

Farmer's Local Wisdom In Agricultural Land Conservation of Dieng Area

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Abstract

Dieng area is one of potato producer areas. Land clearing for potato crops has increased land damage. Communities have local wisdom that has not applied by potato farmers. The research aims to find out farmer participation in performing land conservation local wisdom. Purposive sampling is used as a sampling technique with sample indicators consist of people who do farming, knowledgeable people, and young generation. The research location is Sembungan Village that dominates by high slope land and Dieng Kulon Village, which is a flat land. The research samples comprise 60 respondents of 1,428 populations. Data collection technique was done using questionnaire, interview, and observation, whereas data analysis method used percentage frequency. The research result indicates that the forms of farmers' local wisdom in land conservation include nyabuk gunung, tumpang sari (intercropping), selokan dalam (deep gutter), galangan berbatu/rumput (stony/grassy small dikes), a day-related myth, and manure. Regarding farmer participation in Sembungan Village, 52.31% participate less in conservation according to local wisdom. Based on Conservation Activity Index (Indeks Kegiatan Konservasi/IKK), 47.69% farmers did not participate in land conservation. According to the index, only 23.59% farmers in Dieng Kulon Village perform land conservation.

Keywords

land conservation; local wisdom; potato farmers

INTRODUCTION

Land is a natural resource inseparable from human life. It is the source of human needs to perform their daily activities, both as a food source and residential source (Rachmahniah, 2016). Ecologically, it is, directly as well as indirectly, the buffer of earth organism. It is also part of unlimited natural resources. It has various characteristics and its utilization should be adjusted to its abilities. If it is used beyond its ability, its quality could decrease. The decrease in land quality

occurs due to the unlimited land demand for planting causing land damage or often known as critical land.

The Decree of the Minister of Forestry No. 52/KptsII/2001 on Guidance in Watershed Management explains that "critical land is a damage land thus cannot function well according to its allotment as a produc-

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tion media as well as water management media. The number of critical land in Indonesia is increasing from 77,806,880.78 Ha in 2006 to 82,176,443.64 Ha in 2010 (Prabandaru et al, 2016).

Critical land is also experienced by Dieng highland area that includes in Wonosobo Regency and Banjarnegara Regency. Data from Dieng Recovery Work Team (Tim Kerja Pemulihan Dieng (TKPD)) indicates that there are 7,758 ha critical land spread in two areas: Wonosobo and Banjarnegara. The critical land area in Wonosobo is 4058 ha and most of them is planted with potatoes, whereas in Banjarnegara the area is 3,700 Ha. Thousands of population in Dieng highland areas depend on potatoes farming in >60° slopes with production in Dieng Wonosobo highland area is 508,464 quintal or land area of 3,322 Ha (Suara Merdeka, 9 Januari 2018). Due to the increase in population density agricultural activities, especially potato farming, in Dieng highland area also increases. High population density and low land ownership level influence the increase in land demand; thus hills or protected forests have been converted into cultivation areas (Andriana, 2007).

Land conservation aims to reduce land loss (Lichtenberg, E., and R. Smitth-Ramirez. 2010; Suwanto and Sapja 2012). Efforts in critical land conservation management in Dieng highland areas have been conducted through reforestation activities; however, the number of critical land is actually increasing. It is indicated by the increase in bare hills area. Various conservation efforts have been taken by several parties; one of the efforts includes replacing potato crops with other types of crop, such as strawberry (Ngabekti, et al, 2007). However, the economic factor of potato farming discourages farmer to replace it; hence, environmental damage is increasingly severe.

Whether or not land conservation is running can be seen from its farmer participation. If farmers participate in the land conservation, they have been implemented the conservation values. Participation used in the research refers to conservation activity index (*Indeks Kegiatan Konservasi/*

IKK) and those in Rachmaniah (2016). The index refers to research by Suwanto, et al, (2012), farmer participation in land conservation can be approached through IKK that consists of several activities, namely: (1) the making of terraces/*galengan* (dike in rice field) on a sloping land, (2) planting terrace-reinforcement grasses or plants, (3) land cultivation according to the contour line, (4) plant cultivation according to the contour line, (5) seasonal crop rotation, (6) planting perennial crops on high slope land, (7) the use of mulches or manure, (8) terrace or *galengan* maintenance, (9) the making of drainage, and (10) farmer responsibility on land conservation. Participation refers to a research by Rachmaniah (2016) comprises: (1) participation in ways of thinking, (2) participation in properties or objects, and (3) participation in man force.

