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Farmers Perspective to the Biofuel Project: A Case Study of Jatropha Project in Gunungkidul, Yogyakarta - Indonesia

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Abstract

This article tries to describe the transformation that takes place when the knowledge among farmers encounters new knowledge, in this case about biofuel. This exploration is expected to provide an understanding why jatropha in Gunungkidul is currently not developing but also not entirely abandoned either. In other words, the condition is in hibernate. Explanation of the phenomenon of jatropha development among farmers in Gunungkidul is elaborated from a cognitive and symbolic perspective, in its relation to the signification processes that farmers experience through the jatropha development programme. Crop not only consists of a material dimension but also a symbolic dimension. Through transformation process, culture infuses value that constructs social meaning to the community that depends on time, space, and place. In Gunungkidul case, the farmer's decision to planting jatropha was intertwined with social interaction and cognitive aspect. The result of this research showing that the failure of jatropha development project in Gunungkidul because the signification process that occurs since ideas and knowledge about biofuel production firstly introduced do not met with farmer's agriculture system knowledge. Data for this paper were collected in fieldwork among farmers in Gunungkidul. Qualitative data about daily life were collected intensively at Tepus district. Start from one village, data collection process was extended to other villages and districts that relevant to the research.

Keywords: Biofuel, Farmer, Gunungkidul, Jatropha, Social Transformation.

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1. Introduction

Jatropha (*Jatropha curcas* Linn.) is believed to have been brought by Portuguese sailors from Central America and Mexico via Cape Verde, which then spread to Africa and Asia and eventually grew in tropical and sub-tropical regions. Its potential as biofuel source material has been long known. In the Second World War, jatropha was used as

a substitute for diesel fuel in Madagascar, Benin, and Cape Verde [1]. In Indonesia, the mention of the plant in its Indonesian name, *jarak*, often creates a misunderstanding as there are two types of trees known as *jarak*. One is castor, known in Indonesian as *jarak kepyar* (riniscus communis) or *kaliki*. The second type is *jarak pagar*, or jatropha (*Jatropha curcas* Linn.), which in some areas is also known as *jarak gundul* or *jarak cina*.

The jatropha plant is a wooden shrub standing at around 5 m with an average life up to 50 yr. The leaves turn yellow and fall during the dry season. During the rainy season, the leaves (re)grow along with flowers and fruits. In accordance with the name, "*jarak pagar*" (*pagar* means fence), this plant is widely found fencing farms or gardens to block crop-damaging animals from entering. In Indonesia, especially in Java, this plant is also used as an antiseptic, wound treatment, and mouthwash for bleeding gums. Its seeds can also be used as a potent laxative.

In the 2000s, jatropha became one of the popular cultivated crops in Asia—such as Indonesia, Philippines, India, and Myanmar—as well as in Africa—such as Mozambique, Kenya, Tanzania, and Ethiopia. These plants began to be planted on a massive scale as the seeds were promoted as a source of biofuel. In Indonesia, there was a lot of hype surrounding jatropha since they were not just a source of biofuels, but a panacea to resolve the classic problems of third world countries, namely energy crisis, poverty, and unemployment [2]. The claim that it is suitable to be developed in low-fertility-rate soil and not a food crop that it will not threaten food security are the reasons why the development of jatropha became a strategy for poverty reduction.

Initially, farmers in Gunungkidul knew jatropha as a living fence without any economic advantage. Jatropha was originally a wild plant that can be found on rocky cliffs. After extensive publications promoting jatropha as an alternative fuel source, it was transformed into a new value as an economic crop. However, once cultivated, the resulting seeds did not sell well, changing its value once again. Currently, in Gunungkidul, jatrophas are not utilized by farmers and are left to grow untreated, but farmers have stated that if there are a demand and interest in buying jatropha seed, they can still provide the supply. Farmers are willing to plant and cultivate jatropha again, indicating that the previous excitement in jatropha development discourse has not been entirely lost or forgotten.

This article tries to describe the transformation that takes place when the knowledge among farmers encounters new knowledge, in this case about biofuel. This exploration is expected to provide an understanding why jatropha in Gunungkidul is currently not developing but also not entirely abandoned either. In other words, the condition is in hibernate. Explanation of the phenomenon of jatropha development among farmers

in Gunungkidul is elaborated from a cognitive and symbolic perspective, in its relation to the interpretation processes that farmers experience through the jatropha development programme.

