

A Model Strategy of Local Community-Based Environmental Management

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Abstract

Ecological changes in the slopes of Mount Kelud due to loss of crops and large trees can be dangerous to human life, such as landslides, floods, and higher temperatures in the residential village. Cold lava floods of 2008/2009, which occurred in the village of Besowo, carried large pieces of trees, damaging Damlak or water reservoirs located in the protected areas. Damlak damage caused decreased water quality due to exposure to landslides in the surrounding area. It awakens awareness the surrounding villagers to manage their environment. A qualitative research was done by collecting data from May to October 2013. "What is the local community-based environmental management to prevent and deal with disasters?" The study was conducted in the village of Besowo, a Kelud mountainside villages bordering forests and included within the Disaster Prone Areas. Strategy of community-based environmental management is done individually, jointly supported or not supported private and government institutions. Strategies to keep environmental management of Mount Kelud slope are a) by moving the farmers to plant woody plants in the area of people's coffee plantation supported the government through the plantation office, b) cooperation of in-forest community and *Perhutani* office c) empowering NGO Jangkar Kelud; d) holding a ritual to environmental sustainability; e) mutual aid and commissioning Jogotirto. The inhibiting factors are human bad behavior intentional and unintentional in treating the natural environment and diverse socio- economic conditions of rural communities.

Keywords: model, management, environment, local community, Mount Kelud slope

1. Introduction

Mount Kelud with a height of 1731 m (5679 feet) is located in the border of the districts Kediri, Blitar and Malang, about 27 km east of downtown Kediri. Kelud is a volcano of stratovolcan type with explosive characteristics, and last erupted in 1990. At that time it spewed 57.3 million cubic meters of volcanic material. In 2007, Kelud activity increased so that on November 3, 2007 at 16:00 lake water temperature exceeds 74 degrees Celsius and then formed a "lava dome". The lava dome clogged the eruptions of the magma ([http://id.wikipedia.org/wiki/Gunung Kelud](http://id.wikipedia.org/wiki/Gunung_Kelud)). Due to the Mount Kelud activity, in 2008/2009 there was a flood of cold lava that brings volcano materials, landslides and large pieces of wood that had implications for human life in the village, especially the villagers in Besowo, Sub district Kepung, Kediri.

Besowo village is one of the villages in Disaster Prone Areas (DPA) on the slopes of volcanoes because slopes environmental conditions needs to be maintained, such as production forest, protection forest, and areas plantations. It was to keep the forest to prevent more severe impact in the event of natural disasters, especially due to volcanic activity, such as volcanic eruptions, landslides, floods and so on.

Good and bad behavior of the surrounding villagers can affect the face of the slopes. During the Dutch area, in the mountain slopes at an altitude of approximately 600 meters above sea level was used as plantation area for perennial tree crops such as coffee. According to BBP Data of Sub district Kepung in 2011, the area of coffee plantations in the village Besowo was approximately 187.33 hectare. However, these conditions have changed, such as a change in the cropping pattern from woody plant plantations to seasonal horticultural crops in the area of people's coffee plantation. Today, less than 15% of the area is still planted with coffee plants and other crops. The remaining is in the form of seasonal horticultural crops, such as peppers, tomatoes and vegetables. Another problem according to the local residents is vast illegal logging occurring in 1999-2000. However, the conditions in the forest is recovering, sometimes small fires occur fueled by unintentional human behavior, for example during the dry season people usually throw the torch flame to dispel honey bees. This paper describes the "strategies of local community-based environmental management to confront and prevent the occurrence of natural disasters".

2. Method of Research

The study was conducted in the village of Besowo is one of the villages on the slopes of Disaster Prone Areas of Mount Kelud, Sub district Kepung, Kediri, East Java. The area is directly adjacent to forest areas and mountain slopes of Mount Kelud. Year 2008/2009 the area was hit by cold lava flood due to the eruption of

Mount Kelud. Cold lava flood carried pieces of tree particles from the forests. The environment that includes mountain slopes in the area is protected forest, production forest, coffee plantation, dry land as farming activities and settlements in village.

