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Socio-Ecological Management of Drawdown Farming in Jatigede Embankment Dam (West Java, Indonesia)

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A B S T R A C T

The impact of the construction of the Jatigede dam caused at least 6,856 heads of households in 17 villages as affected people (Orang terkena dampak-OTD) must move to new area. They must develop adaptation strategies to make various efforts to obtain income to maintain their survival in new area. Among the efforts made by OTD of Jatigede, they have utilized drawdown area of Jatigede for cultivating various crops. The objective of the paper is to elucidate the socio-ecological strategy of OTD of Jatigede who reside in Maleber Hamlet, Wado Village, Sumedang District, in managing drawdown area. The method used in this study was a qualitative method with an ethnoagroecological approach. The results of the study showed that in an effort to adapt the OTD to a new environment, they have managed the drawdown area of Jatigede lake for cultivating various crops. Generally OTD have successfully managed the drawdown area by cultivating various crops. However, they have still difficulty maintained sustainable cultivating in the drawdown area due to climate changes and drought.

A. INTRODUCTION

Dam project construction in various regions in Indonesia and globally in the world can have various impacts, both positive and negative impacts on the environment (Cooke et al. 2016; Opori et al. 2016; Kura et al. 2017; Amankona 2021; Padhlulloh et al. 2021). Some positive impacts, for example, for irrigation purposes, controlling floods or droughts, generating hydroelectric power, developing freshwater fisheries, and developing tourism (Nurhayati et al. 2020). While various negative impacts from the construction of the Dam project, including causing changes in various landscapes; extinction of local flora and fauna, loss of various ecosystem services, loss of people's homes and agricultural lands, loss of food sources and people's income, and psychological disturbances of project-affected residents (Purnama 2015; Cooke et al. 2016; Wijayanto et al. 2017; Fadli et al. 2019; Sunardi et al. 2019; Padhlulloh et al. 2021; Sayektiningsih and Hayati 2021).

Among the various dam construction projects in West Java, one of them is the Jatigede Dam, Sumedang. The plan for the realization of the development project began in 1982/1983. Furthermore, the construction of the Jatigede Dam was carried out in 2006 (Purnama 2015). In 2015, the Jatigede Dam began to be inundated. Consequently, at least 6,856 heads of families living in 17 villages from 4 sub-districts in Sumedang District had to move to other areas. This is because their villages were partially or completely inundated (Tantowi 2021).

Residents whose residential areas were affected, both partially inundated and flooded, received reimbursement from the Jatigede Dam project. They move to areas around or other areas away from Jatigede Dam. Residents of Wado Village, for example, a village located around the Jatigede Dam inundation, has become one of the places where residents have moved from other areas that were inundated by the Jatigede Dam.

With the Jatigede dam with an inundation area of around 3,953 Ha, the people living around the dam, both residents

who are affected people (OTD) and non-OTD, must adapt culturally to the new environment, in the form of a lake ecosystem. Cultural adaptation is a cultural process that occurs in order to maintain a balance between the population and local natural resources in their environment (Iskandar 2017). Human interaction and ecosystem in agriculture may be studied in ethnoagroecology (Iskandar 2018; Iskandar and Iskandar 2023). So, with the formation of Lake Jatigede, residents around Lake Jatigede have adapted to their local environment, the lake ecosystem (Wijayanto et al, 2017; Nurhayati et al. 2020).

The objective of the paper is to elucidate the socio-ecological strategy for cultivating drawdown area by OTD of Jatigede in Maleber Hamlet, Wado Village, Sumedang.

B. METHOD

This study used a qualitative method, with an ethnoagroecological approach to understand how farmers interact with their environment or their ecosystem in managing farming systems (Iskandar and Iskandar 2023). Data collection techniques were carried out using field observations, semi-structured interviews or deep interviews with competent informants, and collecting secondary data.

Field observations were carried out to obtain information on environmental conditions at the study site, such as the environmental conditions of drawdown area, and observations of various resident activities in managing drawdown area, including preparing land, planting, caring for plants, and harvesting and utilizing the plant production. Semi-structured interviews or deep interviews were conducted with competent informants. The informants in this study were village head (*Kades*), village head (*Kadus*), heads of Waluh Jaya Farmers' Group, male and female drawdown farmers, and village middlemen. While collecting secondary data by collecting data, such as village statistical data and regional statistical data, reports relating to Jatigede.

