

## FACTORS AFFECTING AGROFORESTRY FARMERS' CAPACITY SURROUNDING NATIONAL PARK

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FACTORS AFFECTING AGROFORESTRY FARMERS' CAPACITY SURROUNDING NATIONAL PARK. The rural communities living around the National Park are generally farmers. They are less empowered and classified as poor. This is due to the relatively low capacity of the farmers. In order to be more empowered, the farmers need to improve their capacity. This study aimed to analyze the factors that directly and indirectly affect the capacity building of agroforestry farmers around the National Park. This study was conducted in Kuningan and Majalengka Districts of West Java Province for four months, from July to October 2017. This research used cluster random sampling technique based on the location of agroforestry Forest Farmer Group (FFG) in the buffer zone of Gunung Ciremai National Park. The sample size was 310 members of agroforestry Forest Farmer Group. Results show that the capacity of agroforestry farmers around the National Park was low. This is due to the low level of formal education, farming experience, cosmopolitan level, and small sized farmland of farmers. It is also caused by low environmental support factors (economic accessibility, ecological conditions, FFG role) and low participation of farmers in agroforestry both economically and socially.

Keywords: Farmers' capacity, farmers' participation, agroforestry, national park

*FAKTOR-FAKTOR YANG MEMPENGARUHI KAPASITAS PETANI AGROFORESTRI DI LINGKUNGAN TAMAN NASIONAL. Masyarakat pedesaan yang tinggal di sekitar kawasan Taman Nasional pada umumnya adalah petani. Mereka kurang berdaya dan tergolong miskin. Hal tersebut disebabkan oleh kapasitas petani yang relatif rendah. Agar petani lebih berdaya maka perlu ditingkatkan kapasitasnya. Penelitian ini bertujuan untuk menganalisis faktor-faktor yang berpengaruh langsung dan tidak langsung terhadap peningkatan kapasitas petani agroforestri di lingkungan Taman Nasional. Penelitian dilaksanakan di Kabupaten Kuningan dan Majalengka, Propinsi Jawa Barat. Lama penelitian empat bulan, mulai bulan Juli sampai dengan Oktober 2017. Teknik sampling yang digunakan cluster random sampling berdasarkan lokasi kelompok tani hutan agroforestri di desa penyangga kawasan Taman Nasional Gunung Ciremai. Jumlah sampel 310 orang anggota kelompok tani hutan agroforestri. Hasil penelitian menunjukkan bahwa kapasitas petani agroforestri di lingkungan Taman Nasional rendah. Hal ini disebabkan oleh rendahnya faktor pendidikan formal petani, pengalaman usaha tani, tingkat kosmopolitan petani, dan lahan petani sempit. Disebabkan juga oleh rendahnya faktor dukungan lingkungan (aksesibilitas ekonomi, kondisi ekologis, peran KTH) dan rendahnya tingkat partisipasi petani dalam KTH agroforestri (partisipasi ekonomi dan sosial).*

*Kata kunci: Kapasitas petani, partisipasi petani, agroforestri, taman nasional*

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## I. INTRODUCTION

The rural communities living around the forests are generally less empowered and relatively poor. This is due to the relatively low capacity of farmers. In order to be more empowered in their everyday lives, the farmers need to improve their capacity. Capacity building of agroforestry farmers can be done through the development of farmer's empowerment, namely by giving knowledge and skill needed by farmers. The development of this empowerment reflects the realization of farmers' self-reliant (Dewi, 2018; Mulyadi, 2013; Senoaji, 2011).

Statistic showed that 17.28 million people or 62.25% of 27.76 million poor people live in rural areas in and around the forests, BPS (2017). The villages bordering the forest areas are generally the center of poverty (Dewi, 2018; Adalina, Nurrochman, Darusman, & Sundawati, 2015). This condition is partly caused by the lack of access to forest resources to support their welfare. This is consistent with the findings of Puspitojati, Darusman, Tarumingkeng, and Purnama (2012) and Langat, Maranga, Aboud, and Cheboiwo (2016) who explained that the community is mostly dependent on forest resources. Commonly, they live near forests and collect forest products for self-consumption or work in forest areas. In this sense, community empowerment in forestry development is the key answer to optimize community access (Dewi, 2018; Neil, Golar, & Hamzari, 2016). Handoko (2014) explained that sustainable forest development in Indonesia is still faced with problems such as management obstacles, low management capacity and poor law enforcement. This is due to the weak coordination between law enforcers, regulation of the confiscation process, limited human resources, funds, facilities and infrastructure.

The welfare of agroforestry farmers is largely determined by their self-reliant in farming. This self-reliant can be realized if agroforestry farmers have good self-capacity. Agroforestry farmers are categorized as having good capacity if they have competence in

the cultivation of forestry crops, agriculture, plantation, livestock or fishery. Agroforestry farmers also need to understand about the processing of cultivate products as well as their marketing. In order to improve the agroforestry farmer's self-capacity, supporting factors need to be considered. Supporting factors that are considered to have an effect in improving the capacity of agroforestry farmers are the participation level of agroforestry farmers both economically and socially. The participation of agroforestry farmers may increase if it is supported by good individual characteristics of farmers and environmental support (Herman, Sumardjo, Asngari, Tjitropranoto, & Susanto, 2008; Mutmainah & Sumardjo, 2014; Sumardjo, 1999; Suprayitno, Gani, & Sugihen, 2011).

