Relationship of various factors affecting the sustainable private forest management at Pajangan District, Special Regions Yogyakarta, Indonesia

B Widayanto¹,⁴, R Karsidi², Kusnandar³ and J Sutrisno³

¹ Doctoral Program in Community Development and Empowerment, Graduate School, Universitas Sebelas Maret (UNS), Jl. Ir. Sutami No. 36A, Keningan, Surakarta, Central Java 57126, Indonesia
² Department of Education, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36A, Keningan, Surakarta, Central Java 57126, Indonesia
³ Department of Agribusiness, Universitas Sebelas Maret, Jl. Ir. Sutami No. 36A, Keningan, Surakarta, Central Java 57126, Indonesia
⁴ Corresponding author: budiwidayanto@ymail.com

Abstract. Forests have a role and function in providing good atmosphere with stable oxygen content and affecting global climate stability. Good forest management will provide stable climatic conditions in global climate change. A good forest is managed to provide a sustainable environment condition. This study aims to analyze the relationship of various factors affecting the sustainability of private forests management. This research is a quantitative research with survey method and determination of sampling are was by purposive sampling. Sampling method using multiple stage cluster sampling with 60 samples. From the results it was found that the successful sustainable private forest management influenced by various factors, such as group dynamics, stakeholder support, community institutions, and farmer participation. The continuity of private forest management is determined by the fulfillment of economic, social and environmental dimensions. The most interesting finding is that the group dynamics conditions are very good, whereas the sense of togetherness among community is very strong under limited resources managing private forests. The sense of togetherness resulted creativity to diversify business and thus reduced the pressure in exploiting the forest. Some people think that managing the people's forest as a culture so that its existence can be more sustainable.

1. Introduction
Forest is an ecosystem unit that exists from a natural process and its existence greatly affects the interaction between human’s social, economic life, and their natural environment. A study of forest which is according to the Sustainable Development Goal’s (SDG) at objective 15 deals with life on land. It discusses in detail life on land by emphasizing on protection, restoration, sustainable improvement of the land ecosystem utilization, sustainable forest management, reduction of barren or monarable/arid lands (i.e. combating desertification), prevention and recovery of land degradation, and putting an end to the loss of biodiversity.

According to Bauer et al. [1] the attainment of the SDG’s target are, inter alia, a) to ensure conservation, restoration, and land utilization that are compatible with a sustainable ecosystem of land freshwater and the hinterland; b) to promote the implementation of sustainable management of all types of forest, to put a stop to deforestation, recover damaged forest, and step up afforestation and
reforestation globally; c) more specifically, the idea of the management of long-lasting forest seems to focus on logging, while forest conversion into farmland is the main impetus to global deforestation.

Forest has a strategic function in determining global climate because its vegetation can serve to change CO₂ into organic matter and O₂ (O₂ availability in the atmosphere), so that it can reduce global warming. Indonesian tropical forests have a strategic position geopolitically in responding to global climate change, reduction of carbon emission, conservation of reserves and increase in carbon intake/absorption. Tropical forests have a role in the process of the equilibrium of carbon cycle in the earth’s atmosphere to maintain global climate [2]. Forest has its importance in the aspect of social welfare individually and in the interest of a larger area. Law No. 41 of 1999 concerning forestry Article 18 paragraph 2 stipulates that a province or regency must reserve/set aside land utilization in the form of forest preserve of 30% in the RTRW (spatial and regional plan). The land area of DIY (The Special Region of Yogyakarta) is 318,580 hectares, so 95,574 hectares is needed. The data on the area of state-owned forest in DIY is 16,819.52 hectares (i.e. 5.28% of land area). This condition indicates that in order to fulfil the stipulation of Law No. 41 of 1999, there is a need to increase the acreage of forest beyond the state-owned forest with the alternative of extending and improving the quality of the people’s private and the state-owned forest. According to the data in the district and provincial forestry office in 2004, the area of state-owned forest and the peoples’ (private) forest was 56,211.34 (17.64% of DIY area), thus there was still a shortage of forest area as much as 38,388 hectares (12.36%). This necessitates a policy in the utilization of the people’s forest which can meet the interest of the community and larger region.

The objective of this research is to carry out a study on the relationship of various factors that affect the sustainable private forest management. The factors under study were community development, community institutions, stakeholder support, group dynamics, farmer participation affecting the sustainable private forest management.

2. Literature review

Pajangan is private (privately owned) forest area of 950 hectares. Its people are joined together in a group which called Wono Lestari UMHR (private forest management unit). An institutional approach through UMHR is adopted to avoid the management and utilization of private forest by individual families instead of a collective action, so the private forest employment is operated without the collectivism/ togetherness principle in dealing with the environment. The individual families application often motivate excessive logging, which is resulting in an environmental imbalance. On the other hand, the community’s capacity for establishing the private forest ecosystem is the their culture product which should be respected and appreciated by all concerned parties [3].