RESEARCH METHOD

The research was conducted at agricultural areas in Dieng Mountains located between Wonosobo and Banjarnegara Regencies. Dieng Mountains is one of potato agricultural activity locations with high intensity consisting of low land areas, slope areas, and hills. The research was carried out in two agricultural land areas: plateau areas and slope areas of Dieng Mountains located in Sikunir hills. Administratively, the location was within two villages, Sembungan Village in high slope land and Dieng Kulon Village in form of flat areas (Figure 1).

The research population was potato farmers in Dieng areas of 1,428 farmers who settled in plain areas and Dieng slope areas. Sampling technique used purposive sampling. Sample characteristics included farmers who had land in flat and sloping areas, knowledgeable, and at the age of 30 to 60 years old (young generation to elders). There were 60 respondent samples consisted of 30 farmers from Sembungan Village who mostly owned high sloping land and 30 farmers of Dieng Kulon Village who mostly owned flat areas.

The research variables were local wisdom and farmer participation. Participation

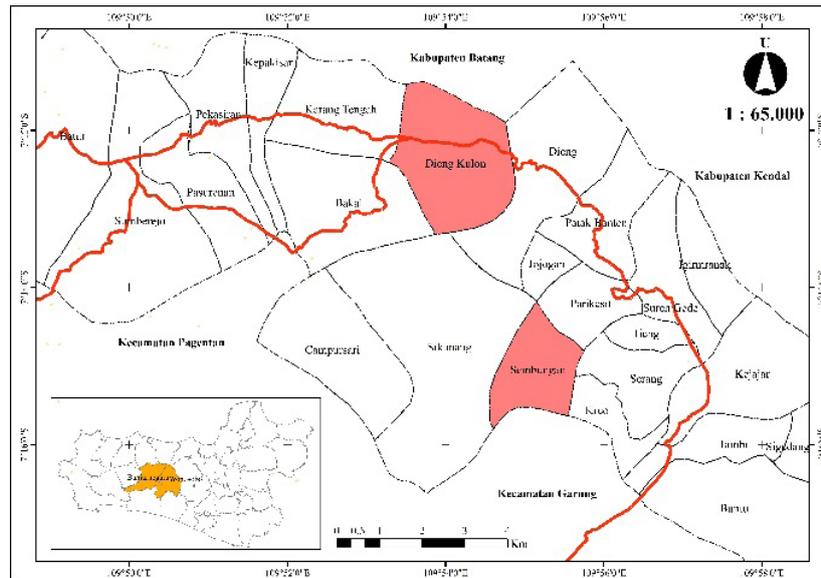


Figure 1. Research Location Map

parameters comprised: land conservation activity index (IKK) and thought participation, man force participation, and properties/objects participation. Data collection techniques were questionnaire, interview, and observation, whereas data analysis method used percentage frequency.

The research used a quantitative approach using frequency analysis and IKK calculation. The percentage frequency analysis used the following steps: 1) raw field data were available, 2) raw data were arranged from the smallest value to the largest or vice versa, 3) a number stating the amount of data known as frequency, 4) percentage frequency was calculated using the following formula:

$$\text{Percentage frequency} = \frac{\text{frequency of class } i}{n} \times 100\%$$

Note: class i= number of data in certain category; n= number of data

If the frequency of the responding farmers was more than 50%, it indicated that farmers participated and understood their knowledge. The form of local wisdom was analyzed using interview technique and classified based on farmer response regarding local wisdom existed in Dieng area.

Analysis of data on farmer participation by calculating the IKK value index, using

the IKK model criteria (Suwanto and Sapja, 2012) include: (1) making terraces/slopes on sloping land, (2) planting terrace plants or reinforcing grass, (3) processing land according contour line, (4) plant cultivation according to contour line (5) annual crop rotation, (6) annual crop planting on land with high slope, (7) use of mulch or manure, (8) terrace or galengan maintenance, (9) manufacture of drainage channels; and (10) a sense of responsibility of farmers for land conservation.