Considering that agroforestry farming, the self-capacity should be inherent in the farmers is the competence in the cultivation technique, the competitiveness of product processing, the competence in marketing and independence, namely the ability to cooperate, competitiveness, and compatibility. If the competence and self-reliant are actually controlled by the farmers, then the farmers can be declared having a high capacity (Sumardjo, 1999). Thus, studies focusing on the capacity building of agroforestry farmers around the National Park is very important. This paper determines the factors that influence the capacity building of agroforestry farmers around the National Park both directly and indirectly. Factors studied includes (1) individual characteristics of agroforestry farmers, (2) environmental support, (3) farmers participation level in agroforestry FFG on the capacity of agroforestry farmers around Gunung Ciremai National Park in Kuningan and Majalengka District of West Java Province.

## II. MATERIAL AND METHOD

### A. Time and Location

The study was conducted, from July to October 2017. Research Locations were in Kuningan and Majalengka Districts of West Java Province. These sites were selected due to its position located around Gunung Ciremai

National Park which is a conservation area of Forest Management Unit (FMU).

## B. Method

The unit of analysis in this study was agroforestry farmers. The population size in this study was 1043 agroforestry farmers. The population is a member of the agroforestry Forest Farmer Group (FFG) living in the buffer villages of Gunung Ciremai National Park. Sampling technique used in this study was random sampling which was carried out by clustering the location of Agroforestry Forest Farmer Group (FFG). The sample size used was 310 respondents consisting of 191 respondents from Kuningan District and 119 respondents from Majalengka District.

The type of research used was descriptive research with survey design. Primary data collection was performed by questionnaires, direct observations in the field, and in-depth interviews either with farmers or with other informants. Farmers agroforestry interviewed 310 people and 20 other informants namely forestry extension officers, forestry police, and village apparatus. Secondary data were obtained from various offices/agencies concerned that are Gunung Ciremai National Park, Forest Management Center Regional V Province West Java, Statistics of Kuningan Regency, and Statistics of Majalengka Regency.

## C. Data Analysis

The data collected were analyzed by path analysis. Data processing and analysis were performed by SPSS (Statistical Product and Service Solution) version 22. Dependent variables in this research are individual characteristics of agroforestry farmers ( $X_1$ ) and environmental support ( $X_2$ ). Individual characteristics of agroforestry farmers included five indicators, namely age ( $X_{1,1}$ ), formal education ( $X_{1,2}$ ), land tenure ( $X_{1,3}$ ), experience ( $X_{1,4}$ ), and cosmopolitan level ( $X_{1,5}$ ). Environmental supports consist of economic accessibility indicators ( $X_{2,1}$ ), ecological conditions ( $X_{2,2}$ ) and agroforestry forest farmer

group ( $X_{2,3}$ ). Whereas the independent variables are a participation of farmers in agroforestry forest farmer group ( $Y_1$ ) and capacity of agroforestry farmers ( $Y_2$ ). The participation of farmers in agroforestry's forest farmer group includes indicators of economic participation ( $Y_{1,1}$ ), social participation ( $Y_{1,2}$ ). While the capacity of agroforestry farmers includes farmers' agribusiness competency ( $Y_{2,1}$ ) and self-reliant ( $Y_{2,2}$ ).

## III. RESULT AND DISCUSSION

### A. Individual Characteristics of Agroforestry Farmers

Agroforestry is a business system that maximizes land use. Therefore, land tenure including area and ownership become very important factors for agroforestry farmers. Agroforestry is a form of land use that combines forestry crops with agricultural crops and/or livestock on the same land. Agroforestry farmers manage land with mixed crops, namely timber, fruit and vegetables.

Individual characteristics of agroforestry farmers around the National Park in this study are indicated by age, formal education, land tenure, farming experience and cosmopolitan level. Agroforestry farmers in Gunung Ciremai National Park are classified as being of productive age, low educated, small sized farmland, low farming experience, and low cosmopolitan level. The description of the distribution of agroforestry farmers according to individual characteristics in Kuningan and Majalengka districts in 2017 is detailed in Table 1.

