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The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing
doi:10.1088/1755-1315/314/1/012065 1 Model of socio-economic recovery of farmers in erupted areas of mount Sinabung in Karo Regency Hotden Leonardo Nainggolan^{1,*}, Albina Ginting¹, Jongkers Tampubolon¹, Johndikson Aritonang¹ and Jef Rudianto Saragih² ¹Faculty of Agriculture, University of HKBP Nommensen. Jl. Sutomo No. 4A Medan North Sumatra, Indonesia. ²Faculty of Agriculture, Simalungun University, Pematang Siantar, North Sumatra, Indonesia. *hotdenleonardo76@gmail.com Abstract.

This study aims to find a model of socio-economic recovery of farmers in erupted areas of Mt. Sinabung in Karo Regency. The study was conducted in Payung and Namanteran Districts with a sample of 30 respondents determined purposively, with descriptive research methods. The result of research; a) Social recovery of farmers carried out by the government through community group development, customs are still minimal, b) Training on adaptation/ mitigation technology related to farming for the process of socio-economic recovery has not been optimal, c) There has been no use of new varieties that are tolerant of diversity that match power support land, d) There is no access to cooperation with partners for the agricultural product market.

In accordance with the results of the study it is recommended; a) Efforts are needed to restore the socio-economic conditions of farmers, through empowerment to improve the ability of farmers, b) A holistic approach is needed to touch all aspects of socio-economic farmers, c) The government must provide free space for farmers to increase their socio-economic strata through activities that productive nature, d) The government must carry out a specific identification process to determine the slow process of recovery in the socio-economic area of farmers affected by eruption. 1.

Introduction Indonesia is a tropical country and has many volcanoes. This causes natural resources in Indonesia to become fertile.

But the existence of the volcano can cause disasters if it erupts. Mount Sinabung is an active volcano located in Karo Regency and is one of the proud tourist attractions of North Sumatra Province. Recorded since 2010 Mount Sinabung has been erupting until now. The first eruption place on 29 August 2010 at 00.08 am, followed by a second on 30 August at 6:30 am. At approximately 4:45 am. local time on September 3, Mount Sinabung erupted again for the third time. This was the latest activity and stronger than the previous two eruptions [1].

On December 21, 2013, the Government of Indonesia issued a level 4 alert, requiring residents living within a 3 km radius of Mount Sinabung to evacuate. The level 4 alert remained in place until January 31 when nearly 14,000 people returned to their houses as volcanic activity had decreased. On September 15, 2013, Mount Sinabung experienced a violent eruption of smoke and ash, causing mass evacuations of villages surrounding the volcano. Local government officials reported that the volcano threatened more than 29 villages [2].

The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing
doi:10.1088/1755-1315/314/1/012065 2 Between 2013 and 2014 the alert for a major event was increased with no significant activity. On 2 June 2015 the alert was again increased, and as of 26 June 2015 at least 10,000 people have been evacuated, fearing a major eruption. A pyroclastic flow in May 2016 killed 7 people [3].

Following is a short overview of activities to date by other agencies to the Sinabung volcano eruption: a) In response to the Sinabung volcano eruption, the Indonesian government through Badan Nasional Penanggulangan Bencana (BNPB/ National Disaster Management Agency) has allocated IDR 15 billion (CHF 1.69 million or USD 1.67 million) to deal with the internally displaced people camps in Karo Regency. This fund will be used for food and drugs as needed and also to ensure security in all affected areas. In addition to this, BNPB has distributed 1,000 blankets, 1,000 sleeping mats, and 500 family tents, b) The local government has allocated 50 tonnes of rice, 14,000 cans of fish, one water truck, 1,000 bottles of ketchup, 240 kg of instant noodles, 500 blankets, 50 family tents, 200 sleeping mats [1]. The eruption of Mount Sinabung caused a decrease in harvested area and production of food commodities such as; paddy rice, corn commodities and horticulture.

Since 2012-2014 corn land decreased by an average of 14.5% and the average

production decline was 12.4%. Tomato land area decreased by an average of 42% followed by an average production decline of 44.3%, as well as citrus production fell by an average of 32.4%, causing farmers' income to decline. The agricultural sector has a strategic role for the economy of Karo Regency. This area is an important commodity production center in North Sumatra, which acts as a supplier to other regions and farmers' sources of income.