The symbolic form of the development of Jatropha appeared in the transformation of the material existence of jatropha trees, which was then turned into non-material discourses and gained different meanings. At any given time, anything can be interpreted economically, but under a different set of conditions e.g. time and place, its interpretation changes again. An object, in this case, a jatropha plant, is not only given meanings in relation to transactional exchanges, but also in the form of its "social life", intertwined with social relations, meanings, and values that differ through time, place, and society [3–5]. Jatropha, as well as other types of plants and goods, is a material substance, but through culture, has been symbolically interpreted to relate to other things. Culture has played an important role in this process of re-interpretation, being one form of control mechanism in regulating behavior [6].

This article is the result of ethnographic research done in the villages of Sumberwungu and Purwodadi in the Tepus District. Data were collected through interviews and observations of farmers' daily activities, to determine the extent of involvement and social interaction that occurred when projects were underway, as well as to see the state of social relations and cognitive systems in practice.

2. The Jatropha in Discourse

Studies on jatropha development in social sciences indicate intertwining social, economic, and political issues within the social relations between farmers and the parties concerned with the development of biofuels [2, 7, 8]. However, existing studies see the development of biofuels as a one-directional introduction process of biofuel sources to farmers. External parties (companies, NGOs, and governments) are seen as actors who introduce the ideas and their understanding of biofuel to farmers, from which these farmers accept and follow what is desired by outsiders. Ecological, socioeconomic, political and economic perspectives, as well as policies, become the prevalent viewpoints in understanding various problems that arise [9–11]. Thus, results of these studies tend to dwell on the successes, failures, positive and negative effects, as well as social changes that have occurred as results of various biofuel development programs [2, 8, 12–14]. Farmers as active agents involved in the process barely appear in these studies. Actually communication between farmer and agents whose promoted jatropha is dialectical forms, whereby processes of production and reproduction of

meanings by both parties interact with each other. Yet, farmers' involvement in the development of jatropha cannot be expected to automatically follow the impetus of an introducing party; there are other aspects that also guide the behavior and decisions of farmers. Their knowledge of farming systems (labor, season, soil, plants, pests), and other considerations such as security and guarantees of subsistence, are aspects of the process that determine their decision.

3. The Paradox of Jatropha

Jatropha is claimed to possess several positive properties, such as high seed productivity, little labor requirements, non-threatening competition towards food production, and disease resistance. Jatropha is also claimed to help overcome the problem of competition between the agricultural demand for food and biofuel production since unlike other sources of biofuel such as palm oil, corn, and sugarcane, it is not an edible plant. Since the land used for growing jatropha is less fertile, Jatropha also hardly interferes land for food crops. However, Jongschaap [15] showed a large gap between the claims and the facts about these plants. In some places like Mozambique, Jatropha has been rejected because it does not match the reality to the claims. The experience and practice of the development of jatropha showed negative issues of agronomic aspects, economic, social, and environmental [16].

However, the development of jatropha as a biofuel source has also experienced controversies. The euphoria of Jatropha development occurring in various parts of the world sparked immense criticism, because of the negative impact felt by communities [2, 8, 13, 17, 18]. Involvement of companies in the development of biofuels is also a new frontier for agribusinesses in search of profits hiding behind alternative energy policies, which have been dominated by discussions on food production [14, 19].

The arguments and debates on biofuel development generally gravitate towards the negative ecological and social impact of the large scale of biofuel production, competition between "food vs fuel" concern about the impact on food security and population growth [15]. Biodiesel production can threaten the availability of food leading to a rise in food prices due to the use of food as a source of biofuel [20]. Although jatropha is not included in the category of food sources, if planted in large scale could lead to competition over land use. The claim that jatropha does not compete with food production availability because it can be grown on barren land with low fertility rates is still disputable. Land categorization of what is suitable and not suitable for Jatropha is not clear because of differing interpretations of its criteria. Unused land is

land not used for agricultural production. However, determining land categories can be viewed through various perspectives, such as agro-ecological, economic, or social [2]. Generally, land used for growing jatropha is economically assessed, that is, land not tilled for farming or cultivation is considered unproductive.