The productive age of agroforestry farmers around Gunung Ciremai National Park of Kuningan and Majalengka districts is in the early to middle adult categories, which were about 18-50 years old (55.16%). While 44.84% tended toward unproductive age because they are already old or classified as final-adult with the age of more than 50 years. The farmers' ability to work in managing land with agroforestry system is affected by age. Land management

Table 1. Distribution of agroforestry farmers according to individual characteristics and categories in Kuningan and Majalengka Districts in 2017

Individual Characteristics of Agroforestry Farmers	Category		Sample Size	%
Age	Early adult	18–35	39	12.58
	Mid-adult	36–50	132	42.58
	Final-adult	>50	139	44.84
Average : 50 years				
Formal Education	Elementary School	2–6	183	59.03
	Junior High School	7–9	61	19.68
	Senior High School	10–12	57	18.39
	Bachelor	13–18	9	2.90
Average : 8 years				
Land Tenure	Very narrow	0.01–1.00	309	99.68
	Narrow	1.01–2.00	1	0.32
	Large	2.01–3.00	0	0.00
	Very wide	3.01–4.00	0	0.00
Average : 0,48 hectare				
Farming Experience	Very low	1–18	141	45.48
	Low	19–34	115	37.10
	High	35–51	49	15.81
	Very high	52–67	5	1.61
Average : 21 years				
Cosmopolitan Level	Very low	0–25	63	20.32
	Low	26–50	167	53.87
	High	51–75	70	22.58
Average Score : 39	Very high	76–100	10	3.23

with agroforestry system requires productive age because the workload is intensive. Physically, agroforestry enterprises require farmers who are still in the productive age ranging between 18–50 years (Hudiyani, 2013; Premono & Lestari, 2013; Suherdi, Amanah & Muljono, 2014). Furthermore, Suherdi et al. (2014) asserts that in productive age, the farmer is a strong physically has adequate knowledge and ability and good intensity of social relations, so as to be able to do farming well.

The formal education of agroforestry farmers in Gunung Ciremai National Park of Kuningan and Majalengka districts was dominated by farmers who graduated from elementary and junior high schools (78.71%). This will have an impact on efforts to increase farmers' capacity. This condition is consistent with findings of Kusumedi and Jariyah (2010); Premono and Lestari (2013), and Suherdi et al. (2014) who reported that agroforestry farmers generally graduated from elementary and junior

high schools. This is in line with Winata and Yuliana (2012) who stated that in agroforestry, forest farmers are well highly educated, they only have farming experience that has been with them since a young age. Nevertheless, low level of formal education does not prevent forest farmers from gaining knowledge for their advancement, particularly in farming.

All farmers' land used for agroforestry farming in Gunung Ciremai National Park of Kuningan and Majalengka districts are classified as narrow and very narrow. The size of farmers' land for agroforestry business ranged from 0.01–2 hectares. The size of the land will greatly determine the volume of trees produced in the agroforestry business. Agroforestry is a business system that maximizes land use. Therefore, land tenure including area and ownership becomes a very important issue for agroforestry farmers. On the larger land owned by the farmers, the selected plants tend to be monoculture. Whereas the farmers who

have narrow land prefer to plant various types of plants (polyculture) in order to meet the needs of subsistence and to have savings at the same time. The land area managed by farmers may come from their own land, leasing or sharecropping system. These systems will have an effect on their management, particularly for land used to cultivate annual crops or long-term crops. Likewise, Hudiyani (2013) and Salampessy, Bramasto, and Purnomo (2012) explained that the area of land controlled by farmers for business has a significant difference to farmers' participation.

Farming experience of agroforestry farmers in Gunung Ciremai National Park of Kuningan and Majalengka districts was low (82.58%). These agroforestry farmers are generally native in their villages so that farming has been done for generations. Farmers in terms of agroforestry farming, on average, have 21 years of experience. This experience is still relatively low because there are 67 years of experience of farming. Experience in agroforestry farming may support the capacity building process of farmers. According to Padmowiharjo (1994), one's experience is a knowledge experienced by the person in an unspecified period of time. A pleasant and satisfying experience will have a positive impact on the same behavior and will be applied to the next situation.

The cosmopolitan level of agroforestry farmers in Gunung Ciremai National Park of Kuningan and Majalengka districts was low (74.19%). This condition showed that agroforestry farmers in Gunung Ciremai National Park are less open to information from outside. They consider that information from outside may not increase their capacity. Suprayitno, Gani, and Sugihen (2011) in their research revealed an opposite reality. Farmers who have wide access to various sources of information will have more information resulting broader knowledge and insight, better attitudes and improved skills. Similarly, Herman, Asngari, Tjitropranoto, and Susanto (2008) explained that the cosmopolitan level significantly affects the capacity of vegetable

farmers both in Pasuruan and Malang districts. This means that the increase of the cosmopolitan level of farmers may also provide an increase in farmers' capacity.

## **B. Environmental Support**

Environmental support in this study is indicated by economic accessibility, ecological conditions, and FFG roles. Economic accessibility and FFG role of agroforestry farmers around National Park were low, while the ecological condition was high. Distribution of agroforestry farmers according to the environmental support and its category in Kuningan and Majalengka districts in 2017 is detailed in Table 2.

Economic accessibility around National Park of Kuningan and Majalengka Districts was classified as low and very low (85.16%). This condition proves that in developing their business, agroforestry farmers still depend on the strength of personal or family capital. They still do not rely on capital support from public, private, and/or cooperative financial institutions. The result of in-depth interview confirmed that they are not interested in getting support from financial institutions (Banks) that offer loans of farming capital. Such disinterest is due to the high cost interest rate of the bank. The farmers have an opinion that the agroforestry farm is like gambling. If they have good luck, they will be able to gain big profit, otherwise, if they have bad luck, they will suffer loss. This is due to the unclear factor of product prices.