The socio-economic conditions of the people affected by the eruption of Mount Sinabung are seen from four aspects, namely (i) social relations that reflect the socio-cultural environment can affect the farm household system, (ii) infra structure that reflects the physical environment, (iii) farming activity and (iv) income generating through off farm employment. Other socio-economic impacts faced by farmers after the eruption of Mount Sinabung were: a) farmers had difficulty developing their farming due to limited production factors such as; seeds, fertilizers and pesticides at a very expensive price, which greatly affects the productivity of farming; b) limited farm labor with very expensive wages, because many people have moved to a place of residence; b) the social ties of the community in the research location become tenuous and generally focus more on taking care of their respective families; c) local community social institutions that have previously developed well, but due to the eruption of Mount Sinabung it has not been taken care of and some have dispersed, because some people have been displaced and even moved to different areas, c) previous non-governmental organizations develop and play a role in helping farmers in various ways; like counseling no longer exists.

Furthermore [4] conveyed; the worst socio-economic conditions faced by the community after the eruption of Mount Sinabung were; a) the marketing network of agricultural products does not work well which causes the level of farmers' income to decrease; b) facility distributors and production factors become far from farm center locations so that the price of production inputs that farmers have to pay becomes more expensive, so that farming costs become higher, c) poverty rates increase due to declining farmer income, d) local social support systems that does not work. The worst condition occurs in the aspect of infrastructure with a score of 39.41, thus disrupting public services in the field of education (score 25.88), health services (score 31.18) and access to clean water (score 35.29).

Disruptions in socio-economic conditions that affect farming include five elements, namely (i) availability of production facilities, (ii) availability of wage labor, (iii) access to business capital credit, (iv) production price information and (v) marketing of farming product [5]. [4] Convey financial damage as a result of Sinabung eruption which can be seen from farming analysis. If before the eruption of carrot, cabbage, tomato and chili

farming shows good business feasibility (the R/ C ratio between 1.43 and 4.79), but after eruption only cabbage farming is economically feasible to cultivate (R/ C ratio= 2.46) while tomato farming, carrots and chili are run in a loss condition with the R/ C ratio below 1.

Eruption disasters not only have a physical impact but have a socio-economic impact, such as; stagnation in economic growth, weakening social relations, rising poverty rates, loss of people's livelihoods [6] even disasters destroy infrastructure systems, social facilities, and other economic support facilities. The events of the Mount Sinabung eruption have a negative impact on the economy of the region and even the socio-economic conditions of the community, therefore it needs remedial action to restore economic conditions through increasing crop productivity and social recovery of local communities. This is in line with [6,7] to reduce the negative impacts of disasters and encourage sustainable life, recovery efforts are needed.

The recovery phase provides an opportunity to rebuild the affected physical, social and economic systems. [8] disaster recovery is grouped above; recovery of economic resources, individual resources, social and political resources. Individual resources that are affected can be recovered through: improving health, physical ability, psychiatry, education/ knowledge/ skills. So that people take advantage of opportunities, access resources and face difficulties after a disaster. Thus this study aims to identify the policy of social recovery of farmers affected by the eruption of Mount Sinabung in Karo Regency. Through this research formulated a collaborative model for socio-economic recovery of farmers.

To achieve these objectives, it is necessary to understand the community to restore their socio-economic conditions due to the impact of the eruption, so that the programs implemented in the future are more effective, efficient and sustainable. 2. Research Methodology This research was conducted in the Mount Sinabung area that is Payung and Naman Teran District, Karo Regency. The location of the study was determined purposive, where the farmers of both districts were affected by the eruption of Mount Sinabung that occurred since 2010 ago.

The population of this study were farmers affected by the eruption in the Mount Sinabung area located in Naman Teran District and Payung District which amounted to 950 families. Farmers interviewed were 30 respondents who were determined purposively from Payung Village in Payung District with a total of 15 respondents and Naman Village in Naman Teran District as many as 15 respondents who were

determined purposively. Data analysis method used is descriptive analysis. Data analysis is done after the data is obtained from relevant parties; through interviews, focus group discussions and public hearings.