Crosschecking, summarizing, synthesizing, and making narratives with descriptive analysis (Iskandar 2018) undertook data analysis. Cross-checking was done by cross-checking the data obtained from observations, information from various informants, as well as statistical data and reports. Next, summarizing and synthesizing were carried out, as well as made narrative with descriptive analysis.

C. RESULTS AND DISCUSSION

In 2015 the Jatigede reservoir, Sumedang, West Java began to flood with water. As a result, a total of 5,686 households in 17 villages in 4 sub-districts were affected by the Jatigede inundation. Moreover, because the water volume of Jatigede Lake has regularly changed during dry and wet season, the drawdown (*lahan surutan*) of lake bank of Jatigede can form. The drawdown can be cultivated by the affected people (OTD) of Jatigede,

including in Maleber community who reside in Maleber Hamlet, Wado Village, Sumedang District (Figure 1).



Figure 1. Distribution of the drawdown areas around the Jatigede embankment dam: (1) Bukit Pasir, (2) Maleber, (3) Buah Ngariung, (4) Sukamenak, (5) Cisirat.

Formally, the drawdown areas of the Jatigede Dam project area are belonged to the government. This is because the settlement and agricultural land of OTD have been compensated by the project. Even though the drawdown formally belongs to the Jatigede project, it is allowed to be cultivated by the local residents of the OTD and non-OTD, as long as this farming practice does not interfere with the quality of the lake. As a result, the drawdown areas are annually cultivated by local residents, both OTD and non-OTD in many hamlets of Wado Village, including Maleber Hamlet.

1. Drawdown farming management *Community meeting*

The drawdown area in Maleber Village has annually been cultivated by farmers. Some stages of cultivating the drawdown area, including hamlet community meeting, land clearing, selection of crop species and planting of plant species, crop maintenance, and crop harvesting and utilization.

Traditionally each year before the drawdown land is cultivated by the OTD and non-OTD farmers, the local community Maleber Hamlet undertakes meeting. This meeting is attended by a Wado village staff, in the Maleber hamlet head (*punduh*), and the "Waluh Jaya" farmer group of Maleber Hamlet. At the meeting it was discussed and agreed on the distribution of land tenure of the drawdown area for each farmer. After the joint decision was made, it was commonly followed by each farmer making boundary markers for the plots of the drawdown that would be cultivated by each farmer. Based on field study in 2019, approximately 5,50 *bata* (8,00 Ha) were cultivated by sixteen OTD and non-OTD of Waluh Jaya farmer Group member (Table 1).

Table 1. List of farmer, status, and size of cultivated drawdown area in Maleber

| Individual household | Household's status | Size of cultivated land (ha) |
|----------------------|--------------------|------------------------------|
| A | OTD | 0.11 |
| B | OTD and Non-OTD | 0.14 |
| C | OTD | 0.28 |
| D | OTD | 0.28 |
| E | Non-OTD | 0.57 |
| F | OTD | 0.28 |
| G | OTD | 0.14 |
| H | Non-OTD | 0.42 |
| I | OTD | 1.00 |
| J | OTD | 0.71 |
| K | OTD | 0.14 |
| L | Non OTD | 2.00 |
| M | OTD | 0.29 |
| N | Non OTD | 0.71 |
| O | OTD | 0.28 |
| P | OTD | 0.85 |
| TOTAL | | 8.00 |

Note: OTD = Orang Terkena Dampak (affected people), Non-OTD = non-OTD.

As can be seen from the Table 1 that the average cultivated area of each family varies from 0.11 to 2.00 Ha/family/year. It is usually determined by the availability of labor and the cost of cultivating the land, as well as agreement on the results of the previous community meeting.

The community meeting before cultivating drawdown, is an important factor, it can build social capital, such as mutual trust, mutual cooperation, and eliminating conflicts between farmers managing receding land. In other words, that trust and the quality of relations, common interests and cooperation, can support OTD and Non-OTD farmers in their success in managing drawdown (cf. Rivera et al. 2019).