Ruhimat (2015) explained that there were seven attributes on the economic dimension that have the potential to affect the sustainability of agroforestry farming, namely the level of economic effectiveness, the stability of the selling price of the crops, the source of farming capital, the place of selling crops, the diversification of income sources, the system of agricultural product sale and the contribution of agroforestry to total income of farmers.

The ecological condition of agroforestry farms in Gunung Ciremai National Park was

Tabel 2. Distribution of agroforestry farmers according to the environmental support and its category in Kuningan and Majalengka districts in 2017

Environmental Support	Category*	Sample Size	%
Economic Accessibility	Very low	147	47.42
	Low	117	37.74
	High	41	13.23
	Average Score : 32	Very high	5
Ecological Condition	Very low	7	2.26
	Low	55	17.74
	High	112	36.13
	Average score : 72	Very high	136
Agroforestry farmer group	Very low	88	28.39
	Low	115	37.10
	High	70	22.58
	Average score : 41	Very high	37

Remarks: The range of score is 0-100. \*) category of 0-25: very low, 26-50: low, 51-75: high, 76-100: very high

good (80%). The topography of the land in Mount Ciremai National Park is generally hilly, but road access is relatively good so it is easily accessible through transportation tools such as four-wheeled vehicles. This condition makes it easier for farmers to do their farming activities such as the transportation of seeds, fertilizers, and agricultural products. Agroforestry is a form of land use that combines forestry crops with agricultural crops and or livestock on the same land to optimize economic, ecological and social functions. Farmers' land is strongly supported by regional access. The topographical condition of the agroforestry business area is also crucial in the selection of business commodities.

In addition, the access of agroforestry areas to the market will also be considered by the farmers. Access to the market may affect price certainty and this will certainly have an impact on the sustainability of the agroforestry business. Similarly, soil fertility will also determine the pattern of farming. Market certainty is the next aspect affecting the level of motivation of farmers around the forest to participate in the management of candlenut forest. The ultimate goal of a farm, in addition to fulfilling household needs, is that the agricultural products can also be sold or may provide financial benefits. Marketing of candlenuts by farmers around the

candlenut forest in Maros district, in general, does not encounter many obstacles because there are already parties who are ready to accommodate or buy the products whenever farmers sell it. This provides assurance for the financial sustainability of farmers' households (Suprayitno et al., 2011).

### C. Farmers' Participation in Agroforestry Forest Farmer Group (FFG)

Farmers' participation in agroforestry FFG of Mount Ciremai National Park is indicated by economic and social participation. Farmers' economic participation in agroforestry was relatively weak at 88.06% which is in the low and very low categories. While the level of social participation of farmers in the FFG was relatively good at 54.19% which is in high and very high categories. Farmers' economic participation in FFG is measured through the selection of plants according to FFG agreement, the use of capital obtained through FFG, and the amount of cooperation that has been established by farmers. While farmers social participation in FFG is measured by farmers' activeness in the activities of mutual cooperation, praying, celebration, FFG meeting, or helping the neighbors hit by disaster. Distribution of agroforestry farmers according

Table 3. Distribution of agroforestry farmers according to their participation in Forest Farmer Group and its category in Kuningan and Majalengka districts in 2017

The Level of Farmers Participation in Agroforestry FFG	Category*	Sample Size	%
Economic Participation	Very low	196	63.23
	Low	77	24.84
	High	26	8.39
Average Score : 24	Very high	11	3.55
Social Participation	Very low	44	14.19
	Low	98	31.61
	High	107	34.52
Average Score: 54	Very high	61	19.68

Remarks: The range of score is 0-100. \*) Category of 0-25: very low, 26-50: low, 51-75: high, 76-100: very high

to the level of farmer's participation in FFG and its category in Kuningan and Majalengka Districts in 2017 is detailed in Table 3.

Farmers' participation in FFG is the mental and emotional involvement of farmers in situations of FFG activities that encourage them to contribute in an effort to achieve the desired goal. This involvement may be due to following others or future orientation. This is in line with Ruhimat (2013), Salampessy et al. (2012), and Suprayitno et al. (2011). who explained that farmers' participation is a form of active involvement of farmers in a particular business or program. Activity or program initiatives may come from outside the community or emerge from within the farming community itself. The level of agroforestry farmers' participation can be seen from the technical, managerial and social aspects. Technical participation involves farmers being actively involved in the cultivation of agroforestry enterprises that cultivate forestry crops and crops, livestock or fisheries. Managerial participation concerns in planning agroforestry farming activities, aspects involved in agroforestry farming activities, aspects of enjoying and/or utilizing the results of agroforestry farming activities, and monitoring aspects of agroforestry farming activities. While social participation concerns on how far farmers are actively involved in agroforestry efforts based on the purpose of maintaining land damaged by landslide or water drought.