This analysis is part of statistics to describe or describe data sets or observations. Descriptive analysis is used to determine the socio-economic recovery activities of farmers affected by the eruption of Mount Sinabung in Karo Regency. 3. Result and Discussion 3.1. Social recovery of farmers affected by the eruption of Mount Sinabung through aspect of social development. [9,10] the resources needed by disaster victims in recovery depend on the use of their social networks. [11] shows strong ties between community members in the village of Tamil Madu, South India, helping communities form informal mechanisms to access logistical needs and financial assistance from outsiders.

The role of government and actors outside of other community systems is important for the post-disaster recovery process [11]. In line with the research [6] that the socio-economic recovery process of the community must be fully restored, it is necessary for the role of government as a planner to synergize recovery strategies. In some cases, post-disaster recovery efforts often focus more on physical recovery such as; housing, infrastructure, while the improvement of the social conditions of affected communities is often overlooked [12,13].

This is because the physical impact can be seen in real terms, the level of loss can be calculated, and can be recovered in a relatively short period of time, while the socio-economic impact is difficult to measure, but can cause social and economic deterioration in the long term [14]; [15,6]. The role of planning is needed in regulating, synergizing recovery efforts and strategies by considering the timeframe needed and synergizing it with other development plans and effective use of resources [6]. In accordance with the results of interviews with the respondent farmers in the study The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing doi:10.1088/1755-1315/314/1/012065 4 location, that the government's role in recovering is not maximal, even some programs do not exist, as presented in Table 1.

Table 1 shows that social development in the context of restoring the social life of farmers is still very minimal, only 40% of respondents said that there was a government program to conduct inter-village community group/ communication coaching. While 37% of respondents conveyed farmer group development programs conducted by the government and the private sector to improve the communication between farmers in one village or between villages. Table 1. The role of the government and private parties

for the social economic recovery of farmers affected by Mount Sinabung eruption through aspect of social development.

Aspects of social development respondents' opinions about the program of socio-economic recovery (existing conditions)/ (%) not existing existing/ non- implemented existing / implemented limited to socialization Group development / communication coaching between and within the village 37% 7% 40% 13% Kinship building between farmers 33% 20% 37% 7% Guidance and development of cultural and cultural activities 27% 20% 47% 3% Guidance and development of church/ mosque activities 20% 0% 60% 17% Formation and development of village level community organizations (eg. karang taruna). 17% 7% 70% 7% Source: Primary data, processed 2018.

There were 47% of respondents who delivered the development program of cultural/ customs activities carried out by the government had begun to run but had not been maximized. And 60% of respondents said that the Church, Mosque activity development program carried out by the government and the private sector had gone well. Then 70% of respondents conveyed the government program in the framework of forming and fostering community organizations that have started to run well.

The results of this study are in line with [10,16] who convey community development and empowerment will have an impact on increasing networking and ultimately affecting the social and economic activities of the community after a disaster and social capital will encourage the creation of collective action to utilize resources in the recovery process. Social resources can be linked to social capital [8,10]. Social capital acts as an informal mechanism that helps disaster victims to share resources, even reducing dependence on external assistance [16] so that reduced social capital in the community will limit the speed and effectiveness of the recovery process.

3.2. Economic recovery of farmers affected by Mount Sinabung eruption through farming aspects and disaster mitigation technology. To support the post-disaster recovery process, the role and support of the government is needed especially through the distribution of resources [17]. In 2015, the Government of Karo Regency received a fund allocation IDR.190,674,100,000 through a central government grant for post-disaster rehabilitation and reconstruction activities, but the results have not been maximized and the recovery process is still ongoing.

[18] that economic recovery is only part of the broader community recovery effort, though a crucial aspect. Economic recovery provides basic necessities of life, jobs to sustain the economy in terms of income and tax revenues, and reinstatement of wealth through detailed property values. At the same time, economic recovery is not likely to

be effective, or at all, unless the physical and sociopolitical fabric is repaired: a) civil orders must be restored, b) infrastructure must be repaired, c) capital markets The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing doi:10.1088/1755-1315/314/1/012065 5 must be accessible, d) workers must be available and labor markets functioning, e) government services need to be available.