This study used a qualitative method based on the local community. Phase of data collection in the field was as follows: First, arranging the permit of study at the district, sub-district and village level requiring about one week. Second, field data were collected with interviews and observation. From May to October 2013 interviews was done to people's coffee plantation owners, village officials, officials who served in the Plantation Office Besowo, PPL Sub district Kepung, Forest Service officials who served in the area of village Besowo, NGOs activist concerned about the slopes of Mount Kelud, the NGO Jangkar Kelud, poor farmers owning people's coffee plantation, wealthy farmers owning coffee plantation, leaders of Hindu religion in village Besowo, Damlak irrigation officer, PKK in Besowo village, former village heads, headmen of village Besowo, and the forest farmer community who were members of LMDH (Lembaga Masyarakat Desa Hutan) or Forest Village Community Institution).

Data Analysis. After the data were collected, they were classified according the themes and objectives and interpreted further for understanding the environmental management strategies based on local community with cultural approach. Culture consists of rural culture system, behaviors and works in managing forests environment, people's coffee plantations and matters relating to environmental issues.

3.Literature Review

The environment is a unity with all things, the circumstances and the living creatures, including human behavior affects the survival of human welfare and livelihoods and living things around (id.wikipedia.org/wiki/lingkungan). Human behaviors in the use of natural resources affect the surrounding environment. Environmental factors that cause changes in the slopes of the volcano is a natural disaster and the behavior of the surrounding rural communities. Volcanic natural disasters that cause ecological changes, such as the eruption, is usually followed by cold lava floods, landslides and so on. Behavior of rural communities around the slopes of the mountain in managing the environment affect the ecological changes. The area around the volcano is usually a protected forest, production forest, and the slopes areas owned by the farmers in certain high altitudes are planted with woody plants.

During Dutch era, slopes region in altitude of 600 meters above sea level was an area for coffee plantations, which was protected even for villagers who were banned from making settlements and conducting traditional economic activities to keep the ecosystem in the area (Geertz, 1963). Changes in cropping patterns in coffee plantation area in the Village Kebonrejo occurred because: a) the coffee harvest only once a year is not sufficient to meet the needs of daily life while horticultural plants have more harvest frequency, b) decreasing coffee quality is likely due to old coffee trees, lots of shade trees felled, the use of pesticides for horticulture which can cause reducing soil fertility in people's coffee plantation area. Changes in cropping patterns in coffee plantations area in the countryside have brought changes in the people. For example, changes in cropping patterns in people's coffee plantation have resulted in: a) decreasing the temperature in the surrounding rural area, b) a decrease in water discharge flowing in the countryside. Even local farmers complained the pest "whitefly" that attack pepper plants until today is a pest of harvested plants in the forest area (Rustinsyah, 2009)

Functions of forests with preserved woody plants for human life is a) to prevent erosion and landslides, b) storing, managing, and maintaining supplies and water balance in the rainy season and dry season, c) enrich the soil, because the leaves will fall breaks down into humus, d) as an economic resource, e) as a plasma source of diversity in forest ecosystems, allowing for the development of genetic biodiversity ; f) reducing pollution, air pollution because plants absorb carbon dioxide and produce oxygen (<http://www.artikellingkunganhidup.com/6-fungsi-hutan>).

The loss of woody plants caused changes in forest ecosystems and declined environmental quality. According to Daniel H. Janzen (1973), chopping trees in the forest results in the change of soil climate and water management. Not only at the time the land is fallow, in advanced arable land, most of the sunlight falls onto the surface of the earth. Upper soil layer is heated temperature exceeds the optimum. It was not only damage crops but also increased the evaporation of water extremely. As a result, the soil layer dries quickly, causing hardening of the soil and harm the water supply to the plant. Sigmund Rehm (1973) wrote a decreased impact shade trees is declining fertility rate due to reduced nutrients in the soil due to evaporation by the sun. Similarly, soils in the tropical areas. Due to the heat of the sun with high temperatures throughout the year, the soil in the tropics undergo chemical decay faster than that in temperate regions. Old soils in the tropics is mainly composed of iron oxide and aluminum acts and binding with absorption slightly above plants fertilizer. Thus, the soil almost has no functions, such as for warehouse of nutrient reserves. To preserve forests and coffee plantations on the slopes. awareness, participation of local people, and government support are needed. However, the government cannot

closely watch the people as individual owners of coffee plantations. Government, through extension workers, have a project for the coffee plantation but often it is not sustainable.