Tjitropranoto (2005) explained that increasing participation of farmers towards the interactive direction in the provision of technology can be done by appointing farmers to become cooperators of an adaptation test, implementer of technological title, and so on. This may increase the farmers' self-capacity. Furthermore, the participation of farmers can still be improved by giving opportunities as the executor of technological degree or demonstration plot, implementer of adaptation test with intensive guidance from the researcher, because the ability of the farmers is in no doubt anymore. Farmers' participation can be improved so that it reaches the level of interactive participation and self-development by providing opportunities to farmers as cooperators on research and/or assessment activities. This situation provides an opportunity for maximum interaction between farmers and researchers/extension workers. This intensive interaction stimulates the farmers to obtain information and understand the technology more deeply, thus farmers may not only utilize it but also develop the technology of agricultural business.

This result is also in line with Rayuddin, Zau and Ramli (2010) who explained that farmers' participation in rural development is measured through full participation, moderate participation, and fewer participation approaches. It is further explained that the

Table 4. Distribution of agroforestry farmers according to capacity and category in Kuningan and Majalengka Districts in 2017

Capacity of Agroforestry Farmers	Category*	Sample Size	%
Agribusiness Competency	Very low	16	5.2
	Low	151	48.7
	High	119	38.4
Average score :50	Very high	24	7.7
Farmers' Self-Reliant	Very low	22	7.1
	Low	145	46.8
	High	135	43.5
Average score: 48	Very high	8	2.6

Remarks: The range of score is 0-100. \*) category of 0-25: very low, 26-50: low, 51-75: high, 76-100: very high

level of farmers' participation will emerge and can be manifestly realized if it is supported by the opportunity, willingness, and ability to participate and be consciously involved. Similarly, Suprayitno et al. (2011), stated that the increase of farmers' participation can be done by increasing motivation to increase income, gain recognition, conserve forests and farmers' capabilities such as technical, managerial and social skills.

#### D. Agroforestry Farmers' Capacity

The capacity of agroforestry farmers is indicated by the agribusiness competence and the self-reliant of farmers. Agribusiness competence and self-reliant of agroforestry farmers in Gunung Ciremai National Park of Kuningan and Majalengka districts were low (53.9%). Agribusiness competence is measured through the ability of farmers to apply agroforestry business techniques, agroforestry product processing, and how to sell products at higher and more sustainable prices. Agroforestry farmers' self-reliant is measured by the level of the ability to cooperate, competitiveness and compatibility of farmers. The ability to cooperate is the ability to make decisions quickly and precisely in agroforestry sector. Competitiveness is the ability to make agroforestry enterprises become more superior than those of others. Compatibility is the ability to cooperate and partner with other parties

that are mutually beneficial. Distribution of agroforestry farmers according to the capacity and category in Kuningan and Majalengka districts in 2017 is detailed in Table 4.

The capacity is the ability of a farmer to be able to carry out agricultural activities, establish the objectives of farming properly and achieve the goals that have been set in the right way, answer challenges, and qualify as a superior farmer (Herman et al., 2008 ; Anantanyu, 2011). Naturally, each individual always has an inherent capacity. The ability of farmers to meet their needs in accordance with their potential is a capacity that should not be ignored in order to achieve sustainable agriculture (Herman et al., 2008).

Tjitropranoto (2005) explained that an understanding of individual characteristics and self-capacity of farmers will determine their level of potential or readiness in accepting the technology introduced to them; conversely by knowing the potential and level of readiness of farmers in receiving agricultural technology, thus agricultural technology that will be introduced to farmers can be adjusted with their potential and readiness. By this approach, farmers will not only apply new sustainable technology, but will also develop their agricultural business using the new technology. It also shows that agricultural technology introduced to farmers should be adjusted to the self-capacity and resources and facilities owned. Adjustment to the capacity

of farmers, both self-capacity and resources or facilities, will ensure the sustainability of technology applied.

Furthermore, Herman et al. (2008) explained that capacity is internalized aspects in farmers' characteristic which is indicated by the knowledge, attitude, and skills to run the farming activities. In order to succeed in conducting farming, high capacity is needed so that farmers are able to identify potentials and take advantage of existing opportunities so that farming is executed in accordance with the intended purpose.

According to Sumodiningrat (1999), empowerment of farmers is seen from several points of view know as creating a situation that allows farmers to develop; enhancement of farmers' capacity to build farming through funding, training, infrastructure development, physical and social infrastructure, and regional institutional development; protection with partiality to weak farmers; and creating mutually beneficial partnerships. The empowerment of farmers is the basic capital for the realization of being self-reliant. Empowerment and self-reliant of farmers are an inseparable unity. Sumardjo (1999) explained that farmers' self-reliant refers to the right or ability (competence) of farmers to manage their self-capacity responsibly. Sumardjo (1999) asserted that the other characters of a true self-reliant were having advanced cognitive, affective and psychomotoric, efficient and highly competitive behaviors so that farmers are able to think or make decisions quickly and accurately, as well as be able to partner and build mutually reinforcing and beneficial cooperation.