RESEARCH RESULT

Human, likewise farmers, depend on their environment. Farmers require land and vice versa, which is a form of interaction. The interaction includes temperature, light, climate and reciprocity with the environment. If human activities in this modern era give more emphasize on economy, the future ecological sustainability becomes unnoticed in development (Setyowati, et al, 2012). Dieng area is located in highland in Sembungan Village and lowland in Dieng Kulon Village. It has different adaptation to maintain a balance with nature, which is between land conservation and local wisdom. Farmers' effort to improve prosperity and land conservation was conducted by maintaining the existing local wisdom as their ancestor heritage.

Sembungan Village area is mostly potato farming land. The land stretches from residential areas to the hilltop areas. Farmers in the village built *galengan* to strengthen their land. The *galengan* was strengthened using stones or grasses. Up to now, conservation activity was conducted by building *galengan*/terrace in sloping areas. The *galengan*/terrace is a compulsion for their land (Figure 1).



Figure 1. Condition of Terrace, Galengan using Stones in Sembungan Village

The use of stones aimed to strengthen the sloping land during rainfall and from water flow smash. The method was applied on unstable land, which is lands that are prone to landslides if rain fall. A stable land is usually overgrown with wild grass. The *galengan* or terrace was left bare for grass to grow. The grass would strengthen the land from rain since the roots attached to the ground. The construction of *Galengan*/terrace will be closed to the construction of waterways. Waterways were an obligatory for farmers in potato crop ecosystem. Each land was required to have waterways with a depth of more and less 60cm. The waterways were used to drain water to prevent inundation that could cause rot on potatoes.

Perennials planted as a form of pro-conservation included *carica* (*Carica papaya*) and tamarillo (*Solanum betaceum*) (Figure 2). The perennials were selected because other perennials would compete with potatoes and the potatoes would lose the survival competition. In addition, potatoes required full sunlight; therefore, farmers selected those plants to maintain their land because they did not grow too high. In addition, high perennials, such as those that

could live for years, could not be cultivated along with potatoes.



Figure 2. Tamarillo and Carica among potato crops

Farmers used manure as a fertilizer for their land. It was assumed that manure did not accelerate soil damage, which was a contrast to chemical fertilizers. The manure was usually mixed with husks (Figure 2).



Figure 3. The Use of Manure for Potato Farming Land

In Dieng Kulon area, the heterogeneous community life was supported by tourism area. Perspective in potato farming was also different. The perspective changed local wisdom value related to land conservation since both were viewed separately. Knowledge and attitude, obtained from the parents,

were remained the same that included in non-formal education. The local wisdom value, however, was increasingly unknown. In other words, there were fewer farmers knew about the local wisdom that supported land conservation. The local wisdom related to land conservation in Dieng Kulon consisted of the making of non-mulch beds, the use of day-related myths, such as *jumat kliwon* or *selasa kliwon*, the use of wind to determine season, and the use of manure.

The farmers preferred to not make *galengan* or terrace for agricultural land located in flat areas. The making of *galengan* was also supported by plants or grass used as a reinforcement (Figure 4).



Figure 4. Without Galengan in Dieng Kulon low land area

Regarding plants or grass planting on *galengan* there were many farmers did not apply the method. The condition indicated that farmers were low in applying plants or grass planting on the *galengan*/terrace in their agricultural land. The making of *galengan*/terrace and plant or grass planting was also supported by maintenance. Farmers, however, showed high participation in land maintenance for potato farming.

According to farmers, the making of non-mulch beds was inherited from their parents. The activity aimed to reduce soil humidity since mulch utilization could increase soil water content. Education taught by parents was not limited to knowledge (cognitive). It included skills and attitude values and behavior towards agricultural land, which was an essential point in the education taught. Non-mulch beds had high erosion risk; hence, intercropping was

used to protect agricultural land. As stated by Ngabekti et al, (2007) the advantage of intercropping is to protect soil from direct sunlight and erosion, and reduce soil vulnerability from pests.