Forest communities or local community in forest areas and mountain slopes have a culture. Culture is as a human adaptation to the physical and socio-cultural environment. Adaptation is human behaviors to use the environment. There are also good and bad behavior. Good behavior towards the natural environment can provide benefits to the common life. While the bad behavior of humans to the environment can damage the nature and can be detrimental to the survival of the society. Pelzer (1971) wrote that human impact on the nature may be good and bad. Ecological damage in the mountain slopes that are considered to threaten the lives of villagers in the vicinity raises environmental management strategies to deal with the impact of damage and natural disasters. Changes in behavior of the mountainside village community life is due to demands, markets, and government policies relating to the exploitation of nature in the countryside. Among the people who know the market, the money exchange and exploitation of natural resources not only to meet the needs of his life but the production to benefit the economy. At that time the rapid ecological changes due to the exploitation of natural resources is likely to be more aggressive because of the demanding needs of the people living around it.

3.1 Model of environmental management in villages.

Model is a form and strategy pattern. Local community strategies to prevent and cope with disasters is done individually, in institutions and individuals and institutions of cooperation. Strategies and actions by Keesing and Keesing (in Ahimsa Putra, 2003) can be viewed from two sides, the pattern for and the pattern of for. Pattern of is the pattern made by the researcher based on his observations on one or a variety of specific activities that are always repeated in more or less the same form, for example, the pattern of economic activity. Pattern for is a series of strategies, norms, ideas, knowledge which is usually used as a hint to solve various problems.

To explain the strategy of local community-based environmental management we used theory of adaptation strategies. The theory was originally developed by Bennett (1976). According to Bennett, adaptation is a pattern of adaptation process of social adjustment by individuals within a group. Adaptation is also called adaptive dynamics, adaptive strategies. Therefore adaptation strategy is the pattern, or adjustment efforts to address various issues. There are two kinds of adaptations are behavioral adaptations (desired) and mal adaptation (rejected).

Environmental management strategies is a series of initiatives, efforts, particularly action to prevent and cope with disasters. Disasters around the slopes of the volcano is due to natural disasters, people's behavior or both. Behavior of forest fringe communities in protecting forests affects the sustainability of forests. Forests have an important function for human life. The research of Boediono et al (2006) concluded that the behavior of farmers in conserving protected areas in 12 villages in Lampung province was a) the behavior of forest edge farmers in conserving the forests tend to have a motive for increasing revenue and not oriented on the forest; b) the behavior of forest edges farmers tend to be economically motivated and have social and cultural dimension so as to change the behavior of farmers should be carried out jointly against both dimensions, c) the application of the principles of soil and water conservation has not been done properly and peasants consider soil conservation cost is still very expensive and hard to do; d) lack of effort and cost for managing the conservation of agricultural land ; e) forest preserve behavior is very different from the behavior in conservation farming, the difference is also reflected in the sphere of competence of knowledge, attitudes and skills.

4. Result and Discussion

Environment on the slopes of Mount Kelud comprises protected areas, production forests, coffee plantations owned by the people, arid farmland around the village. According to residents in Sidodadi, now is the condition of protected forest and production forest is good. Changes occur as a result of a small fire-seeking behavior of honey bees. Small fires quickly resolved because good security system. Sometimes the surrounding residents cut branches and leaves for fodder. As the year 1999/2000 in Besowo forests damaged by illegal logging. Garden conditions that have changed people's coffee, only approximately 15% of the area planted with coffee and shade trees, planted horticultural rest by its owner. Agricultural systems around the village is dryland farming systems with horticultural cropping pattern (peppers, tomatoes, and vegetables, and so on

