GPS), an aid or system to detect the location or determine coordinates on the Earth's surface with the help of satellite signal alignment; and 2) learning to identify natural characteristics that are symbols of the boundaries of the village, such as rivers, springs, trees, or others. Participants also received direction to identify natural resources potential, either on the village border or at other points in the Warungbanten Village area they visited.

Third, field survey. These stages were divided into two main activities. First, mapping the boundaries of the village. At this stage, the team was divided into four groups according to the four wind directions: west, north, east, and south. Each group was tasked with mapping the boundaries of the village in accordance with the location of their respective wind directions. This stage was completed within 1.5 days. Subsequently, the mapping proceeds to the second stage. At this stage, a small team was formed, consisting of apparatus, Jaro, and representative of Participatory Mapping Network (JKPP). This team

was tasked with exploring and mapping the natural resources potential in Warungbanten Village.

Fourth, the creation of map and social profile of the village based on the results of participatory mapping. Both social profile and village map are a form of documentation as an output of participatory mapping. The social profile of the village contains complete and detailed data and information that were processed and analyzed in relation to the state of nature and natural resource potential of Warungbanten Village. This is then needed as a basis for the direction of village development planning and policy. According to Jaro Ruhandi, the results of this participatory mapping become a basis for determining the direction and focus of further village development.

> *"Based on the results of mapping the village potential, the agricultural potential of Warungbanten Village is very abundant. Therefore, the choice of village development by emphasizing agricultural potential is a very sensible choice and based on factual conditions in the field."* (Ruhandi, 2021)

Fifth, the integration of participatory mapping results into the village regulation draft, both as planning and village-scale local policy documents. The draft of the village regulations specifically regulates the protection and utilization of natural resources in Warungbanten Village.

Participatory mapping as an innovative step in natural resource management in Warungbanten Village produces at least three outputs, namely map, social profile and natural resource potential, and Village Regulation Draft on Natural Resource Management. First, the map is the first product of the participatory mapping process. There are at least two types of maps produced from this process, namely the map of the village area that is integrated with the land use map and the map of land and natural resources in Warungbanten Village. The first map contains the boundaries of the village that correct the village map based on the results of delineation whose accuracy level is not yet appropriate. When referring to the indicative map of the results of delineation from the Geospatial Information Agency, many villages' administrative areas overlap with the maps of other villages' administrative areas so that they can trigger village boundary conflicts. Cases like this could potentially occur between Warungbanten and one of its neighboring villages, Neglasari. This map also contains data and information about land use in Warungbanten Village.

This land use map has a high degree of accuracy for at least two reasons. First, this map was made by the village community in a participatory manner on April 8-9, 2018 after previously conducting a 1.5-day field survey along the boundaries of the village and identifying various natural resource potential in the village area. Subsequently, this map underwent revision on July 18, 2021. Second, this map was also clarified with the neighboring villages on November 13. In other words, this map was made based on facts

and conditions in the field and the results have been agreed by the parties, in this case the village community as the main subject of participatory mapping and neighboring villages.

As seen in the land use map above, there are eight types of land use in Warungbanten, namely agricultural fields, set-aside lands, rice fields, settlements, customary forests, retention basins, graveyards, and mining sites. The most extensive land use is for agricultural fields, which is 762.62 ha (57.05%). It is followed by rice fields (21.38%), set-aside lands (14.90%), mining sites (4.13%), settlements (1.68%), customary forests (0.54%), retention basins (0.21%), and graveyards (0.11%). More detail is presented in the Table below.

Table 1. Land Use Map of Warungbanten Village

No	Land Utilization	Area (Ha)	Percentage (%)
1	Agricultural Field	762.72	57.05%
2	Set-Aside Land	199.15	14.90%
3	Rice Field	285.88	21.38%
4	Settlement	22.41	1.68%
5	Customary Forest	7.25	0.54%
6	Retention Basin	2.77	0.21%
7	Graveyard	1.43	0.11%
8	Gold mining area of PT Sarana Banten Jaya (SBJ) and PT Aden	55.24	4.13%
	Total	1,336.84	100%

Source: Pemerintah Desa Warungbanten, 2018

The second map is a map of land and natural resources control in Warungbanten Village. This map contains information on land and natural resources ownership and distribution. According to this map, the control of land and natural resources is divided into three parts: 1) individual control/ownership of land and natural resources by the village community covering 96.24% of the total area of the village; 2) control/ownership of land and natural resources by the village government (0.35%); 3) control/ownership of land and natural resources by the gold mining company, namely PT Sarana Banten Jaya, amounting to 3.41%. The map of land and natural resources in the picture below shows the distribution of land and natural resources in Warungbanten Village.