Local wisdom in the research referred to a concept from Chouinard, et al, (2008) and Setyowati, et al (2012) stating that local wisdom is generally kept in the attitude, awareness, viewpoint, behavior, and local community activities revealed in form of rituals, languages, folklores, songs, proverbs, dances, cultural values, beliefs, customary laws, agricultural practices, tools, materials, and so on. Community has wisdom to maintain environment, such as forests, soil, rivers, lakes, and hillsides. Sinclair and Walker (1998) explained that technology and information continue to enter and change in agricultural environment. However, not all technology and information were accepted, adopted and practiced by local farmers. The local farmers are familiar with their neighborhood and cultivation condition; therefore, they have certain wisdom (farmer wisdom) in managing land. The wisdom becomes a foundation in adopting information and technology according to local agricultural condition and in turn, it creates local knowledge.

There was not much local wisdom in Dieng Kulon Village since the area was a tourism area that gradually eroded the agricultural culture. The form of land conservation local wisdom in Dieng area is presented in Table 1.

Participation is an active process meaning that related people or group take an initiative and use their freedom to do it. The participation, in this case, is a voluntary involvement of community in their self-determined change (Boateng, 2005). According Andreeyan (2014) participation is a spontaneous involvement accompanied by awareness and responsibility towards group interest to achieve common goals. Rachmaniah (2016) proposed that participation in conservation can be divided into five, namely: (1) thought participation that can be done by suggesting ideas, (2) man force participation that can be done by providing

Table 1. Local Wisdom and Land Conservation in Dieng Area

No	Local Wisdom	Form of Land Conservation
Sembungan and Dieng Kulon (Highland and Low land areas)		
1	Day-related Myth (conducted by elders)	The myth was used to set harvest time and planting time; thus there was a pause for land recovery and maintenance.
Sembungan (Highland Area)		
1	<i>Nyabuk Gunung</i> (performed by various farmers)	Farmers cultivated land according to mountain slope and altitude or contour line
2	Intercropping	Farmers cultivated spring onion, chili, and cabbage to reduce soil erosion and protect soil from direct sunlight
3	Deep gutter or " <i>kalen</i> "	1) Farmers built <i>kalen</i> in every land to drain water flowing on the ground 2) The depth of the <i>kalen</i> was more or less 60 cm
4	"Tahi Ayam (chicken feces)" manure	Farmers cultivated land using chicken feces manure mixed with bran
5	Stony/grassy <i>galengan</i>	1) Unstable land with high slope used stone as the <i>galengan</i> foundation 2) Stable land used grass roots to strengthen the <i>galengan</i> 3) Farmers planted perennials of <i>cerica</i> and tamarillo to strengthen the <i>galengan</i>
Dieng Kulon (Low land area)		
1	Non-mulch beds	Farmers left the beds open to reduce soil humidity
2	Intercropping	Farmers planted <i>loncang</i> (spring onion), <i>dieng</i> nut and chili to protect soil from pest
3	Manure	Farmers cultivated land using natural fertilizers as follows. 1) Cristal fertilizer: a mix of 25% chicken feces and 75% rice husk 2) CM fertilizer: a mix of 5% chicken feces and 95% rice husk 3) <i>Othok</i> fertilizer: a mix of 50% rice husk and 50% chicken feces

Source: analysis research data of 2018

man force from the community, (3) properties/objects participation that can be done by donating money or property and foods, (4) skill/expertise participation, and (5) social participation.

In the research, participation referred to conservation activity index (IKK) and a research by Rachmaniah (2016). The index referred by Suwanto, et al, (2012), that farmer participation in land conservation can be approached through IKK that consists of several activities, namely: (1) the making of terraces/*galengan* (dike in rice field) on a sloping land, (2) planting terrace-reinforcement grasses or plants, (3) land cultivation according to the contour line, (4) plant

cultivation according to the contour line, (5) seasonal crop rotation, (6) planting perennials on high slope land, (7) the use of mulches or manure, (8) terrace or *galengan* maintenance, (9) the making of drainage, and (10) farmer responsibility on land conservation. Participation referred to a research by Rachmaniah (2016) that includes: (1) thought participation, (2) properties or objects participation, and (3) man force participation. Farmers' motive to conduct land conservation varied. One of them was economy, which was in order to increase land productivity and farming income. In addition, social motive could also play role since farmers should have kept the land fertile. Moreover, agricul-

tural land also belongs to future generation. As regard farmer participation in Dieng area, highland and lowland, Table 2 indicated a score of 52.31% for highland meaning that half of 30 farmers performed conservation according to IKK and the remaining 46.69% did not carry out conservation according to IKK. Lowland, on the other hand, had a score of 23.59% suggesting that

few farmers conducted land conservation based on IKK and the remaining 76.41% did not carry out conservation according to IKK.