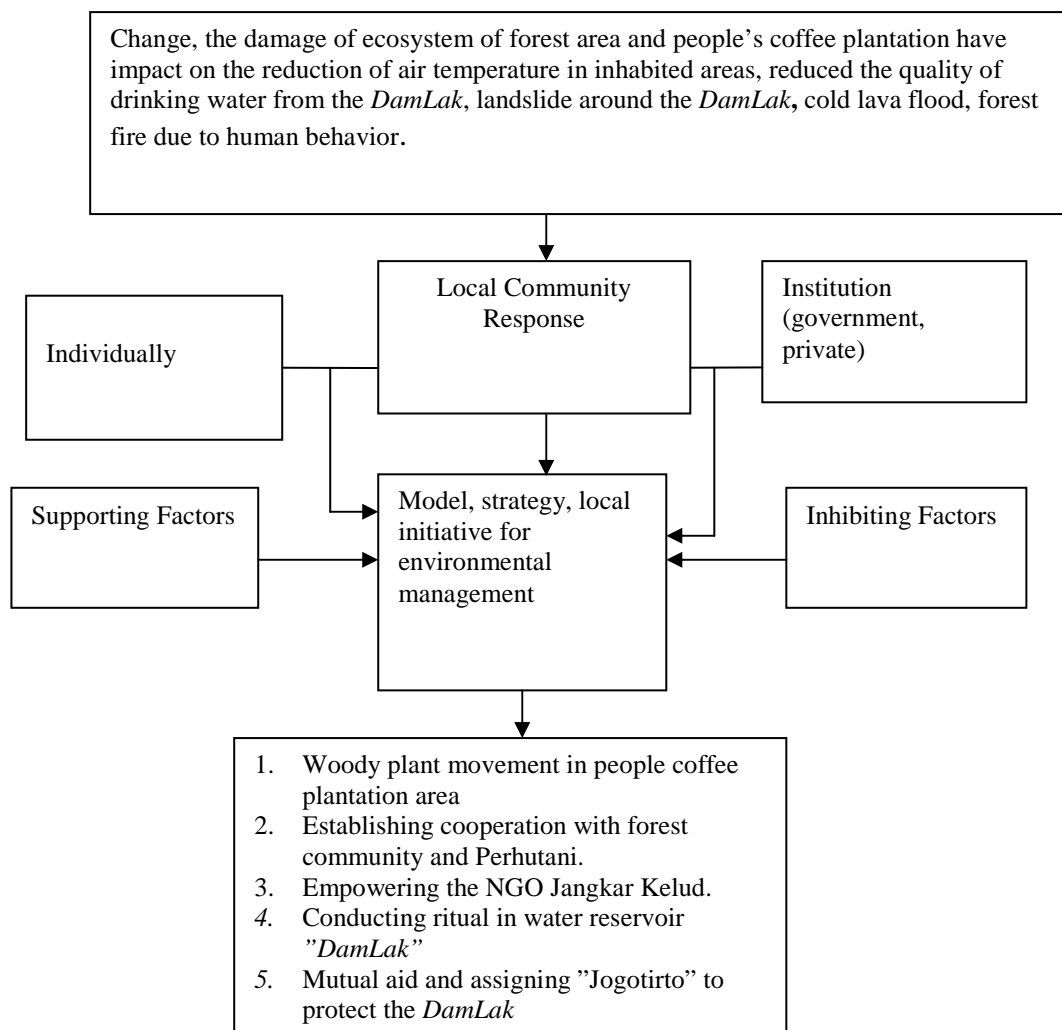
Besowo village, Sub district Kepung, Kediri, is one of the disaster prone areas on the slopes of Mount Kelud which is still active. It is estimated to erupt once in 15 years. The eruption of Mount Kelud has positive and negative impact. Positive impact on the surrounding area is a fertile agricultural area and material (sand, stone, etc.) that can be used for human needs. In 2007 Mount Kelud had increased activity, followed by cold lava flood 2008/2009 which resulted in a) "*DamLak*" damage water or shelter in the middle of a protected forest in a distance of approximately two and a half kilometers from the village Besowo b) cold lava flood brought pieces of material of huge tree from the forest area.