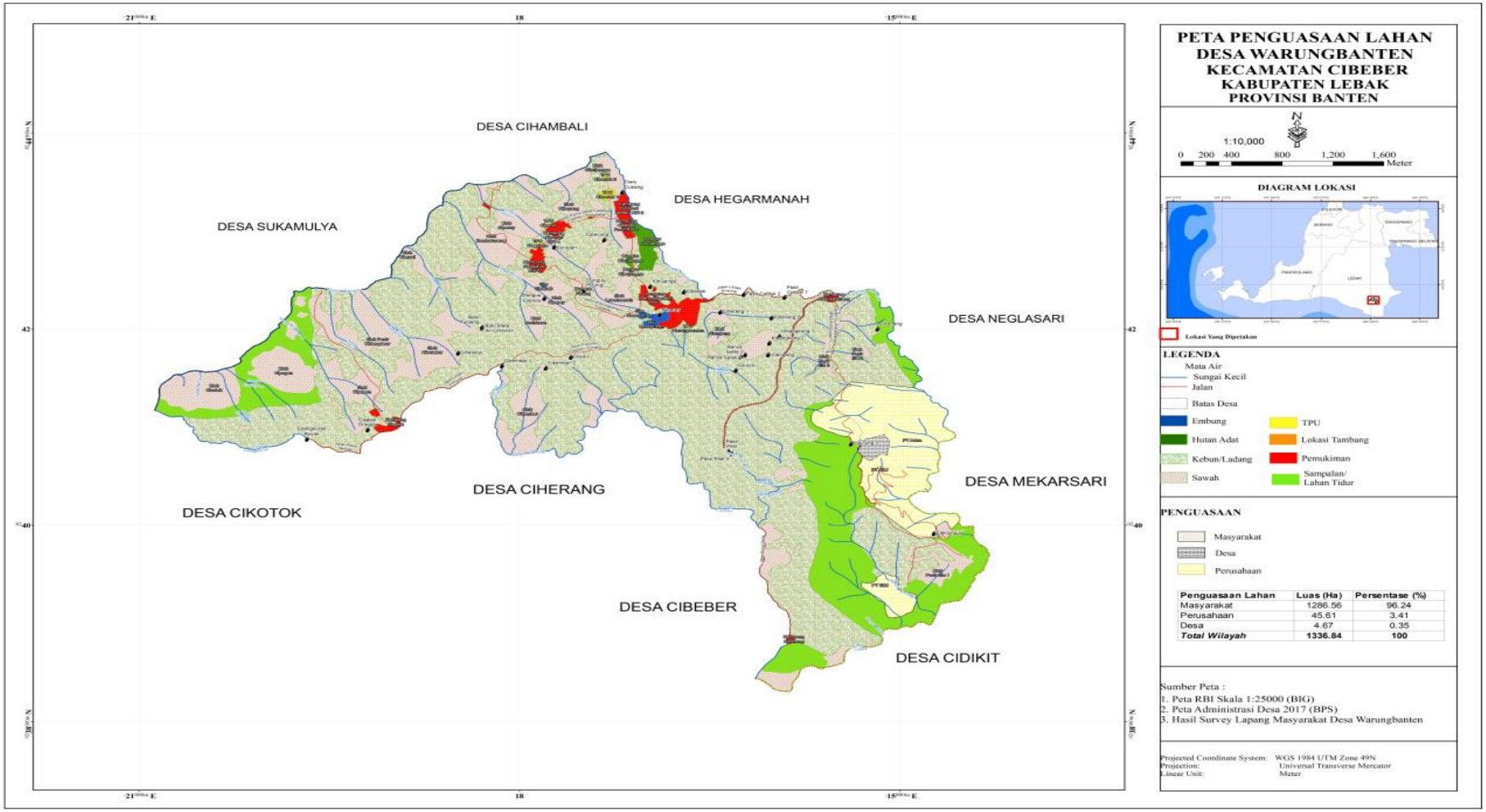

Figure 2. Map of Land and Natural Resources Control in Warungbanten Village
Source: Warungbanten Village Government Document, 2018

Second, the Social Profile of the Village**.** This profile was compiled to resemble a village monography by the Warungbanten Village Social Profile Drafting Team. It contains data and information about Warungbanten Village in a very detailed manner, which includes an overview of the location (orbits, administrative boundaries of the village, public facilities, and social facilities), the village's physical environment (topography, geomorphology, soil type, climate and weather, biodiversity, and hydrology), demographics (population data based on age, gender, population growth rate, and population density), history (village history, ethnicity, language, religion, living legend), governance and leadership (village government history, village government structure, influential actors in the village, conflict resolution mechanisms, land ownership, and decision-making mechanisms), social institutions (formal and informal institutions and village social networks), land and natural resource processing, control, and utilization industries (maps and distribution of land ownership/control and land rights).