#### **E. Factors Affecting Farmers' Participation in Agroforestry Farmer Group (FFG)**

Farmer's participation in Gunung Ciremai National Park of Kuningan and Majalengka Districts is indicated by economic and social participations in FFG which is directly affected by cosmopolitan level of farmers, economic accessibility and forest farmer groups. This means that the willingness of farmers to receive

information from outside, as well as the ease of economic access, particularly farm capital and the active role of FFG in the interest of its members may increase the participation of agroforestry farmers in their group.

Based on the result of regression analysis which is part of path analysis, it showed that individual characteristics of farmers and environmental supports have direct effect on farmers' participation around National Park. Variables of individual characteristics of farmers and environmental support had a contribution of 40.1% in explaining the changes occurred in agroforestry farmer's participation level around the National Park, while the rest, 59.9% is explained by other variables outside the model including counseling, training, or comparative studies.

Partially, it is seen that age, formal education, land tenure, farming experience and ecological conditions do not have a direct influence on the variable of farmer participation in FFG. This is because farmers are old, farmers' education is generally low, namely elementary school and junior high school, low farming experience, and small sized managed land. While the cosmopolitan level, economic accessibility and FFG role have a significant effect on the variables of farmers' participation in FFG. Regression coefficient of factors affecting farmers' participation in FFG in Kuningan and Majalengka districts in 2017 is detailed in Table 5.

The variables of age, formal education, land tenure, farming experience, and ecological conditions that have no significant effect on agroforestry farmers' participation, hence these factors are eliminated from the model. Thus, the structural equation is as follows:

$$Y_1 = 0.280X_{1,5} + 0.152X_{2,1} + 0.373X_{2,3} + \epsilon_1 \dots(1)$$

Based on the coefficient value (+), the variables  $X_{1,5}$ ,  $X_{2,1}$  and  $X_{2,3}$  have a positive influence on the variable  $Y_1$ , which means that an increase of 1 unit of variables  $X_{1,5}$ ,  $X_{2,1}$  and  $X_{2,3}$  will increase the variable  $Y_1$  to 0.280, 0.152, and 0.373, respectively, assuming all other independent variables remain constant. It can be interpreted

that the increase of farmer cosmopolitan level, economic accessibility and FFG will be able to increase the participation of agroforestry farmers in FFG both economically and socially. The willingness of farmers' to receive information from outside can directly affect farmers' participation in FFG. Similarly, the ease of partnering with financial institution and forest farmer group activities also has a direct effect on the increase of agroforestry farmers' participation in FFG.

Factors directly affecting farmers' participation in FFG based on the path analysis is presented in Figure 1. In relation to the level of participation and self-reliant of farmers, the age of farmers does not indicate a significant difference (Hudiyani, 2013; Salampessy et al., 2012; Arolita, Amanah, & Susanto, 2008). While Herman et al.(2008) asserted that the level of education has a significant effect on the capacity and self-reliant of farmers. As described by Suprayitno et al. (2011), age showed a dominant influence on the level of ability of farmers around the forest. Older farmers have long lived in the forest and have long interacted with forest, managed and utilized the forest products, thus their ability in managing forest has been integrated and became part of everyday life.

In relation to the level of participation and self-reliant of farmers, the level of formal education of farmers does not indicate a significant difference (Hudiyani, 2013; Salampessy et al. 2012). While Herman et

al. (2008) asserted that the level of formal education of farmers has a significant effect on the capacity and self-reliant of farmers. Arolita et al. (2008) revealed that the level of formal education has a high correlation coefficient with the level of self-reliant on the capital. This indicates that the higher level of formal education of respondents, the higher the level of self-reliant in the capital.

**F. Factors Affecting Agroforestry Farmers' Capacity**

The capacity of agroforestry farmers in Gunung Ciremai National Park of Kuningan and Majalengka Districts is directly affected by the levels of formal education, cosmopolitan, ecological conditions, FFG and participation of farmers in agroforestry FFG. This means that the higher the formal education of the farmers, the more is the willingness of farmers to receive the information from outside, the easier access of roads, the more active the role of the FFG, and the higher the level of farmers' participation in FFG that ultimately increases the capacity of agroforestry farmers around the National Park.

Based on the result of regression analysis which is part of path analysis, the individual characteristics of farmers, environmental support and farmer's participation in FFG around the National Park directly affect the capacity of agroforestry farmers which is indicated by agribusiness competence and self-reliance of farmers. The individual