Damlak damage resulted in approximately 1,412 households in the village Besowo, Subdistrict Kepung not be able to enjoy clean water for approximately two months. There are approximately eight sub villages in Besowo village that had clean water shortages, such as the sub villages Krajan, Bonse, Kentheng, Sidodadi, Jaban, Wangkalan, Sumberrejo and Sabiyo. To meet the need of clean water, local government of Kediri district provided drinking water (PDAM) for approximately two months. Since the aid was insufficient, most people used rainwater for household purposes. Until then, when heavy rains occurs around the protected forest, the water in the *DamLak* is affected by landslides and water becomes turbid.

Floods in Besowo village is exacerbated by the loss of tree in the forest. According o local residents, the loss of woody plant is due to a) dryness and death as a result of high temperatures around the time of Mount Kelud eruption, b) the rampant illegal logging in the year 1999/2000 ; d) of forest fires during the dry season due to the behavior, for example, people who searched honeybee using a torch flame. The loss of woody plants in the protected areas and coffee plantations resulted in reduced functionality so that the impact of forest land around the forest landslides and rising temperatures in the countryside.

To prevent and manage disasters and the environment, environmental management strategies is needed based on local community. Figure 1 shows on the model, environmental management strategies to prevent and deal with local community-based disaster.

Figure 1. Model, local-community based environmental management strategy in preventing and dealing with disaster.



Source: Research Data for Treated (2013)

First, the movement to plant woody plant in the people's coffee plantation. In the area of people's coffee plantation in Besowo village there was a change of cropping pattern from woody plants to horticultural crops such as chili, vegetables, tobacco, corn and so on. Only approximately 15% of plantation owners still maintained the coffee plant and its protective trees. Changes in cropping patterns is due to : a) coffee harvesting only once a year, the price is not fluctuative, and the quality of the coffee fruit has decreased due to the aging old plants resulting in lower revenue from coffee plants than that from horticultural crops, b) most of the population has narrow plantation of less than 0.5 acres and only in one location so it is more profitable to plant horticulture. The excessive use of pesticides and chemical fertilizers for horticulture caused decreased or "sodden" soil quality or so that the growth of coffee plants around it becomes less good.

To conserve soil and improve the ecosystem in the area of the mountain slopes, especially in people's coffee plantations, the government through the Plantation Office, which has a branch in the village Besowo, drive the movement to plant cocoa. In 2010/2011, the program was initiated by the East Java provincial government through APBD level I. Cocoa plant was selected as one of the woody plants as well as for soil conservation because these plants suited to the climate in the mountain slopes, harvested more frequent than coffee, the selling price is quite good, easy sales and low production costs because it does not need pesticides and chemical fertilizers. The government provides assistance to cocoa seedlings free of charge, to help eradicate diseases of cocoa plants. To facilitate the sale of cocoa, cocoa cooperative was formed in the village of Besowo. According to the chairman of cocoa cooperative in village Besowo, cocoa planting program seems to obtain a positive response from the peasants as one by one the farmers began to try to plant cocoa. To add the income of cocoa peasants in the village, the Plantation Office in Besowo proposed to plant coconut seedlings as shade tree. Constraints faced for cocoa planting program is a socio-economic conditions of the people's coffee plantation owners who generally have a narrow land and seek to maximize farm by planting horticulture.

Second, to build partnerships between the community and the *Perhutani* office. One of the objective of co-operation between local communities called "forest people" and *Perhutani* is to keep production forests and protected forests. They were the people of sub village Sidodadi located in the forest of less than 900 people or 290 households. According to the head of the sub village, Sidodadi residents existed before the 1960s. At that time each family obtained land to build a house measuring 25 x25 or 625 square meters with rights of usage status. Currently, the land has been hereditarily inhabited by children, grandchildren or others by giving compensation to the previous occupant. The village has already had primary school, kindergarten, religious facilities such as mosque, temple and church, electricity, drinking water needs of Damlak accommodated in shelters tanks.

Sub village Sidodadi community is joined in an LMDH (Lembaga Masyarakat Desa Hutan, Forest Village Community Institution) organization, chaired by the head of the subvillage. In performing their duties, LMDH created a board comprising sections for security, planting, and maintenance, with respective social duties. Each section consists of approximately 40 people and under the coordination of four or five people. Each member is obliged to follow the established activities of LMDH institution. Forms of cooperation between farmers and forestry is the contract to work the agricultural land in production forest area. Therefore, each family received arable land from *Perhutani* of approximately 0.1 acres for members, sometimes larger depending felled forest area. Agency officials got a broader share of arable land.