Farmers performed IKK-based land conservation due to the change in habits. Those habits that were previously done were not carried out. The habits were hereditary habits conducted as a form of farmer participation in conservation activity. It implied

Table 2. Farmer Participation related to IKK-based Land Conservation in Dieng Area

No	Area	Percentage	Description
1	Highland	52.31%	Around 52.31% farmers conducted land conservation-related local wisdom, such as intercropping, the use of manure, the making of <i>kalen</i> and <i>galengan</i>
2	Lowland	23.59%	Around 23.59% farmers performed land conservation-related local wisdom, such as the making of non-mulch beds, the use of manure, and intercropping

Source: Data Analysis, 2018

Table 3. Farmer Participation based on IKK in Dieng Highland Area

No	Statement	%	Description
1	Farmers made <i>galengan</i> /terrace on sloping land in the agricultural land	100%	All farmers were participated in the making of <i>galengan</i> with stones or wild grass
2	Farmers planted the agricultural land with plants or grass to strengthen the <i>galengan</i>	77%	About 77% farmers strengthened their <i>galengan</i> using arranged large stones and the remaining farmers used grass.
3	Farmers cultivated land according to the contour line/cutting the slope	60%	Not all farmers cultivated their land according to the contour. Most farmers cultivated land upright to the slope
4	Farmers planted or cultivated plants according to the slope contour/by cutting the slope	43%	Approximately 43% farmers planted carrots as well as potatoes
5	Farmers carried out plant rotation, usually annually, on agricultural land	43%	Few farmers conducted plant rotation with carrots. On average, farmers did not apply plant rotation.
6	Farmers planted perennials on land with high slope level	43%	Around 43% farmers planted perennials, such as <i>carica</i> and <i>tamarillo</i>
7	Farmers used manure in agricultural land cultivation	100%	Manure used was from chicken feces mixed with rice husk
8	Farmers performed <i>galengan</i> maintenance	83%	Almost all farmers conducted <i>Galengan</i> maintenance by fixing stone arrangement or letting the weeds grew after harvest
9	Farmers made drainage/waterways on agricultural land	80%	<i>Kalen</i> was made in almost all lands to avoid inundation
10	Farmers participated in providing their own knowledge in a group	20%	Farmer groups did not work regarding sharing information related to conservation
11	Farmers also provide man force assistance in land cultivation in a group	23%	About 23% farmers provided their force during mutual assistance to maintain paralon for potato watering
12	Farmers provided donation in form of money in land cultivation in a group	0%	There was no donation in form of money for land cultivation. The money was only issued for private land affairs.
13	Farmers donated tools to facilitate the smoothness of land cultivation activity in a group	7%	Tools used for mutual assistance included sickles, hoes, chainsaws

Source: analysis research data of 2018

that farmer participation tended to be low.

Dieng farmers in lowland areas participating in their agricultural land conservation based on conservation activity index (IKK), providing ideas, man force and properties/objects were low compared to those who did not perform with a score of 76.41%. It suggested that almost none of Dieng farmers in lowland areas performed conservation for their agricultural land.

Land maintenance required longer time; thus, farmers chose to directly plant the land with new potatoes. There were no pause in agricultural land between harvest time and planting time; hence, the land had

no time to recover. Potato farmers' participation activity in Dieng highland and lowland areas was different.

There were few Dieng farmers in lowland area participated in IKK-based agricultural land conservation, provided ideas, man force and properties/objects compared to those who did not perform with a score of 76.41%. It suggested that almost none of Dieng farmers in lowland areas performed conservation for their agricultural land. Detail explanation on each score for each response could be seen in Table 4.