Third, output in the form of policies/regulations, by integrating the results of mapping into village local policies/regulations, namely the Village Regulation Draft on Natural Resource Management. Regarding the reason for the preparation of the Regulation Draft, Jaro Ruhandi said:

> *"A further step of the mapping process is the existence of village regulation related to natural resource management. It is considered important to provide signs in optimizing natural resource management while still paying attention to the aspect of sustainability." (Ruhandi, 2021)*

Supporting Factors

a. Innovator Aspects

The development of grassroots innovation in Warungbanten Village cannot be separated from the existence of innovators attached to the figure of the village head. He was the one who brought the initial idea of natural resource management innovation in his village, which was then carried out through participatory mapping. In addition to being an initiator, he also acts as a local organizer in calling to the collective action of the village community to carry out mapping. How could that prominent role emerge from the figure of the village head, Jaro Ruhandi?

It is obviously undeniable that this is inseparable from his position and authority as the head of the village itself, with his strong motivation to encourage village change. Jaro Ruhandi's position as village head has great authority to make a policy at the village level. The great authority certainly comes from his position as village head who gets mandate from the community to lead and exercise the authority of the village, including authority in the administration of government, implementation of development, community development, and empowerment of village communities. In order to carry out these responsibilities, the village head formed a village government administration, consisting of

village apparatus and other village apparatus that carry out the functions of village authority.

In the context of village development, Jaro Ruhandi initiated participatory mapping as a breakthrough step in natural resource management in Warungbanten Village. For the community and the Warungbanten Village government, this is a new thing because it has never been done before. Meanwhile, for Jaro Ruhandi, participatory mapping is a strategic step to answer some of the challenges faced by Warungbanten Village.

In his efforts to realize this innovative initiative, Ruhandi took at least two important steps: mobilizing the social networks he owned and opening the space for the involvement of the parties, especially by empowering youth groups and women's groups. Women's groups are one of the actors who are outside the village government institution. As villagers, they certainly have the opportunity to influence village policy. However, in the context of Warungbanten Village, the situation is somewhat different because women's groups do not have the opportunity to appear in the public space. The strong patriarchal culture causes community social relations to prioritize the role of fathers. However, under the leadership of Jaro Ruhandi, women are given space and opportunities to take on wider roles. In the context of participatory mapping, women's groups were involved in all stages of mapping up to the drafting of the Village Regulation Draft as a follow-up. There is a reason for this. Although not as large as men, women's groups have access to natural resource management, especially in the context of utilizing agricultural lands, plantations, and labors.

Women's involvement in agriculture is common. If further detailed, in the context of the Kasepuhan Banten Kidul indigenous community, from the 15 stages of farming activities in paddies and dry fields, there are 11-12 types of activities carried out by women, with four activities among them only carried out by women's groups, namely *babad*, *ngaseuk*, *ngored*, and *ngarambet*. Meanwhile, male farmers do 12-13 types of activities, with four of them only carried out by male farmers, namely *bebere*s, *mocong*, *ngunjal*, *neteupkeun* (Saptariani, N, et al, 2011). Although the type of farming activities carried out by women farmers are fewer than men, their daily lives are more intense in caring for agricultural land. Women farmers go to rice fields or agricultural fields almost every day, from morning to afternoon. Meanwhile, male farmers sometimes have to work elsewhere to meet short-term or daily needs as seasonal migrant workers in cities such as Rangkasbitung or Jakarta, so they cannot work on the field daily (interview with Mansyur, September 12, 2021). Therefore, the role of women in agriculture sometimes becomes more dominant than men.

With such a background, women are one of the key sources of information in managing natural resources in Warungbanten. They go to the agricultural fields or dry fields and paddies to do various types of activity stages in rice planting. It is this experience that is dug deeper in the mapping process into a more comprehensive knowledge. In

addition to having a balanced role with men in agriculture, the explanation above implies that women hold a lot of information about the village's natural resource potential. Therefore, Jaro Ruhandi made room for women's groups to play a significant role, as their involvement in participatory mapping, including in the data search process. They were also involved in the drafting of the Village Regulation on Natural Resource Management as a follow-up to the mapping results.