The peasants-tenants can plant seasonal horticultural crops such as peppers, tomatoes, taro and other crops in between the woody plants up to 3-4 years. After 3-4 years, smallholder farmers can grow horticulture crops in the middle of *Perhutani* plants with profit sharing, with the provisions that tenant peasants have 80% share and forestry have 20% share of the harvest. Tenant farmers in this area was quite advanced in cultivation. It is evident from the pattern of intensive farming using mulch. Tenant peasants have an obligation to keep the woody plants so that felling will be done when the trees are approximately eight years old. At the time of harvesting, the farmers in the village can work as harvesting laborers, transporting with wages of less than Rp. 50,000.00 depending on volume work. During logging, the workers also get the "rencsek" or branches that were are not taken by *Perhutani*. Rencsek waste can be sold with a price of one truck of Rp 600.000,00. If the weather conditions is good, there could be four to five trips in a day. On average they can sell 30 trips of "rencsek" each month. The result of rencsek sales is managed by LMDH with the following distribution : workers or loggers 50%, operations foreman 20%, mantri (head overseer) 5%, LMDH 15%. LMDH money is used to give honor to a) security picket at logging sites, b) forest police of KPH Kediri, for gasoline and food costs.

Maintenance of woody plants in *Perhutani* area was done synergetically between smallholder peasants as members of LMDH and forest police of KPH Kediri. Protection to woody plants was done intensively since the age of four when plants are susceptible to fire. Especially for areas adjacent to protected areas, there is almost certainly fire in every year. Protected forest fires in the dry season due to a lot of people who were looking for firewood, honey bees in the forest used fire torches. Sometimes they throw the torch flame to ignite the fire.

However, presently, with heavy security, fires in Besowo forest can be identified immediately and then extinguished.

Third, empowering the NGO "Jangkar Kelud". NGO Jangkar Kelud oversees disaster prone areas of Mount Kelud with coordinators based in the village of Kesambon, Pondok Agung, district Malang. The establishment of NGO Jangkar Kelud was led by KAPPALA (Kelompok Pemerhati Pencinta Lingkungan or Environmental Concern Group) Organization of the National Development University of Yogyakarta. In 2007, community leaders around the disaster prone areas of Mount Kelud and KAPPALA formed "Alert Team" for the disaster in Disaster Prone Areas of Mount Kelud. In 2007, Kelud activity increased, and later in 2008/2009 cold lava flood hit the village of Besowo. Some of the activities carried out in support of environmental sustainability and disaster in "Disaster Prone Area " in Kediri in the village Besowo were a) conduct "local training" for community leaders in disaster prone areas of Mount Kelud in 2007, b) establish, support programs Community Radio in Disaster Prone Areas. c) help to handle the cold lava floods in 2008/2009 ; c) incorporate the lessons of disaster management as local content in Besowo Village Elementary School.

Community Radio in Disaster Prone Areas of Mount Kelud is totally of nine radios, namely a) Disaster Prone Areas (KRB) I in Kediri, there were four Community Radios, Kelud FM di sub villages Margomulyo, village Sugihwaras, sub district Nance, Sempu Raya FM in village Sempu, sub district Ngancar; RJKS FM in village Satak, sub district Puncu; and Ampel Denta Voice FM in village Siman, sub district Kepung. b) In Disaster Prone Areas of district Blitar comprises Lintas Kelud FM in village Modangan, sub district Glagah. Candi Kelud FM in village Candirejo, sub district Ponggok. c) In Disaster Prone Areas of Malang there are Pandowo FM Community in Pondok Agung village, Kasembon; Smart FM in Ngantru Village, Ngantang. Community radio as an effective medium to convey information in disaster-prone areas such as on mountain landslide, tornado, and programs related to rural development and entertainment. Besowo village and surrounding areas can receive community radio broadcasts from Pondok Agung vilage and Adevo FM Community Radio of MTs Sunan Ampel School in village Siman. Procurement of equipment and operating costs of community radio generally comes from donors. For example, instruments of Community Radio Pondok Agung was from Sampurna cigarette company donations. Community radio operations are not allowed to receive funding from commercial advertising, product marketing, and so on, so that the operational costs of the budget was allocated from the Village Fund or *Anggaran Dana Desa (ADD)* which was very limited in number, from the generous donations, and the efforts made by the managers of radio. To realize the delivery of disaster management, the subject is included in the Elementary School of village Besowo, and there was no trouble since elementary school teachers were also activist of Jangkar Kelud and the modules were provided by KAPPALA.