Wono Lestari UMHR has a system called SVLK (Timber Legality Verification System), which is a requirement to fulfil the timbers/ products legality that is devised according to a parties concerned consensus who set up standards, criteria, indicators, verifiers, verification method, and evaluation norms (Forestry Ministerial Regulation No. P.38/Menhut-11/2009 Article 1 para. 10). This certification has an implication for acceptance and recognition by the international market on the local timbers product and it bolsters the long-lasting forest management. UMHR also has a certification called PHBML (Sustainable Community-based Forest Management), which is a forest and forest products management that is practiced by the traditional ways of community and individuals in a community unit, community-based operation unit, as well as by individuals on a small and medium scale run in a sustainable way [4].

Wono Lestari is a forum for the private forest farming community in Bantul Regency to step up the community’s welfare by preserving and maximizing the forest potential. The vision is to become an organization that oriented to the private forest conservation, and the mission is to foster Wono Lestari as a strong organization, improve the members’ skills and knowledge, and boost the forest products selling price [5]. As a system, the private forest should be managed by paying due attention to the various functions importance that ensure the harmony of the sustainable private forest system.
The people who live in the vicinity of the forest can actually become the pillars for the creation of sustainable forest management. Their behavior is a crucial component in managing and conserving forest [6]. In addition, initiative should be encouraged from outside and gradually the rural community can learn from their own experience [7].

Private forest is owned by the farmers so all utilizations are largely determined by the farmers’ will and capability. To encourage the farmers to be willing to conduct a sustainable forest management, the most logical approach is a group approach where they are organized. Friedman [8] affirms that an individual’s capability to organize themselves in a group is regarded as the most effective form of community level empowerment (collective self-empowerment).

A dialogical encounter that fosters and strengthens an awareness and solidarity will be occurred by employing a group. Empowerment is aimed at enhancing power out of a disadvantage. Community empowerment should be able to influence community institutions that play a role in shaping the people’s behaviour in terms of the sociocultural aspect history. Besides, it should also be able to influence the stakeholders in efforts to promote a sustainable management. The behavioral change strategy says, the main strength in changing an individual’s behavior is through the process of participation in a group [9].

The empowerment has the independence and participation element, and in this context is oriented to strengthen community institutions; therefore its community members is an initial step towards the all the members participation [10]. In other words, it is a participation road, particularly in the decision making process in order to foster their independence. It is the assets and capabilities expansion of poor people to participate in, negotiate with, influence, control, and hold accountable institutions that affect their lives [11].

The results of the World Bank’s study on the agriculture development project show that the project success happens when the attention is given to institutional development and community participation [12]. Lineberry [13] suggests that the main problem in community empowerment is determined by the institutional factor that exists in the community. Its afforestation and forest rehabilitation is intended to involve all the potentialities in society, especially universities, community organizations, and non-government organizations for cultivating sustainable forest development for an indefinite period [14]. The private forestry operations development needs to be managed and designed with a sustainable forest management system. For its purpose, its management should be participatory, providing opportunities to the people who in and around the forest to actively take part for sustainable forest advancement by starting from decision making, planning implementation of activities, monitoring and evaluation as well as the products utilization. Private forest management should cover the economic, social, and environmental aspects [4].

3. Method
Research was conducted in Pajangan, Special Region of Yogyakarta with the consideration that the private forest management there has developed with the ownership of Sustainable Community-Based Forest Management (PHBML) and Timber Legality Verification System (SVLK). This research was a quantitative research using the survey method. It is the best available method in social sciences in gathering original data in order to describe a very large population observed directly [15]. By this method, the showed sampling was ensured that the samples’ characteristics can reflect a large population. In the implementation, great care is needed to determining the same standard questionnaire construction for all respondents. The survey method was adopted to create generalization from the observation of samples number.

3.1. Population and sample
A population is all the individuals, conditions, or symptoms that serve as research objects. Considering the population distribution, the technique which was used is to multiple stage cluster sampling in accordance with groups based on area, or sample taking in stages.
The taken steps with regard to the research samples were as follows: 1) Selection of subdistrict villages: Sendangsari and Triwidadi were selected for the simple reason that they pioneered the existence of Wono Lestari private forest management unit (UMHR) and sustainable community-based forest management (PHBML); 2) Selection of 3 forest farmer groups (KTH) on the basis of their intensity in the private forest sustainable management of in each village, and with the officers consideration in charge, 6 KTH were selected; 3) Random respondents sampling from each KTH: 10 respondents were selected for their active participation in private forest management (as attested by the data from the groups). As a whole, from 2 villages (6 KTH) 10 respondents were selected so that there were 60 respondents.

In this research, the data were obtained by using a research instrument with scales measurement on attitudes by Likert scale. States that the basic principle of Likert scale is determining an individual position in a continuum of attitudes to the object of attitudes, starting from very negative to very positive [16]. The model comprises 6 variables consisting of 1 exogeneous variable (community empowerment/X1-PM) and 5 endogeneous variables (community institutions/Y1-KM), (stakeholder support/Y2-DS), (group dynamics/Y3-DK), (farmer participation/Y4-PP) (sustainable private forest management/Y5-PHRB). The details of the community institutions variables (Y1-KM) consists of 3 subvariables with 22 indicators; the stakeholder support variable (Y2-DS) consists of 4 subvariables with 16 indicators; the community empowerment variables (X1-PM) consists of 3 subvariables with 25 indicators; the group dynamics variable (Y3-DK) with 9 variables with 37 indicators; the farmer participation variable (Y4-PP) consists of 5 subvariables with 17 indicators; and the sustainable private forest management variable (Y5-PHRB) consists of 3 subvariables with 29 indicators.