Land clearing

Cultivating activities in the drawdown area of Maleber began with cutting *cucuk* (*Mimosa pigra* L). The *cucuk* plant grow when the lake water recedes (*surut*) in the dry season and a drawdown forms. The tools used for land clearing include big knife, hoe and glove to protect hands from the thorns of the *cucuk*. Some farmers employ laborers for land clearing depending on the size of the cultivated land and availability of labor in the household.

Some crops to be planted in the drawdown are mainly consider that can be harvested less than 90 days. This is because if the farmer cultivate species of crop that can be harvested more than 90 days, there is a possibility that the land will dry out because there is no longer enough water or a tidal lake will occur due to beginning rain season. As a result, the crops may be failed to be harvested.

Based on our research in 2019, the farmers cultivated the drawdown in Maleber Hamlet commonly twice planting seasonal crops, before the rainy season arrived and the reservoir was flooded again. However, for the second time cultivating, due to the dry land conditions, the cultivator had to spend more capital to rent a water pumping machine to provide water for crops.

Planting activities include planting seeds on drawdown starting with cutting and clearing the shoots and making canning. Then, the drawdown land began to be planted with various plant seeds. For example hybrid corn (*jagung hibrida*) seeds (*Zea mays* L). The farmers obtained hybrid corn seeds from government assistance given to the Galuh Jaya farmer group. In general, farmers of drawdown only need to incur costs in the form of mutual cooperation funds for transportation costs for the collection of hybrid corn seeds. The distribution of hybrid corn seeds to farmers is adjusted to the area of each farmer's land. For example, with a drawdown land area of about 100 *bata* (0.14 ha), 5 kg of hybrid corn seed can be obtained. Meanwhile, for lowdown cultivators who grow other crop species, seed are commonly obtained by themselves.

According to informants, the dominant crops planted by farmers were hybrid corn. This is because the hybrid corn plant seeds are provided by the government. As a result, the capital for cultivating land is not too much, and the corn yields can be easily sold to Agro breeding cattle business as main buyer of corn production. Some farmers cultivated the land not only *jagung hibrida*, but also other crops. For example, Abah Olong, he cultivated *jagung hibrida* (*Zea mays* L), and also cultivated *pare* (*Oryza sativa* L), and *kangkung* (*Ipomoea aquatica*) in July, and were harvested in August-September.

Maintenance of crops

Caring for crops in the drawdown includes fertilizing, weeding weeds, controlling pests and providing water. Fertilization is done by applying inorganic or organic fertilizers, such as livestock manure. Weeding of weeds on drawdown land aims to prevent crops from disturbing the terrestrial weeds. Weeding the grass usually uses a small hoe (*kored*). Various weeds besides acting as nuisance crops, also provide benefit. Particularly for farmers who have livestock, such as sheep, various weeds are also commonly used as a source of fodder for livestock. For example, according to an informant, he has 15 individuals sheep. Each day he usually collecting weeds about 2 sack of fodder grasses which are collected from the drawdown area.

Some grasses and other plants are commonly found in the drawdown which are usually used as feed for sheep, including *eurih* (*Imperata cylindrica* (L) Beauv), *jukut kawat* (*Cynodon dactylon* (L) Pers), *jukut lameta* (*Leersia hexandra* Sw), *jukut odot* (*Pennisetum purpureum* cv Mott), *jukut mute* (*Cyperus rotundus* L), *jukut riut* (*Mimosa pudica* L), *jukut gewor*, *lempuyang*, *kangkung darat* (*Ipomoea aquatica* Forsk), *daun jagung* (*Zea mays* L), *daun singkong* (*Manihot esculenta* Crantz), *daun hui boled* (*Ipomoea batatas* L), and *daun pisang* (*Musa x paradisiaca* L).

Some pests, including caterpillars are also found in crops which usually damage the leaves of corn plants. Some efforts, including the caterpillar are manually taken. Moreover, the collected caters are killed or given to domestic chickens.

Among some crop maintenance activities on cultivating the drawdown, the most severe is the providing of water for crops. This is because if crops are not provided water, the crops will not grow well and even die. For spinach crop (*bayam*), for example, need to be given water every day on a regular basis. Water is taken from lakes or rivers

using buckets and dippers. Similarly, cucumber/*mentimun* and rice/*padi* must be provided water every day. Meanwhile, hybrid corn/*jagung hibrida* are given water regularly 1-2 times a week.