Based on the results of the study through interviews with respondents in the research location, that the role of the government in carrying out economic recovery based on farming aspects and disaster mitigation technology is not yet running as in Table 2.

Table 2. The role of the government in the social economic recovery of farmers affected by Mount Sinabung eruption through farming aspects and disaster mitigation technology. Farming aspects and disaster mitigation technology respondents' opinions about the program of socio-economic recovery (existing conditions)/ (%) not existing existing/ non- implemented existing / implemented limited to socialization Calendar and planting schedule 60% 23% 10% 7% New superior varieties / tolerant diversity, dry resistance 63% 20% 13% 3% Technology of water resources processing / rain harvest technology / identification of water potential / rain prediction technology 87% 0% 13% 0% management of land resources/ application of fertilization technology 83% 0% 10% 7% irrigation channel development planning 73% 17% 0% 10% Spatial evaluation (plant type and land carrying capacity) 93% 0% 0% 7% Development of systems information and disaster early warning (earthquake / eruption). 67% 10% 17% 7% Understanding climate change (application of adaptation and mitigation technologies) 93% 0% 0% 7% Source: Primary data, processed 2018.

Table 2 shows the government program in the context of recovery of socio-economic farmers in the affected areas of the Sinabung eruption in Karo Regency has not been carried out properly. The results of the interviews showed that 93% of respondents said there were no training/ counseling programs on understanding climate change including the application of adaptation and mitigation technologies and their relation to the development of farming in the context of socio-economic recovery of the community. Then 93% of respondents also said that the spatial evaluation of the use of plant species that was adjusted to the carrying capacity of the land also did not exist.

This is supported by the opinion of 63% of respondents who convey new superior varieties that are tolerant with no diversity and drought. [19] reveals there are three basic components to household recovery. These are housing recovery, economic recovery and psychological recovery. All three of these components require resources to recover, but house- holds must invest time to obtain these resources. This includes time to find and purchase alternate shelter, clothing, food, furniture and appliances to

support daily living [20]. Time is also needed to file insurance claims, apply for loans and grants, and search for jobs.

The time required for these tasks is increased by multiple trips to obtain required documentation and understaffing of providers [21] finally, victims need skill and self confidence to cope with the disaster assistance bureaucracy. much longer. For example, the percentage of households reporting complete economic recovery after the whittier earthquake was 50% at the end of the first year but 21% reported little of no recovery even at the end of 4 years [22]. Economic recovery was positively related to household income and negatively related to structural damage, household size, and the total number of moves [22]. In some The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf.

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doi:10.1088/1755-1315/314/1/012065 6 cases, this is due to the loss of permanent jobs that are replaced only by temporary jobs in temporary shelter management, debris cleanup, and construction – or are not replaced at all [20]. 3.3. Economic recovery of farmers affected by the eruption of Mount Sinabung through aspects of local wisdom and traditions of the local community.

The eruption of Mount Sinabung that occurred some time ago certainly had a tremendous impact, not only on physical impacts, but on the economic impact, so a recovery program was needed for the condition of the people affected by the eruption so that the role of the community itself was needed to carry out the recovery process. The results of interviews with respondents showed that the economic recovery program of the communities affected by the Sinabung volcano eruption by regulating cropping patterns and community understanding of social and economic erosion impacts had not yet been implemented as in Table 3. Table 3. The role of government/ society in the economic recovery of farmers affected by mount Sinabung eruption through aspects of local wisdom and tradition.

Aspects of local wisdom and tradition Respondents' opinions about the program of socio-economic recovery (existing conditions)/ (%) not existing/ non-implemented existing / implemented limited to the program Determination of cropping patterns / types of plants based on local wisdom / local community beliefs / related to disasters 40% 10% 47% 3% Understanding disaster / climate change based on ancestral traditions 43% 10% 40% 7% Source: Primary data, processed 2018. Table 3 shows that the economic recovery of farmers through farming development has not paid attention to cropping patterns, and 47% of respondents said that the determination of cropping patterns that are in accordance with local wisdom has not yet been implemented. Then

43% of respondents said there were no programs implemented by the government and the private sector regarding public understanding of disaster.