Meanwhile, the involvement of youth elements is inseparable from the character and approach of Jaro Ruhandi in leading the village which puts youth at the forefront of accelerating village development. Jaro invited representatives of youth elements to engage as village apparatus. Gradually, some young residents began to fill posts in the structure of village apparatus, until most village officials consisted of young people born in the second half of the 80s or early 90s. Practically, only the village secretary was born in the 70s. In addition to aiming to regenerate, steps like this are also aimed at inviting youth groups to care about the future of the village through their involvement in the administration of government and village development.

As a former Chairman of PBPC, it is not difficult for Jaro to stay connected with the local youth community. Among the youth, he was always an advisor who was always asked for opinions and advice on activities initiated by PBPC. Therefore, Jaro did not find any significant difficulties when inviting them to be involved directly in the field during the participatory mapping process.

b. Environmental and Socio-Cultural Aspects

Socio-cultural environmental aspects refer to two things, namely the spirit of mutual cooperation between village communities and networks that are used to collaborate. Regarding the first, the grassroots innovation practice of Warungbanten Village as a collective action shows how to involve the role of policy stakeholders, women's groups, and young people. Each of them plays a role that is not simple. Their presence cannot be categorized as complementary, but rather is at the forefront when the mapping process took place, by going directly into the field. Therefore, this section slightly reviews their respective involvement in the grassroots innovation collective action.

The ability to build networks also allows grassroots innovation to grow. In this case, Warungbanten Village invited civil society organizations, such as Participatory Mapping Network (JKPP) and Bina Desa Foundation. Each of these networks plays an important role in facilitating and educating village communities, especially in mapping and following up the results of the mapping. Therefore, the collaborative dimension is an inherent character in grassroots innovation. An innovation can be categorized as grassroots innovation, one of which is because, both in design, practice, and follow-up is done collaboratively. The Warungbanten Village experience confirms that. In other words, when viewed based on

the collaborative component, there is no reason or obstacle at all for grassroots innovation in Warungbanten Village not to continue.

c. Market Aspects

The existence of market aspects also supports grassroots innovation that takes place in Warungbanten village. This aspect refers to the commercial or non-commercial value of the innovation. The commercial value of grassroots innovations that take place in Warungbanten can be seen from the profitability in the form of material profit opportunities obtained by the village community so that they have the potential to increase their income. For example, the use of set-aside lands with an area of hundreds of hectares that were previously abandoned. Participatory mapping-based innovation allows the existence of the land to be identified both its condition and potential, thus encouraging the government and village communities to take advantage of it. The village government has also accommodated these aspirations into village development planning documents and prioritized infrastructure development in the form of farming business roads as an opening access to the location of set-aside land. The quick response from the village government and the community shows a strong desire to be able to immediately utilize and cultivate the set-aside land to increase their agricultural production. This is where one of the commercial values of grassroots innovation carried out by Warungbanten Village is apparent.

Meanwhile, non-commercial value is identified from two things. First, the impact on village efforts in maintaining environmental sustainability and sustainable utilization of natural resources. This means that the innovation that takes place has a benefit to the efforts to save the environment. Second, the impact of innovation on the agenda of strengthening and empowering the community. The latter can be seen from the innovation process that takes place by involving the organization of the community. In this case, they gather to discuss the planning, preparation, division of the field team, before then going into the field survey tracing the entire village area. They mapped the boundaries of the village, digging up information about the condition and natural resource potential. This kind of process also encourages the "movement to know the village itself" which boils down to the transformation of the village community's knowledge.

Based on the experience of Warungbanten Village above, we can see how the three supporting factors above play a role in encouraging grassroots innovation to grow. In this case, the leadership of the village head is able to play the role of an innovator by involving the role of various community elements, especially youth and women's groups. The ability to utilize networking allows the village to optimize the involvement of external actors and obtain the injections of resources needed to develop their natural resource management. Similarly, the benefit aspects to answer challenges and sustainability issues in natural resource management allow the innovations carried out to gain the support of the parties.

Contribution to Natural Resource Management

There are at least 3 (three) major contributions of grassroots innovation to natural resource management in Warungbanten Village. *First*, grassroots innovation as an advocate of village sovereignty over natural resources. The assertion of sovereignty is evident from the village's efforts to rest on the principle of protection and sustainable use in natural resource management. This spirit is then expressed in the Village Regulation Draft on Natural Resource Management which is prepared based on the results of participatory mapping. The preparation of the draft is intended as a local legal or regulatory instrument to strengthen the mapping results in order to have an impact on restoring the village access and control over natural resources. In other words, it can be seen how grassroots innovation contributes as an advocate of village sovereignty over natural resources.