Based on the experience of farmers, they harvest crops have not always succeeded, but sometime the crops have failed to be harvested. For example, the rice crop were cultivated on the drawdown by Pak Anam, rice was planted in July, but the yields were failed to harvest. This is because the lacked water for rice crop due to the rapidly drying conditions of the drawdown land. However, other informants, such as Abah Oling and Mang Ujang, they also cultivate rice. They succeeded harvest rice. This is because they cultivated rice on drawdown in the valley location of the much waters of the Cimanuk River, forming a small lake (*siitu*). As a result, in July after planting, the condition of the land in the *situ* area was still wet and the rice plants did not lack water, and in the end, the rice could be successfully harvested.

Based on the experience of the successful practice of farmers in managing drawdown area as described early, it can be seen that cultivating in drawdown is a very complex matter in the form of reciprocal relations between social systems, such as population, local knowledge of the population, farming costs, and others. with ecosystems, including soil, water, crops, pests, and others (Amankona 2021; Iskandar and Iskandar 2023). Therefore, in the development of drawdown agriculture is not usually seen only in the production aspect, but also must be considered holistically, such as productivity, stability, equity and sustainability (Iskandar and Iskandar 2023).

Harvest and utilization of the results

The cropping pattern on drawdown is strongly influenced by rainfall conditions and lake tidal events. Therefore, drawdown farmers in Maleber Hamlet, Wado Village, generally plant various species of crops in July, and harvest in September (Table 2). Considering that July coincides with the dry season, the Jatigede lake water is down or ebb, and drawdown areas are formed, so at that time it is suitable for the drawdown planting period. However, the harvest time of various crops must be carefully considered. This is because in September the rainy season usually begins, and water of Jatigede dam will rise. Therefore, if farmers fail to determine the right time of planting period and harvest period, it can cause crop failure. In addition, the farmers have not experience for cultivating in the drawdown. This is because the farmers do not have local knowledge (LK) or Traditional Ecological Knowledge (TEK) in managing drawdown land. They actually had rich various TEK in managing rice fields or gardens, since before existing the Jatigede dam, they have usually cultivated rice at sawah and cultivated non-rice crops in gardens. In contrast to Western scientific knowledge, TEK is usually obtained from the inheritance of lecturers orally using the mother tongue, as well as the results of continuous interaction between farmers and their local environment (Iskandar 2018). However, with farmers doing trial and error in cultivating crops the drawdown area. Today, in general they have adapted to various changes in local environmental conditions, such as seasonal tides changes of the Jatigede lake, and in general farmers are successful in cultivating the drawdown area. They manage

drawdown land based on TEK and embedded with local traditions.

Utilization of the crops production on the drawdown is usually intended for subsistence economics for consumption within the family, and some surpluses are usually sold for the commercial economy to the middleman. In general, the production of the crops, including rice/*padi*, sweet corn/*jagung manis*, *bayam*, and *kangkung* to be utilized for the subsistence economy, to meet the needs of the household. Meanwhile, the production of hybrid corn/*jagung hibrida* which is usually in the form of fresh corn kernels and dried corn seeds is usually sold to middlemen of Agro breeding cattle business (Table 2).

Tabel 2. Crops, land-size, harvest season, production, and utilization (example only)

| Farmer | Crops | Size (ha) | Harvest season | Yield (ton) | Utilization |
|--------|----------|-----------|----------------|-------------|--------------|
| C | Maize | 0.28 | Jul-Sept | 4.5 | Sold, Fodder |
| P | Maize | 0.35 | Jul-Sept | 5.0 | Sold, Fodder |
| | Maize | 0.28 | Jul-Sept | 1.5 | Consumption |
| | Rice | 0.14 | Jul-Sept | 0.8 | Consumption |
| | Amaranth | 0.07 | Jul-Aug | - | Consumption |
| I | Maize | 0.70 | Jul-Aug | 11.0 | Sold, Fodder |
| | Rice | 0.14 | Jul-Sept | 0.8 | Consumption |
| | Kangkong | 0.02 | Jul-Sept | - | Consumption |
| | Amaranth | 0.02 | Jul-Aug | - | Consumption |
| | Cucumber | 0.08 | Aug-Sept | 0.7 | Sold |
| N | Maize | 0.28 | Jul-Sept | 4.0 | Sold, fodder |
| | Rice | 0.42 | Jul-Aug | - | - |

The Agro business is a cattle breeding business located in Mekarasih, Malangbong Subdistrit, Garut District, West Java. The yields of hybrid corn were purchased in the form of whole corn plants (stems, leaves, cobs) at a price of IDR 550/kilogram in 2019.