The results of this study indicate that the role of local wisdom has not been utilized optimally in the process of socio-economic recovery of farmers in areas affected by the eruption of Mount Sinabung. In general, the recovery process carried out by related parties [23] is still focused on physical recovery and basic needs, as stated by arly recovery focused on the basic functions and services of the community and the recovery of vital facilities and infrastructure. Including recovery of religious activities, revitalization of arts and culture.

Socio-economic recovery of farmers can be done through; revitalization of farmer groups, gardens and livestock, diversification/ alternative programs for agricultural businesses, provision of fast harvesting seeds, business capital assistance for traders and small and medium industries. In connection with this, Table 3 shows that only 43% of respondents understand that local wisdom in accordance with the tradition of heredity (ancestors) plays a role in the process of socio-economic recovery due to climate change or due to an eruption disaster. 3.4. Socio-economic recovery of farmers affected by the eruption fo Mount Sinabung through market aspect, institutional and capital resources.

[24] implied that economic recovery in post-disaster in Yogyakarta has performed well because of conducted by central bank in regard with loan of the victims, and others. Right decisions made by local and central government have been implemented well with support of people impacted and not impacted by the disasters. The recovery discussed also indicated the importance of development. The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing doi:10.1088/1755-1315/314/1/012065 7 quality to ensure standard of education, economic life and social activities which were proven helpful in the awakening in the aftermath of disasters.

The results of interviews with respondents in the locations affected by the Mount Sinabung eruption showed that the socio-economic recovery program of the communities affected by eruption disasters based on market aspects, institutions and sources of capital had not gone well as in Table 4. Table 4. The role of government and private sector in the social economic recovery of farmers affected by Mount Sinabung eruption through market aspects, institutional and capital resources. Market aspects, institutional and capital resources Respondents' opinions about the program of socio-economic recovery (existing conditions)/ (%) not existing existing/ non- implemented

existing / implemented limited to socialization Information on agricultural production prices 87% 0% 1% 7% agricultural market information 87% 10% 3% 0% development and formation of farmer groups 20% 0% 19% 17% access to collaboration with partners (third parties) for domestic, industrial and export markets) 83% 13% 3% 0% farmer counseling and agricultural labor training 27% 20% 40% 13% Providing capital assistance and capital access (government and private banks, etc.) 53% 30% 13% 3%
 Source: Primary data, processed 2018.

Table 4 shows that the economic recovery program of farmers in the affected areas of Mount Sinabung eruption has not yet taken place, where 87% of the respondents said that the production price information and market information on agricultural products did not exist. Likewise, with access to cooperation with partners, 83% of respondents expressed access to cooperation with partners (third parties) for market purposes, both domestic and export not yet available. The partnership model is needed by farmers to help develop their farms. The efforts made are with financial policies such as; property compensation purchases, job opening, skills training, tax relief, asset purchases, low interest credit offers and others.

For example, many victims of the Aceh Tsunami disaster received training from donor agencies and the government to develop alternative livelihoods or improve previously owned skills, such as entrepreneurship skills, farming techniques, and aquaculture techniques [25]. [24] the important role showed by government in several levels during the recovery along with continuous support from people implied that different cultures resulting different attitude toward help, support and gift during and after disasters. This is noteworthy since Indonesia has many disaster risks disaster and its recovery in the aftermath.

There are of course some limits in this paper that should be addressed in the further research such as additional data on macroeconomic indicators related to inclusion of others natural disasters effected areas in Indonesia; comparison with other cases of different cultures. 3.5. Model of recovery of socio-economic farmers in areas affected by the eruption of Mount Sinabung in Karo Regency. The socio-economic recovery program of farmers implies to increase the independence of farmers so that all their potential is empowered to improve social life (the distribution of power to manage their farms) and economic power (redistribution of economic resources through productive activities). In the paradigm of social and economic development of farmers, farm managers must be able to become planning, implementing and beneficiaries.