4. Jatropha Development in Gunungkidul

There are two kinds of jatropha development models in Gunungkidul: monoculture and intercropping (*tumpangsari*). The monoculture model was performed by private companies in hiring or purchasing land for jatropha cultivation. Plantation management was done by paid workers from the company, with a daily or monthly payment system depending on individual job scopes. Government-supported jatropha projects also applied a similar monoculture model, particularly on state-owned land to create seedling plots. Communities implemented intercropping models—for example, planting jatropha along roadsides and as hedges for main crops, usually food crops, or planted in between teaks *(Tectona grandis),* and acacias *(Acacia* spec.*)*

Jatropha projects in Gunungkidul developed in a number of ways. The first were those managed by companies, with the second initiated by the government. Projects by companies were undertaken in cooperation with the government and farmers. These began with a proposal and a memorandum of understanding (MoU) between the district government and the company. In the MoU, the government played a role in supporting the cultivation process—for example, by offering opportunities for companies to develop a range of plants in particular areas, as well as introducing jatropha development programs to farmers. Government agencies also provided jatropha seed pressing machines and allocated a budget to carry out various forms of training and other supporting activities. The company then ran the project by organizing the initiation process at district and village levels. The company made various agreements with farmers, among them an agreement to sell the harvested seeds to a collector who had been appointed in each village. In 2008, the company promised that jatropha seeds would be purchased at a price of IDR 2 000/kg.

The interest in planting Jatropha among farmers of Sumberwungu began when companies began to disseminate information through the local village government. In initiating jatropha, companies delivered a letter to the village government, inviting one representative to be present during the project socialization meeting. Representatives were generally appointed by office staff who is responsible to people's welfare affair since jatropha projects aimed to improve the welfare of society.

The appointed village representative then became the coordinator in charge at the village level in disseminating information and organizing farmers in growing jatropha. Suwasino, who worked as office staff for the People's Welfare in Sumberwungu, recalled that when the jatropha project was in progress, he was instrumental in distributing seeds to farmers interested in planting jatropha. He was also appointed to collect harvested seeds and even appointed by the company as the village coordinator, later on, acted as the district-level coordinator. He took up these appointments even though he did not receive any salaries or wages from the company. He did not object because he thought at that time that it was a good initiative. Pursued collectively, he thought it would undoubtedly benefit the community.

Suwasino distributed jatropha seeds to about 250 farmers in 2009. People who owned land areas that had not been used to grow food or wood were approached to plant jatropha. An informal approach was utilized through face-to-face and communal meetings. During the interview, Suwasino stated that farmers should plant some jatropha on their land because it still sparsely populated so that they could sell them later with great result. Interested farmers would be given jatropha seeds suitable for the size of his/her land area. Suwasino then took notes of the size of the land registered by the farmers. In addition to the seeds, the company also provided young jatropha plants of about 30 cm, sown inside polybags.

Although many farmers signed up, the seeds ended up distributed only to certain people. Not all farmers grew these seeds since the size of arable land owned was limited, and the average area cultivated was only about 1 000 $m^2$to 1 500 m^2. Jatrophas were grown only as garden living fence, while hilly plantation areas were planted with acacia trees *(Acacia spec.),* teaks *(Tectona grandis),* falcatas *(Albizzia chinensis),* and mahoganies *(Swietenia macrophylla)*. Those who could plant jatrophas in large numbers were the village officials since they had access to more land than the general public. Village officials received *pelungguh,* arable land given as salary for his/her position as a village official. The expanse of land is used for growing food crops. Additionally, there were also some limestone hills with thin layers of soil which were unproductive for food crops. This was used for jatropha planting. Sometimes the seeds received by farmers were less than their demands and took a long time to be sent. Farmers used their own initiatives to find wild jatropha seeds and twigs from the forest to be planted on their own land.

Suwasino was among the few who were very excited in planting jatropha. His position as village official as well as coordinator encouraged him to plant as many jatrophas as possible to set an example in encouraging people to follow. At that time the

company had promised to buy the seeds at IDR 3 000/kg. This promise had attracted farmers to plant Jatropha, especially since jatropha did not need special treatment.

Although the jatropha plants began to bear fruits, results were disappointing. The trees grew well, but fruits were scarce, making it hard to harvest and sell them. Some farmers did pass over collected seeds to Suwasino, but due to their scant quantity, they were not worth the cost of retrieval and were not bought by the company either. Eventually, the farmers grew reluctant to care for jatropha and harvest the seeds. They directed their energy towards more urgent and rewarding work rather than harvesting jatropha seeds. Additionally, jatrophas need to be harvested at a time when agricultural labor intensity is high; simultaneously with the harvest period for corn. Farmers thus prioritized other duties rather than taking care of jatropha. Finally, Suwasino's activities as coordinator gradually declined and eventually stopped. The company no longer contacted or coordinated with him. There was no clear outcome.