DISCUSSION

Table 4. Farmer Participation in IKK-based Land Conservation in Dieng Kulon

No	Statement	%	Description
1	Farmers made <i>galengan</i> /terrace on sloping area in the agricultural land	7%	Almost all farmers' land were in flat area
2	Farmers planted their agricultural land with plants or grass to strengthen the <i>galengan</i>	0%	All farmers did not participate in planting the <i>galengan</i>
3	Farmers cultivated land according to the contour line/cutting the slope	0%	All farmers cultivated land in flat area
4	Farmers planted or cultivated plants according to the slope contour/by cutting the slope	0%	All farmers did not adjusted the plants with the contour
5	Farmers carried out plant rotation, usually annually, on agricultural land	0%	All farmers did not participate in plant rotation
6	Farmers planted perennials on land with high slope level	0%	All farmers did not participate in planting perennials in their land
7	Farmers used manure in agricultural land cultivation	100%	All farmers participated in applying manure
8	Farmers performed <i>galengan</i> maintenance	100%	Farmers performed <i>galengan</i> maintenance during rainy season
9	Farmers made drainage/waterways on agricultural land ?	100%	Farmers made waterways during rainy season
10	Farmers participated in providing their own knowledge in a group	0%	All farmers did not participate in providing their knowledge
11	Farmers provided man force assistance in land cultivation in a group	0%	All farmers did not provide their power to the group
12	Farmers donated in form of money in land cultivation in a group	0%	All farmers did not donate money to the group
13	Farmers donated tools to facilitate the smoothness of land cultivation activity in a group	0%	All farmers did not donate tools in group activity

Source: Data Processing Result, 2018

Sembungan Village is located at Dieng high land. Most of its area is potato farming area. Its potato farming land stretches from residential areas to the hilltop areas. At current modern era, land conservation-based activities are rare. Potato farmers' awareness in Sembungan was fluctuated. The farmers must be reminded in order to conduct conservation. Since there was no one who reminded them about it, the conservation activities were no longer conducted. Land conservation activities in Sembungan Village had its pros and cons from its farmers. The pro was indicated by farmers who carried out IKK-based land conservation. The con was suggested by farmers who did not conduct the conservation and even abandoned the activities. Pro-conservation activities that were still being done to date included the making of *galengan*/terrace in sloping land, the making of waterways, perennials (*carica* and tamarillo) planting, the use of manure, and intercropping. These activities performed by farmers since they considered them as not disturbing the potato yield. Suwanto and Sapja (2012) say that the implementation of farmers' land conservation activities can vary, as is the case in agricultural areas in general. According to Tiwari et al. (2008) in addition to the availability of various conservation technologies that can be selected and applied in land conservation, the rate of conservation adoption is low and land fertility declines continue in the mountainous region of Nepal.

The pro-conservation activities were assumed by farmer to be able to protect their land naturally, for example intercropping that could protect soil from solar exposure, reduce erosion impact, and reduce pest that damage potatoes. Perennials (*carica* and tamarillo) planting still conducted by the farmers since both perennials were not too dense thus they did not hinder the potato crops to obtain sunlight. The making of *galengan* and waterways must be done periodically to suppress erosion rate and land slide. The farmers were conscious that their land was located in an area with high slope.

Conservation activities gradually abandoned were crop rotation and land cul-

tivation according to the contour line. The activities were deserted since they did not support the enhancement of production yield. In the modern era, farming activities were closely related to commercial activities. The farming activities were demanded to fulfill the economic activities; therefore, crop rotation and land cultivation according to contour line rarely found in the farmers' land. Farmer participation in conservation would be gradually abandoned due to the economic factor. Economic pressure required farmers to increase production and as a consequence conservation was conducted improperly.

Dieng Kulon with its heterogeneous community was supported by tourism area; thus, its perspective changed. The perspective altered land conservation value towards farmer participation. IKK-based land conservation performed by farmers included the application of manure, perennials planting such as *carica* and candle nut (peach), intercropping, and the making of *galengan* and waterways during the rainy season. Farmers in the area had transformed their perspective regarding land cultivation. It was due to economic pressure; thus, production yield was more important than land sustainability.