Some crop production harvest from the drawdown area can be seen in Table 3. Based on Table 3 it can be seen that corn production is mainly traded at middlemen outside the village, especially the dealer from Agro which is located in Mekarasih, Garut. Therefore, the hybrid corn farming system, apart from being influenced by internal factors, such as water availability, soil type and fertility, the corn farming system is also influenced by fluctuations in selling prices at the corn in the market, as well as farming input prices, such as seeds and fertilizers. On the basis of monoculture farming, such as hybrid corn, it tends to apply the High-External Inputs Agriculture (HIA) system which has a high risk of climate change, and fluctuations in the price of input-output farming and is less pro-environment, than implementing a farming system. sweet corn and polyculture with other crops, such as bayam, mentimun, kangkung etc., with the Low-External Inputs and Sustainable Agriculture (LEISA) system which is pro-environmental and has a low risk of environmental changes and fluctuations in input-output prices for farming (Wikarta 2020; Iskandar and Iskandar 2023).

2. Obstacles in sustainability

Based on the status of land tenure, according to Western theory, Hardin's theory, for example, that land is owned by the open public, usually everyone who controls these natural resources is selfish, only concerned with himself and can cause conflict, and can cause environmental damage that must be borne by everyone or the tragedy of the commons (Hardin, 1968). However, in the case of land tenure of the drawdown area in Maleber Hamlet did not occur tragedy of the commons as was the case put forward by Hardin. Even the drawdown area can be utilized by the Maleber community for common interests, cultivated as annual farming land, so that the drawdown natural resources become a benefit of the common instead of the tragedy of the common. This is because the management of drawdown applied design principles, including the resource has clearly defined, the use and provision of the resource is adapted to local conditions, and conflicts and issues are resolved through low-cost and accessible conflict resolution mechanisms (Sestakova and Plichtova 2019).

In addition, the common pool resource, such as land sinks may have inadvertently contributed to the unfulfilled expectations of commons projects from local communities (Saunders, 2014). In the case of drawdown in Maleber Hamlet, for example, the flooded land that was previously open, but through community meetings, open land can be divided into plots with clear boundaries which are controlled and managed by each resident. Thus, the natural resources of the land can be used by local farmers by providing various benefits for farmers.

Furthermore, conflicts over drawdown land management by the community in Maleber Hamlet can be avoided because of social capital, namely trust, norms, network, and civic engagement in the drowned cultivating farming community in Maleber Hamlet (Parlinah et al. 2018; Rivera et al. 2019). For example, with the formation of the Waluh Jaya farmer group, social capital can be built, such as trust, norms, and networks among farmers in managing decline.

According to informants, however, the main obstacle in managing drawdown land is still the risk associated with water conditions. Initially, many farmers who managed drawdown experienced farming failures. This is partly because the drawdown farmers do not understand the dynamics of the water rice and water drop of the Jatigede reservoir water. This is because the farmers do not have Traditional Ecological Knowledge (TEK) about farming in the drawdown. They mainly actually have TEK regarding the management of the sawah paddy fields and cultivating the upland gardens. The management of paddy fields or gardens is mainly influenced by rainfall conditions and seasonal changes. In general, rural farmers in West Java, including in Jatigede, Sumedang, prepare land for rice fields and gardens during the dry season, then plant at the start of the rainy season, and harvest various crops before the dry season (Iskandar and Iskandar 2023). In general, West Java have two main seasons, namely the dry season (*usum halodo*) and the

rainy season (*usum hujan*). Based on normal conditions, especially in the past, the rainy season is usually November-April due to the influence of the southwest winds. While the dry season is in May-October influenced by southeast winds. However, currently climate anomalies often occur, so the dry season and rainy season are increasingly difficult to predict. Consequently, crop failure often occurs, especially in wet rice cultivation (*tani sawah*).