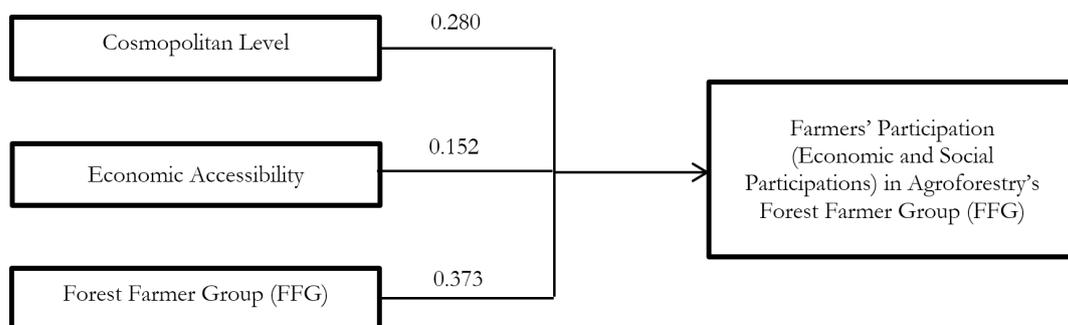


Figure 1. Factors directly affecting farmers' participation in Agroforestry Forest Farmer Group (FFG)

Table 6. Regression coefficient of factors affecting agroforestry farmers' capacity in Kuningan and Majalengka districts in 2017

Factors Affecting Agroforestry Farmers' Capacity	Regression Coefficient	Significance
Constant		0.000
Age (X <sub>1,1</sub> )	-0.047	0.501
Formal Education (X <sub>1,2</sub> )	-0.147	0.004**
Land Tenure (X <sub>1,3</sub> )	0.073	0.152
Farming Experience (X <sub>1,4</sub> )	-0.054	0.433
Cosmopolitan Level (X <sub>1,5</sub> )	0.202	0.001**
Economic Accessibility (X <sub>2,1</sub> )	0.083	0.127
Ecological Condition (X <sub>2,2</sub> )	0.334	0.000**
FFG(X <sub>2,3</sub> )	0.148	0.010**
Farmers' Participation in FFG (Y <sub>1</sub> )	0.183	0.002**
R Value: 0.603		
R <sup>2</sup> Value: 0.363		

Remarks: \*) Significantly different at the level of 0.05, \*\*) Significantly different at the level of 0.01

characteristics of farmers and environmental support contributed to farmers' participation in agroforestry's FFG of 36.3% in explaining the changes occurred on the variable of agroforestry farmers' capacity around the National Park, while the rest 63.7% is explained by other variables outside the model.

Partially, it can be seen that age, land tenure, farming experience, and economic accessibility have no significant effect on the capacity of agroforestry farmers in FFG. Whereas formal education, cosmopolitan level, ecological condition have a significant effect on farmers' participation in FFG. The regression coefficient of factors affecting the capacity of agroforestry farmers in Kuningan and Majalengka Districts in 2017 is detailed in Table 6.

Based on the above explanation, then the structural equation is as follows:

$$Y_2 = (-0.147X_{1,2}) + 0.202X_{1,5} + 0.334X_{2,2} + 0.148X_{2,3} + 0.183Y_1 + \epsilon_1 \dots\dots\dots(2)$$

The coefficient value (+) of variables X<sub>1,5</sub>, X<sub>2,2</sub>, X<sub>2,3</sub> and Y<sub>1</sub> has a positive influence on the variable Y<sub>2</sub> which indicates that the increase of 1 unit of variables X<sub>1,5</sub>, X<sub>2,2</sub>, X<sub>2,3</sub> and Y<sub>1</sub> will increase variable Y<sub>2</sub> equal to 0.202; 0.334; 0.148; and 0.183 units, with the assumption that other independent variables remain constant.

While the coefficient value (-) of variable X<sub>1,2</sub> has a negative effect on the variable Y<sub>2</sub> which indicates an increase of 1 unit variable X<sub>1,2</sub> will reduce the variable Y<sub>2</sub> of 0.147 unit, with the assumption that other independent variables remain constant.

The Factors that directly and indirectly affect the capacity of agroforestry farmers around the National Park based on path analysis are presented in Figure 2. Based on the results above, it proves that the cosmopolitan level and FFG have direct and indirect effects on the capacity of agroforestry farmers. This means that if the cosmopolitan level of farmers and FFG are improved, it will directly or indirectly increase the capacity of agroforestry farmers, either agribusiness competence or self-reliant. Economic accessibility does not directly affect the change in farmers' capacity but indirectly affect it through the level of farmer participation in agroforestry FFG. This indicates that the better the economic accessibility, the better the farmers' participation in agroforestry and it will further increase the capacity of the farmers. While the formal education of farmers and ecological conditions directly affect the change in agroforestry farmers' capacity, without any change in the level of farmer participation in