This strategy is carried out so that the deterioration The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science

314 (2019) 012065 IOP Publishing doi:10.1088/1755-1315/314/1/012065 8 conditions as a result of a disaster can immediately recover, thus; farmers' readiness to face globalization and the utilization of available opportunities [26] can be better. Based on the results of the research through interviews with respondents, several very important aspects were identified to restore the socio-economic conditions of the farmers.

Important aspects that need to be considered to support the socio-economic recovery of farmers include; technological innovation activities, counseling activities, training, mentoring and strengthening of local economic institutions. And based on the results of data analysis as in Tables 1, 2, 3, 4 and referring to the results of previous studies can be formulated models of socio-economic recovery of farmers affected by the eruption of Mount Sinabung in Karo Regency in Figure 1. Figure 1. Model of socio-economic recovery of farmers in erupted area of Mount Sinabung in Karo Regency. Figure 1 shows the model of socio-economic recovery of farmers affected by eruptions in the Mount Sinabung area.

The recovery process must involve the government including and the private sector, with the main focus being; 1) development of social aspects which include; training of farmer groups and communities, increasing religious activities and fiber culture of local customs, involving the community to maintain traditional values and local wisdom, 2) developing farming aspects based on disaster mitigation technology, taking into account; nursery technology that is susceptible to climate change, the application of technology in the field of farming and water resources technologies such as; rain harvest technology, as well as paying attention to land carrying capacity, 3) development of social and cultural aspects, including traditional values that play a role in developing local the role of government/ private sector for the recovery of the socio- economic farmers market aspects, institutional and capital resources farming aspects and disaster mitigation technology aspects of local wisdom and tradition aspects of social development land carrying capacity superior varieties technology adoption group coaching religious activity culture and customs capital assistance price information business partnership local wisdom superior commodities annual party The 1st International Conference on Environmental Sciences (ICES2018) IOP Conf. Series: Earth and Environmental Science 314 (2019) 012065 IOP Publishing doi:10.1088/1755-1315/314/1/012065 9 potentials in the community, such as the work culture of the year which serves to improve kinship between communities and farmers, 4) development of market aspects and partnerships as sources of capital.

It is very important to build partnerships with related parties to accommodate the production of community agricultural products at competitive prices, as well as clear market information for farmers. The results of this study are supported by the findings

of [27] who stated that the objectives of the farmers' socio-economic recovery program were welfare and to make people can survive, which can be seen in terms of increasing income, consumption levels and purchasing power of farmers.

And when viewed from economic anthropology, welfare is seen as inter-cultural relativity, because the concept of sociology views welfare from the aspect of social stratification in the form of opening up access to the lower socio-economic strata in order to increase. Thus, the model of socio-economic recovery of farmers in Karo Regency aims to empower the community's economy towards self-reliance so as to improve farmers' adaptive behavior in the face of future disasters. 4. Conclusions and Suggestions 4.1.

Conclusions Based on the results of the research and the discussion carried out, it can be concluded; a) social recovery of farmers carried out by the government through guidance of farmer groups and communities as well as cultural activities and customs is still minimal, b) Social recovery of farmers conducted by the government through training and counseling programs on the implementation of adaptation and disaster mitigation technologies related to farming development has not been implemented, c) The use of plant species that are adapted to the carrying capacity of the land and new superior varieties that are tolerant with diversity and drought do not yet exist, d) Farmers' economic recovery program through information on production prices and information on agricultural markets is not yet running, e) Farmers' economic recovery program through access to cooperation with partners (third parties) for market purposes, both domestic and export does not yet exist, while this partnership is needed by farmers to help develop their farms. 4.2.

Suggestions Based on the conclusions the suggestions are; a) integrated and integrated efforts are needed to restore the socio-economic conditions of farmers, through economic empowerment in the framework of developing the ability of farmers in areas affected by the eruption of Mount Sinabung, b) a holistic handling effort is needed to touch all aspects of socio-economic farmers, and not a form of empowerment which is sloganistic and only touches on the structural aspect of empowerment, c) The government must provide free space for farmers to improve their social and cultural economic strata, through activities that are productive and on target, d) The government must carry out a specific identification process to find out the root causes of the problem of the slow recovery process of socio-economic farmers in the area affected by the eruption of Mount Sinabung.

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