Second, grassroots innovation as a basis for developing sustainable livelihoods. The results of the participatory mapping-based innovation showed that Warungbanten Village has abundant natural resource potential. This potential is not only in agriculture, but also in tourism. The information and data collected from the mapping process indeed informed that there are still many community lands that are still in the form of set-aside lands. Therefore, the Village Government encourages the residents to make optimal use of the land. One of them is the community land located in Pasir Pilar which has not been utilized because there is no adequate road access to it. Therefore, the Village Government has planned to build a farming business road that connects the access road from Kadukalahang to Pasir Pilar.

In addition to utilizing agricultural potential, grassroots innovation also allows other prospective livelihood potentials to be developed, namely nature tourism and goat herds. Based on the exploration of natural potential through participatory mapping, in Warungbanten Village no less than 25 rivers and 31 springs were identified, some of which were waterfalls. Some points in this location are suitable places to develop as natural attractions, especially waterfalls.

Third, grassroots innovation based on participatory mapping in Warungbanten Village also contributes to village efforts to overcome administrative constraints in natural resource management, namely by overcoming village boundary conflicts. This is because the results of participatory mapping provided a spatial database that confirms the boundaries of the village area. In other words, the village can actually resolve boundary conflicts between villages after conducting participatory mapping. The results are in the form of more accurate village boundary maps and based on the agreement of the parties.

The three contributions above show that grassroots innovation as a local initiative makes an effective contribution to addressing the problems and challenges of natural resource management at the village and rural level. In other words, as local initiatives emerge from below and give birth to local solutions, grassroots innovation yields local

emancipation. Emancipation is the heart of village independence as the fruit of a combination of approaches from the inside and the bottom. In short, the village government, village institutions, community organizations, and residents build collective action to optimize the use of networks and resources to respond to challenges and obstacles in natural resource management that is oriented towards utilization and protection (Eko, 2013). This similar approach is in line with the concept of "village building" which places the village as the main subject or actor of the village development. Meanwhile, civil society organizations such as Participatory Mapping Network (JKPP) facilitate and educate from below. Their presence is not to advise and patronize the villagers, but rather to be friends and reconcile the villagers in fighting with the various problems and challenges they face. The contribution of Participatory Mapping Network (JKPP) as a village partner institution is evidence of the benefits of networking and collaboration with external parties that have been built by Warungbanten Village, especially through the hand of Jaro Ruhandi as the Village Head.

CONCLUSION

The practice of grassroots innovation in natural resource management in Warungbanten Village shows that the capacity of the village as a sovereign subject is able to become an innovator to respond to various needs and problems faced, in accordance with the context of space and the scope of its authority. The innovative initiative arises in response to several problems that the village is facing in managing natural resources, namely the inadequate utilization and protection of natural resource potential, the threat to village sovereignty over natural resources, and the emergence of administrative constraints (village boundary conflicts) that indirectly affect the natural resource management in Warungbanten Village. A series of these problems may also occur in other villages. Therefore, the experience of Warungbanten Village can inspire local initiatives and similar collective actions elsewhere.

Warungbanten's experience confirms that the success of village innovation is not in the hands of one party, but a collective work involving various elements of policy stakeholders, ranging from local leaders, village government, village communities, and regional governments as well as village partner institutions. This means that efforts to develop innovative initiatives in building villages are not sufficiently focused on the will from above and from below. The practice of grassroots innovation to accelerate village and rural development is closely related to the role of four main actors: actors from within (village government and village institutions), and actors from below (residents or community organizations), actors from above (supra-village government support), and actors from outside (civil society organizations/village partner institutions). However, the experience of Warungbanten Village shows the central role of local leaders, in this case the village head, who got permission from the traditional leader.

RECOMMENDATIONS

Based on the research findings, this study suggests the following recommendations: *First*, as the party responsible for carrying out the guidance and supervision functions, the Regional Government through the Community and Village Empowerment Office needs to introduce the concept of grassroots innovation more broadly and develop a policy instrument that can create a strategic environment for the village to foster innovative ideas in its natural resource management. Learning from the experience of Warungbanten Village, local initiatives in building natural resource management innovations through participatory mapping are proven to be able to help the village to overcome problems in natural resource management and formulate a local policy oriented towards protection and sustainable use.

Second, it is increasingly urgent for policy makers at the higher level, namely the Government and Regional Government, to design a policy that can ensure the sustainability of village innovation, especially when there is a succession of village political leadership.

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