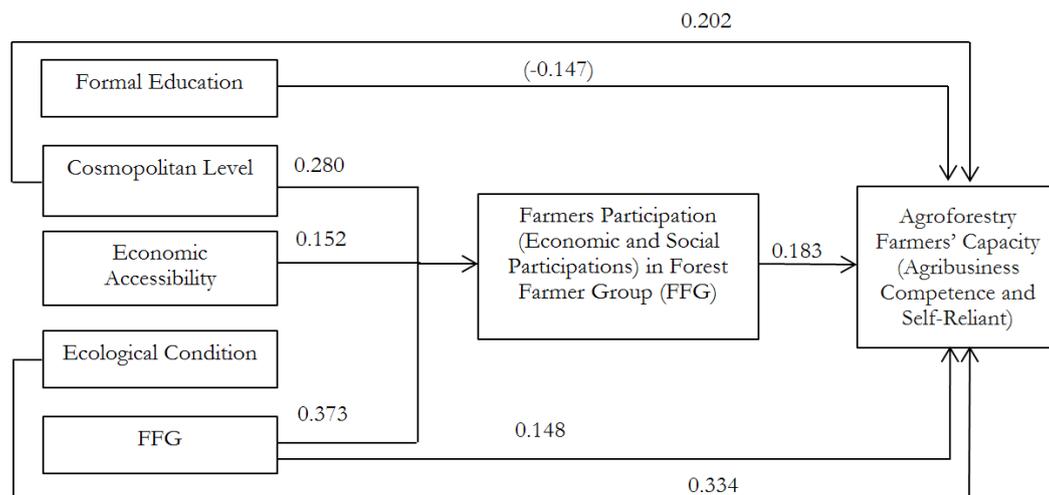


Figure 2. factors directly and indirectly affecting the capacity of agroforestry farmers

agroforestry FFG. This indicates that the higher the formal education of agroforestry farmers and easier road access, the higher the capacity of agroforestry farmers. The formal education of farmers (Figure 2) has a negative effect on the capacity of agroforestry farmers. It explains that agroforestry farmers who have a high education are not interested in agroforestry. They will look for other businesses that are better suited to their educational level, thus their land is not managed optimally.

Based on results of this study, factors affecting the capacity of farmers are formal education, cosmopolitan level, economic accessibility, ecological conditions, the role of FFG, and the level of farmer participation in agroforestry's FFG. These factors affect the capacity of agroforestry farmers either directly or indirectly. These findings are in line with the results obtained by Mutmainah and Sumardjo (2014) that personal factors including age, educational level, and farming experience may have an impact on the high level of farmers' participation in the empowerment process. Similarly, the results obtained by Ristianasari, Muljono, and Gani (2013) described factors that are related to community's self-reliant including socio-demographic characteristics, interaction and access, and empowerment

program approaches. The results of this study support the findings of Arolita et al. (2008) who stated that self-reliant is not dependent on other people, however, it will increase if there is cooperation between catfish farmers. Indicators related significantly to self-reliant are formal education, the number of family member, cosmopolitan level, business experience, and access to credit. The self-reliant of catfish fishers is not dependent on age and educational level of fishers, but the motivation to live better so that the needs of everyday life can be fulfilled.

#### IV. CONCLUSION

The weak individual characteristics of farmers directly affect the low capacity of agroforestry farmers around the National Park area. The most influential aspects are the level of formal education and cosmopolitan of farmers. Farmers' education is generally low, namely elementary school and junior high school. In general, they are less active in agroforestry farming or are less serious in cultivating land, thus their capacity becomes low.

Weak environmental supports also directly affect the low capacity of agroforestry farmers around the National Park area. The most influential aspects are the ecological conditions

and the role of FFG. Farm road access needs to be maintained and its quality needs to be improved. The hilly topography needs to be guarded against landslides by planting many kinds of protective trees. In addition, water sources need to be maintained and managed properly so as to provide justice for farmers.

The low level of farmer participation in agroforestry FFG directly affects the low capacity of agroforestry farmers around the National Park area. The levels of farmer participation are indicated by aspects of economic participation and social participation. Farmers' involvement in FFG economic activities, whether in terms of business capital, seed demand, fertilizer, equipment, or product marketing is able to increase their capacity. Similarly, by actively attending meetings, recitals, working together, and helping neighbors hit by disaster, are also factors able to increase their capacity.

The low capacity of agroforestry farmers around the National Park area is also indirectly influenced by the economic accessibility, farmers' cosmopolitan level, and the role of FFG. Increasing aspects of economic accessibility, cosmopolitan level, and the role of FFG have been able to increase the participation of farmers in agroforestry FFG, which further enhances the capacity of agroforestry farmers around the National Park area.

In term of capital needs fulfillment, agroforestry farmers still rely heavily on the economic capacity of the family. They have not been interested in making use of government or private financial institutions and cooperatives. This is due to the complexity of the financial institutions' bureaucracy and the high interest rates on loans.

## RECOMMENDATIONS

The formal education of agroforestry farmers needs to be increased through package programs A, B or C. Meanwhile, cosmopolitan levels may be improved through training, seminars, workshops or internet-based forestry extensions. The role of FFG for farmers needs to be increased through forestry extension

conducted by forestry extension agents with a higher intensity, empowering FFG as a learning tool, fostering cooperation, facilitating farming needs, or solving farmers' problems. Economic accessibility needs to be increased by facilitating bureaucracy, unsecured or non-interest venture capital loans facilitated by the government. Improved coordination between local government (institutions of forestry education in regencies or provinces) and central government (Ministry of Environment and Forestry) needs to be conducted so that better cooperation can be established in the framework of the implementation of forestry extension as an effort to increase the capacity of agroforestry farmers around the National Park area.

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