Flat agricultural areas affected farmers to pay less attention on their land conservation. Land conservation concept, however, could support local wisdom sustainability since such activities as non-mulch beds, intercropping, and perennials were a unity that has a positive value to the Dieng Kulon agricultural land areas. The community is very instrumental in carrying out land conservation, supported by the opinion of Setyowati, et al (2017) who said that community participation in conservation activities is an effort to preserve the value of local wisdom.

CONCLUSION

Farmer participation based on IKK in Sembungan Village and Dieng Kulon Village required some improvement. Farmer participation was seen in activities of applying

intercropping system, making *galengan*, cleaning waterways, planting perennials, and applying manure. Whereas, farmers were infrequently conducted land cultivation according to the contour, plant cultivation according to the contour, crop rotation, and increased perennials planting.

REFERENCES

- Andreeyan, R. 2014. *Studi tentang Partisipasi Masyarakat dalam Pelaksanaan Pembangunan di Kelurahan Sambutan Kecamatan Sambutan Kota Samarinda*. Samarinda. 1938-1951
- Andriana, R. 2007. Evaluasi Kawasan Lindung Dataran Tinggi Dieng Kabupaten Wonosobo. *Tesis*. Program Magister Ilmu Lingkungan UNDIP, Semarang.
- Boateng, W. 2005. Community Participation In Sustainable Land Management In Ghana. *Ghana Journal of Development Studies*, 2(2).
- Chouinard, H.H., T. Paterson, P.R. Wandschneider, And A.M. Ohler. 2008. Will Farmers Trade Profits for Stewardship? Heterogeneous Motivations for Farm Practice Selection. *Land Economics*, 84(1), pp. 66-82 ISSN 0023-769; E-ISSN 1542-8325 by The Board of Regents of the University of Wisconsin System.
- Lichtenberg, E., and R. Smitth-Ramirez. 2010. Slip-page Conservation Cost Sharing. *Amer. J. Agr. Econ.* 93 (1), pp. 113-29.
- Ngabekti, S, Dewi L.S, dan R. Sugiyanto. 2007. Tingkat Kerusakan Lingkungan di Dataran Tinggi Dieng sebagai Database Guna Upaya Konservasi. *Manusia dan Lingkungan*, 14(2), pp. 93-102.
- Prabandaru, L.H., Arief L.N., dan Abdi S. 2016. Pemetaan Lahan Kritis Kabupaten Wonosobo dengan Penginderaan Jauh dan Sistem Informasi Geografis (Studi Kasus: Kec. Kejajar, Kec. Garung, Kec. Mojotengah). Dalam *Jurnal Geodesi Undip*, 5(4), pp. 65-72.
- Rachmahniah, Nur A. 2016. Partisipasi Petani dalam Konservasi Lahan di Desa Kulur Kecamatan Majalengka Kabupaten Majalengka. Dalam *Antologi Pendidikan Geografi*, 4(2), pp. 1-10.
- Setyowati, D.L., Juhadi, dan Umi K. 2017. Konservasi Mata Air Senjoyo melalui Peran Serta Masyarakat dalam Melestarikan Nilai Kearifan Lokal. Dalam *Indonesian Journal of Conservation*, 6(1), pp. 36-43.
- Setyowati, D.L, Qomariah, Hendro A.W., dan Dany M. 2012. *Kearifan Lokal dalam Menjaga Lingkungan Pengairan, Kepulauan, dan Pegunungan*. Sanggar Press, Semarang.
- Sinclair, F.L. and D.H. Walker. 1998. A Utilitarian Approach to the Incorporation of Local Knowledge in Agroforestry Research and Extension. L.E. Buck; J. P. Lassoie dan E.C.M. Fernandes (Eds). *Agroforestry In Sustainable Agricultural Systems*, CRC Press: pp. 245-75.
- Suwarto, dan Sapja A. 2012. Model Partisipasi Petani Lahan Kering dalam Konservasi Lahan. Dalam *Ekonomi Pembangunan*, 13(2), pp. 218-34.
- Tiwari, K.R., B.K. Sitaula, I.L.P. Nyborg, and G.S. Paudel. 2008. Determinants of Farmers' Adoption of Improved Soil Conservation Technology in Middle Mountain Watershed of Central Nepal. *Environmental Management*. 42: 210- 222. DOI 10.1007/s00267-008-9137-z © Springer Science + Business Media, LLC 2008.