Nowadays, the uncertain influence of climate change makes it more difficult for Jatigede drawdown farmers. This is because drowning farmers must be able to accurately predict the rice and drop of Jatigede lake water which is affected by rainfall in the rainy season and dry season. So, failure to determine the right time for high tide and low tide for Lake Jatigede water can cause crop failure. For example, the result of late harvesting of plant crops can cause crop failure because the species of crops before they are harvested are already inundated by lake tides. On the other hand, if there is a long drought and drought, many crops are damaged or die from lack of water, resulting in crop failure. What farmers can do to provide water to drought-stricken crops is by pumping water from the lake. However, buying pumps requires high costs, so only rich farmers can afford to buy water pump. In addition, to use the water pump also costs money to buy fuel oil. Consequently, many farmers who do not have water pump, are usually to provide water for crops by simply hauling water from lakes or ground wells using buckets and dippers.

Today, globally, the impact of climate change is being felt by the community, especially rural communities in various developing countries, whose main source of livelihood is farming. Therefore, multi-disciplinary and transdisciplinary studies are urgently needed to understand the very complex interrelationships between social systems and ecosystems to address climate change risks to rural communities, such as rural farmers (Habibur-Rahman et al, 2022).

D. CONCLUSIONS

Based on the results of this study, it can be concluded that due to the construction of the Jatigede Dam, 6,856 heads of families had to move because their villages were partially or completely inundated. The OTD in a new place must adapt to the new environment. One of the adaptation efforts for OTD is by utilizing drawdown areas to plant various crops, including hybrid corn. At first, many OTD farmers failed to harvest crops in the drawdown area. The reason is, they don't have TEK about management of drawdown area. However, with the process of cultural adaptation, they have got various information about their local environment, especially the tidal season of Lake Jatigede. Therefore, the new TEK and their old TEK combined applied to manage the drawdown area.

Although they are quite successful in managing drawdown areas for farming activities. However, due to climate anomalies, such as long drought in dry season, the OTD in managing farming in the drawdown area often

encounter water shortages. As a result, they have got difficulty in maintaining sustainable agricultural farming systems in the drawdown area.