In Purwodadi village, jatropha projects were carried out by the district government under the coordination of the Department of Forestry and Agriculture (Dishutbun). The project began with community outreach about the importance of planting jatropha in anticipation of future energy needs. Under the leadership of the village government, farmers were organized in groups, based on the location of the land to be planted with jatropha. There were 34 groups, each consisting of 30 to 40 people.

Before the seeds arrived, farmers were required to prepare planting holes according to the number of seeds proposed. Seedlings in polybags were then sent to locations of planting sites. The seedlings had grown to an average height of between 25 cm to 30 cm. Since the planting sites in the hills could be difficult to reach by vehicle, the seeds were unloaded in a pre-specified location, where farmers had to transport them to their own plots. Carrying these seeds uphill was not easy. The soils inside the polybags made the transportation heavy and arduous since they had to traverse hills and walkways. Surkawi recalled that some of them through the soil in polybags into the river or ravine to reduce the load. Some even discarded the seedlings. During the interview, Surkawi stated that the farmers should not send the jatrophas with the soil, which add more weight when carried. Even (when they are) plucked out from the soil, they will grow anyway. Sure enough, the jatrophas could still grow even when removed from the polybags. Farmers who threw away the seeds did not receive any sanctions since no monitoring was done by either the management group or village officials with regards to the quantity of seeds planted. In addition to seeds, farmers also earned incentives for making plantation holes, transporting, and planting. Additionally, farmers also received fertilizer for the initial fertilization process.

The farmers became increasingly confident that Jatropha seeds were promising good results since a seed processing unit was also built in the village. The building was set up with a processing machine. The group administrator also attended training sessions to process jatropha seeds into jatropha oil. Jatropha oil processing trials were conducted in cooperation between the government and one of the agribusiness research institutes of UPN Veteran Yogyakarta. Jatropha seeds used for testing were imported from other places since jatrophas in the village had not yet borne fruits.

In the process, the jatropha project also did not turn out as expected. Planted seedlings and seeds grew well initially, but bore few fruits. Towards the dry season, branches were trimmed, in the hopes that they would germinate and grow again in the rainy season. This method was based on their experience with wild jatrophas. However, after the rainy season, only twigs and leaves budded while flowers were scant. Some trees even dried up and died. Some people still continued to harvest and only managed to get 1 kg to 2 kg, thus seeing no point in passing the harvested seeds to village official collectors. According to the project scheme, harvested seeds needed to be passed to the village official collectors, who would then pay for them. Yet it turned out that the planted jatrophas barely bore fruits during the harvest period, even though the trees had grown well. They were perplexed to find that wild jatropha left untreated, could grow well and bear many fruits, yet when properly planted and maintained, bore little fruit. Those that bore some fruits were not handled properly—the fruits were left neglected to dry and fell off due to the lack of harvest labor.

5. Cognitive System and Social Relations of Farmers

Tepus Subdistrict is located within the southern zone of Gunung Kidul called Gunungsewu zone. The contours are hilly, dominated by karst layer with very thin and infertile layers of soil. Rivers and surface water are difficult to find except on the hills and hollows of the cave [21]. The soil is so porous and dry that farming is done on dry land without any irrigation system. These conditions compelled the land management to adapt to the patterns of rainfall. Land preparation for rice planting was conducted in September-October before the rainy season. It begins with the provision of manure/compost and the raking of soil layers. Roughly around the rainy season, rice seeds are sown, followed by corn and cassava. This cropping pattern is known as *tumpangsari* (intercropping), where various types of plants are planted in a certain pattern. The goal is to optimize land productivity to produce several types of plants in a single planting season. If the rainy season arrives according to the forecast, the

seeds will most likely grow. However, if it misses, they will dry out without growing. Other variables such as weeding grass, plant density setting, fertilization, and pest prevention should also be considered to fit growth and crop conditions.

Unpredictable rain forced farmers to be careful in preparing growing season. Before the arrival of the rainy season, they had to promptly prepare the land to prevent a bad harvest. During the land preparation stage before the rainy season, the farmers would have increased work intensity and labor requirements. Farmers prioritize their labor for this cultivation to any other activity.

The harvest season takes place in March. The first crop that can be harvested is rice, and then corn. If the rain continues to fall during the period, after the rice has been harvested, peanuts or soy are planted. Cassava is harvested in September, before the arrival of the next planting season.

Cassava is the most reliable agricultural product, although rice, corn, and beans are also grown. Rice harvest is usually saved as a food supply, while corn and beans are sold to satisfy the daily needs. Cassava, that is then peeled and dried into *gaplek*, which can be processed into *tiwul* as a food ingredient. Currently, most of the gaplek are sold to *gaplek* milling factory which then turns it into flour to be used as ingredients for various food products.