Fourth, ritual was done in "*Damlak*" water reservoir. Every year in September, the Hindus in the village of Besowo perform rituals in Damlak. The ritual was intended to get a blessing, water as a source of human life will be properly maintained and in honor of the Goddess who keep the Damlak. The ritual is called "*Mendak Tirta*". The ritual is led by the leader of Hindu religion in the village Besowo. Used for ritual offerings called a) *Daksine* which contains rice and grains (hazelnut, *kluwak*), money, and whole coconut. Whole coconut is used for offerings as a symbol that the embryo will continue to grow well. b) *Tumpeng* containing rice, side dishes, fruit, vegetables and so on. Some of *tumpeng* is eaten together and some are placed in *Damlak* as offerings. c) *Aguman* or *Kupat* d) Purification in the form of plain flour. After the ceremony, the offerings are laid out in "*DamLak*", the large cone is eaten near the *Damlak*. Costs used for rituals in Damlak are from endowments of the Hindus the village Besowo.

Fifth, mutual work and assigning *Jogotirto* or irrigation officers to maintain village irrigation water in Damlak with compensation of obtaining *tanah bengkok* as wide as approximately one acre. *Jogotirto*'s main task in the village Besowo is to maintain water availability and quality for the needs of residents originating from *Damlak*. *Jogotirto* jobs are opening, closing sluice gates during heavy rain that can be done day or night. When the rain is heavy, the soil around Damlak slides and mud surrounding Damlak come into the water so that the water is brown during the rainy season because of mixed mud. Mutual assistance in Besowo village was two: mutual assistance coordinated by the village and the sub village. The primary village mutual assistance includes the cleaning of Damlak water pipes and the environment before the Independence Day. When disaster strikes, mutual aid is immediately done to the entire village. For example, when there was cold lava flood in 2008/2009. Mutual assistance in the sub village is generally to clean water storage tanks flowing to residents. This mutual cooperation is coordinated by local village heads, gutters handyman, and RT (Neighborhood). Mutual aid activities is tailored to the needs of the local community. To maintain water storage tanks, usually every house pay dues Rp 3000.00. Especially for forest communities of sub village Sidodadi, mutual aid activities in the forest is to make way so that trucks can get into the forest.

5. Conclusion

The impact of disasters and people's behavior in Mount Kelud, particularly, Besowo village is the *Damlak* damage due to exposure to cold lava floods in 2008/2009, changes in cropping pattern from woody plant to horticultural crops in people's coffee plantation area, higher temperatures in the residential village. Change, environmental degradation in the area gained response from the local community to cope with disasters, restore forest functions, and undertake soil conservation. Community response is in the form of strategy in managing the environment around the slopes of Mount Kelud.

The strategies of keeping and managing the environment in the slopes village are done individually or in institutions. Strategies to maintain and manage the environment are: a) Movement to plant woody plants in people's coffee plantation. A program as a way for the soil conservation on the slopes of the mountain and increase peasants income; b) To build partnerships between communities of sub village Sidodadi belonging to the LMDH (*Lembaga Masyarakat Desa Hutan*) or Forest Village Community Institution and *Perhutani*. The cooperation pattern for the keep, maintain plants in production and protection forest from the forest damage caused by illegal logging, fires, and others; c) Empowering NGOs (NGO.Jangkar Kelud) in several activities, among others, local practice in the face of disaster, supporting the operations of Community Radio in Disaster Prone Areas of Mount Kelud covering Kediri, Malang and Blitar; include disaster management as a subject matter in the Elementary School at Besowo. Programs and activities of NGOs useful as media communication for dissemination of the disasters caused by volcanic activity; d) Ritual held in *Damlak* water reservoir by the Hindus in Besowo village. A ritual was intended to appeal God's blessing so that villagers around forest to get protection and sufficient water as a source of life. e) To conduct mutual aid in village and sub village level and assigned *Jogotirto* or water officers to guard *Damlak* irrigation. Its were intended that the viilagers get water supply sufficient in quality and quantity.