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REFERENCES

- Amankona D (2021). Socio-ecological Impact and Adaptation Arising From Chinese-led Infrastructure Developments in Africa: A Case Study of the Bui Hydropower Dam in Ghana. Ph.D. thesis of Faculty of Arts and Social Sciences The Open University. DOI: <https://doi.org/10.21954/ou.ro.00014798>.
- Cooke FM, Nordensvard J, Saat GB, Urban F, Sicilio G (2016). The Limits of Social Protection. The Case of Hydropower Dams and Indigenous People's Land. *Asia & Politic Studies* 4 (3): 437-450. DOI: 10.1002/app5.187
- Fadli R, Noor TI, Isyanto AY (2019). Dampak Sosial Ekonomi Pembangunan Waduk Jatigede Terhadap Masyarakat Tani di Kabupaten Sumedang. *Jurnal Ilmiah Mahasiswa Agroinfo Galuh* 6 (3): 552-563.
- Habib-ur-Rahman M, Ahmad A, Raza A, Hasnain MU, Alharby HF, Alzahrani YM, Bamagoos AA, Hakeem KR, Ahmad S, Nasim W, Ali S, Mansour F, Sabagh AE (2018). Impact of Climate Change on Agricultural Production; Issues, Challenges, and Opportunities in Asia. *Front. Plant Sci.* 13:925548. DOI: 10.3389/fpls.2022.925548.
- Hardin G (1968). The Tragedy of the Commons. *Science* 62: 1243-1248.
- Iskandar J (2017). Ekologi Manusia dan Pembangunan Berkelanjutan. Edisi Revisi, Program Studi Magister Ilmu Lingkungan, Unpad.
- Iskandar J (2018). *Etnobiologi, Etnoekologi, dan Pembangunan Berkelanjutan*. Yogyakarta: Plantaxia.
- Iskandar J dan Iskandar BS. "Pendahuluan". On Johan Iskandar and Budiawati S. Iskandar (eds) (2023). *Etnoagroekologi Petani Tatar Sunda Pasca Revolusi Hijau di Desa Karangwangi Cianjur Selatan Jawa Barat Untuk Mendukung Pembangunan Berkelanjutan*. Yogyakarta: Lily Publisher, p. 1-20.
- Kura Y, Joffre O, Lapplante B, Sengvilaykham B (2017). Coping With Resettlement: A Livelihood Adaptation Analysis in Mekhong River Basin. *Land Use Policy* 60 (2017) 139-149. DOI: <https://doi.org/10.1016/j.landusepol.2016.10.017>.
- Nopianti R, Melinda T, Harahap J (2018). Strategi Adaptasi Masyarakat Terdampak Pembangunan Jatigede di Dusun Cipondoh Desa Pawenang Kecamatan Jatinunggal Kabupaten Sumedang. *Patanjala* 10 (1): 17-34.
- Nurhayati A, Herawati T, Lili W, Yustiati A, Nurruwati I (2020). Kajian Nilai Sosial Ekonomi dan Lingkungan Sumberdaya Perikanan Tangkap di Waduk Jatigede Kabupaten Sumedang Provinsi Jawa Barat. *Jurnal Penyuluhan* 16 (1): 122-133. DOI: <https://doi.org/10.25015/16202025262>.
- Ofori BD, Lawson ET, Ayifor JS, Kanlisi R (2016). Sustainable Livelihood Adaptation in Dam-Affected Volta Delta, Ghana: Lessons of NGO Support. *Journal of Sustainable Development* 9 (3): 248-260. DOI: 10.5539/jsd.v9n3p248.
- Padhlulloh L, Parikesit, Hadi Firman (2021). Land Suitability Evaluation of New Settlement for Citizen Affected by Construction of Cisokan Reservoir in West Bandung. *E3S Web of Conferences* 249, 03014 (2021). DOI: 10.1051/e3sconf/202124903014.
- Parlinah N, Nugroho B, Saleh MB, Hendrayanto (2018). Possibility of Harnessing Social Capital to Support the Development of Payment for Environmental Services in Small-Scale Forests: A Case of Jatigede Catchment Area. *Jurnal Manajemen Hutan Tropika* 24 (2): 70-80. DOI: 10.7226/jtfm.24.2.70.
- Purnama Y (2015). Dampak Pembangunan Waduk Jatigede Terhadap Kehidupan Sosial Budaya Masyarakatnya. *Patanjala* 7 (1): 131-146.
- Rivera M, Knickel K, Diaz-Puente J, Afonso A (2019). The Role Social Capital in Agricultural and Rural Development : Lesson Learnt From Case Studies in Seven Countries. *Sociologia Ruralis* 59 (1):66-91. DOI: 10.1111/soru.12218.
- Sundaers FP (2014). The Promkise of Common Pool Resource Theory and the Reality of Common Projects. *International Journal of the Commons* 8 (2): 636-656.
- Sayektiningsih T and Hayati N (2021). Potential Impact of Dam Construction on Environment, Society and Economy Based on Community Perceptions. *IOP Conf. Series: Earth and Environmental Science* 874 (2021) 012013. Doi: 10.1088/1755-1315/874/1/012013.
- Sestakova A and Plichtova J (2019). Contemporary Commons: Sharing and Managing Common-Pool Resources in the 21st Century. *Human Affairs* 29: 74-86. DOI: 10.1515/humaff-2019-0007.
- Sunradi, Ariyani M, Febriani R, Maharani GS, Yee Fu RH, Fujikura R (2019). Rebuilding Livelihood of Rural and Peri-Urban Resettlers in Post-Involuntary Displacement of Saguling Dam Construction. *Journal of Asian Development* (5) 1: 12-30. DOI: 10.5296/jad.v5i1.14421.
- Suwartapradja OS. (2021). Climate Change and Plant Time (Studies in Rice Cultivation Strategy Peasant, Case Study: Leuwihideung Village Darmaraja Sub-District, Sumedang. *Ecodevelopment Journal* 4 (1): 19-23. DOI: 10.24198/ecodev.v4i1.39129.