For farmers in Gunungkidul, not making dried cassava can feel "*ora umum*" (one who does things differently) and strange, particularly if others around are turning cassava into *gaplek*. This was what Kamjian had experienced. He was working on a 1 000 m^2 land leased by one of the village officials. During the research period, his harvest result was drastically reduced compared to the previous season. One reason was the lack of rainfall, retarding the growth of cassava—many of the cassava trees were infected; the leaves curled, the stem infested with fungus, with very few fruits. He only managed to harvest 3 ku of cassava, while previous harvest seasons would yield up to 1.3 t of cassava. With poor harvest conditions, Kamijan was feeling even more reluctant to process it into *gaplek*. He sold the cassava directly to a middleman with the price of IDR 1 000/kg, even though the price of *gaplek* could go up as high as IDR 1 900/kg, higher than the price from the previous year by IDR 200. For Kamijan, and farmers in general, successfully harvesting cassava in large quantities brought a certain satisfaction. Seeing the large pile of yams in their front yard, and then the busy activities of neighbors who dropped by to help peel the dried cassava brought its own satisfaction (and meaning) for farmers. Therefore, when the cassava harvest amounted to little, they felt *wegah nyawang* (reluctant to see it) because even the sight brought to shame.

Kamijan's experiences illustrate that farmers possess a certain cultural system that guides his/her social behavior. The satisfaction and happiness of a farmer are realized in following the process of plant growth from seeds to fully-grown plants. This can be seen from their daily activities. A day without a visit to the field would leave farmers unsettled. If the plants are not in good condition, then he/she would try to resolve the problem. If the plants are in a poor condition, others will see him/her as an incapable farmer. Growth is measured through the physical appearance of buds, stems, and leaves. Green leaves signify good growth. When harvest time arrives, good harvest boosts the spirit and satisfaction. Economic calculation of the crop, whether sold or not, is another thing. During the interview, Arjo stated that farmers do not create the price, but create produce. Farming is not aimed solely towards achieving results but is embedded within social values interwoven with social relations. The ability to do what other farmers are doing is a form of social tolerance that maintains social relationships. Otherwise, not doing so will earn an "*ora umum*" (not common) perception that disrupts the social relations among them.

Previously, farmers regarded jatropha as wild plants, not included within the category of crops cultivated for their yields like corn, cassava, or other crops. The physical characteristics of jatropha are different from the character of seasonal plants normally cultivated by farmers. Jatropha is a perennial plant. In the rainy season, the tree grows well, its green leaves will bud with flowers and fruits blooming. In contrast, during the dry season, the leaves fall, leaving just the base of the tree. When it was introduced as a crop, its characteristics were not in line with the existing cognitive system of the farmer who viewed good crops as those with green and lush leaves. Thus, farmers recognized jatropha as a wild plant field fence. Hence, the introduction of Jatropha encountered a gap in the cultural meaning system as being one of the types of agricultural crops.

6. Conclusions

Within the farmer's perspective, plants have certain categorizations determined by their interpretations towards the plants. These interpretations implicated their social behaviors in determining their perceptions and consequent action. When Jatrophas were planted on the slopes of barren mountains, farmers treated these plants based on their cultural experience with their spatial understanding of the area. All this time, the area on the hillside with layers of barren and calcareous soils had not been treated as an area for intensive cultivations but was used for growing timber that only required low labor intensity. Therefore, jatrophas were treated in the same way as other plants

that grew within the area, such as teak, acacia, and sengon, with results ready to be reaped later. The introduction process of jatropha as a biofuel source underwent a transformation of meaning in the cognitive system of farmers. The phenomenon failed to be understood as a way for welfare improvement through the development of a new commodity. Farmers had in fact interpreted it differently; not solely based on its economic value, environmental-friendliness, or potential as an energy resource, but transformation into something else. The farmers' interest in planting jatropha was no longer based on what was introduced by the company or the government but based on the formed constructions of their social relations, that is, who had done the introduction. Farmers wanted to plant jatropha because they were invited by one of the village officials. Generally, a village official commanded a certain amount of respect and what he/she says tends to be complied with. The relations between the village officials and residents generally formed the basis of patronage that politically places the village officials in a more dominant position. On the other hand, the development of jatropha also showed some aspects of collectivity in the community. If everyone but one farmer is planting jatropha, he/she would be considered "*ora umum*" (not common, strange) since that person becomes different. If you can do what others are doing, disregarding success, then you will be treated as part of a collective consciousness.

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