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References

- Anonymous. no year. Gunung Kelud (http://id.wikipedia.org/wiki/Gunung_Kelud)
- Anonymous. (2012). Hutan Lindung Kawasan Gunung Kelud Terbakar". <http://alha-raka.org/perjuangan-rakyat-kawasan-hutan-besowo>).
- Anonymous. (2012). Profil Desa Besowo, Kecamatan Kepung, Kabupaten Kediri.
- Ahimsa Putra, HS (2003). *Ekonomi Moral, Rasional dan Politik: Industri Kecil di Jawa*. Yogyakarta: Kepel Press.
- Bennet, J.W. (1969). *The Ecological Transition: Cultural Anhropology and Human Adaption*. New York: Pergamon Press.
- Budiono, P. et al. (2006). "Hubungan Karakteristik Petani Tepi Hutan dengan Perilaku mereka dalam Melestarikan Hutan Lindung". *Jurnal Penyuluhan* 2(2): 44-52.
- Collier, W. (1981). *Agricultural Evolution in Java: The Decline of Share Poverty and Involution*. New York: Westview Press.
- Geertz,C.(1963). *The Social History of an Indonesian Town*. Cambridge, Massachussets: The Massachussets Institute of Technology.
- Heffner, RW (1990). *The Political Economy of Mountain Java*. Translation by A. Wisnuhardana and Imam Ahmad. Yogyakarta: LKIS.
- Janzen, DH (1973). "Ekosistem pertanian tropis", In J. Metzner & N. Daldjoeni (eds). *Bertani Selaras Alam*. Jakarta: Yayasan Obor Indonesia.
- Mahfud, M (2000). "Kajian penanaman cabai dan paprika di musim hujan hemat pestisida". *Jurnal Institut Pertanian Malang Agritek* (4): 45-46.
- Mahfud, M (2001). "Teknologi penghematan pestisida dalam usaha tani hortikultura". *Prosiding Seminar Hasil Penelitian Teknologi Pertanian*. Bogor:Badan Penelitian dan Pengembangan Pertanian Pusat Penelitian dan Pengembangan.

- Metzner and Daldjoeni, N (1987). *Ekofarming: Bertani Selaras Alam*. Jakarta: Yayasan Obor Indonesia.
- Pelzer, KJ. (1971). "The Agricultural Foundation", in B Glassburner (ed.). *The Economy of Indonesia*. Ithaca and London: Cornell University Press.
- Penny, DH and Ginting, M(1984). *Pekarangan Petani dan Kemiskinan*. Yogyakarta: Gadjah Mada University Press.
- Rehm, S. (1987). "Aktifitas pertanian di negara tropis yang berhujan banyak", In: *Ekofarming: Bertani Selaras Alam*. Jakarta: Yayasan Obor Indonesia.
- Rustinsyah, (2009). "Kapitalisasi Usaha Tani Lahan Kering di Desa Kebonrejo, Kecamatan Kepung, Kabupaten Kediri". *Dissertation*. Unpublished.
- Sayogya (1982). *Ekologi Pedesaan: Sebuah Bunga Rampai*. Jakarta: PT. Rajawali.
- Thijsse, JP. (1982). "Memperbaiki tanah menurut metode ekologi di Indonesia dan daerah-daerah beriklim panas lainnya". In: Sajogya *Ekologi Pedesaan: Sebuah Bunga Rampai*. Jakarta: PT. Rajawali.
- Wicaksono, YG (2009). 400 Desa di Jawa Timur Rawan banjir dan Longsor. (<http://www.media.com>.)

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