The data from 60 respondents were then tabulated and reliability and validity tests were performed. The results of the validity and reliability tests that met the requirements were followed by a modelling process using WarpPLS 5.0.

4. Result and discussion

The relationship results between various variables (community institutions, stakeholder support, group dynamics, farmer participation) affecting sustainable community forest management can be seen in Figure 1.

Figure 1. Various factors affecting sustainable private forest management.

Figure 1 shows the testing results on the direct effect model. The results can account for the direct relationship between variables, for instance the community empowerment direct effect on community institutions was significant with path coefficient of 0.38; the direct effect of X1-PM on Y3-DK was significant with path coefficient of 0.68, whereas the direct effect of Y1-KM on Y5-PHRB was not
significant with p-value of 0.35 (>0.05). The suitability of the model can be seen with various indicators in Table 1.

| Indicators                          | Value | P value |
|------------------------------------|-------|---------|
| Average path coefficient (APC)     | 0.417 | 0.002   |
| Average R-squared (ARS)            | 0.400 | 0.003   |
| Average adjusted R-squared (AARS)  | 0.370 | 0.005   |
| Average block VIF (AVIF)           | 1.638 |         |

\(^{a}P < 0.01\)
\(^{b}P < 0.05\)

The output in Table 1 shows that the model fit indicators have been met, i.e. APC with a value of 0.417, which means with significant with p-value 0.002 (\(**p<0.01\)) and ARS with a value of 0.400, which means significant with p-value if 0.000 (\(** p<0.01\). Likewise, AVIF indicator of 1.638 meets the ideal requirement (AVIF<=3.3).

Table 2 shows that all the path coefficient of the predictor variable effect on the response variable have a positive and significant effect, except for Y1-KM variable on PHRB which was not significant with p-value of 0.35 (>0.05). WarpPLS output was the standardized data so that it can be interpreted that the greater the path coefficient the stronger the effect will be. Table 2 displays, on the whole, the model PHRB variable has a determination value (R\(^2\)) of 0.65. the relationship path that portrays the significant effect was demonstrated by the variable coefficient and its p-value, namely Y2-DS, X1-PM, Y3-DK, Y4-PP with a p-value of <0.001, whereas if Y3-DK goes directly to PHRB without going through Y4-PP it is significant at p=0.05.

Based on Table 3 it can be explained that the community empowerment variable (X1-PM) has a significant direct effect on the community institutions variable (Y1-KM) with coefficient (beta) value of 0.38 but X1-PM has a non-significant effect (p=0.35>0.10) on the sustainable private forest management (Y5-PHRB). The X1-PM variable has a significant effect on Y3-PHRB indirectly and through the institution dynamics (Y3-DK) of 0.422 and was significant with a p-value of <0.001, so that it can be said that Y3-DK is a mediation effect of X1-PM on Y5-PHRB (mediation of 2 segments). X1-PM has a significant effect on Y5-PHRB indirectly through Y3-DK and farmer participation (Y4-PP) of 0.186 and significant with a p-value of <0.001 (mediation of 3 segments). From all path coefficients, the predictor variable has a positive and significant effect. However, the path coefficient of community institution variable effects (Y1-KM) was not significant.
This was probably due to several things: 1) The community institutions were too large/extensive to be able to attend to the private forest activities, and 2) Not all community institutions are capable of being able to support the private forest management activities effectively and efficiently.

The other results of research show that the farmer’s orientations in dealing with private forest are as follows: (1) Economic reasons to meet their basic necessities of life; for their livelihood, they rely on working as laborers, private forest operation, and partly on financial assistance from successful relatives; (2) Ecological reasons to create more green and healthier environment for the community collectively; (3) Social reasons for social life by creating job opportunities for their welfare, and cultural reasons of the community who still uphold the principle that ownership of trees (especially teak) gave a higher social status.

The three reasons were a dimension of the sustainable private forest management system, and specifically, the third reason is an extremely supportive of the sustainable private forest management achievements.

5. Conclusion and recommendations
The impacts of climate change can be reduced by sustainable private forest management. To achieve the sustainability of private forests with attention to the community institutions factors, stakeholder support, community empowerment, group dynamics, and farmer participation.

This research has analyzed the various variables effects (community institutions, stakeholder support, community empowerment, group dynamics, and farmer participation) on sustainable private forest management. The PLS results displayed that the total predictor variable percentage as much as 65%. Based on Table 2, only the relationship of Y1-KM to Y5-PHRB which was not significant, but from data processing by removing/deleting the predictor variable, the R² of the response variable decreases to 62%. Various reasons why farmers postpone logging were as follows: harvesting which according to the trees age; environmental requirements; the need for certification; and culture. The most interesting reason was by owning large-sized and older age trees, the farmers have a high social status in society, and the cultural consideration was very influential in sustainable forest management.

Although with a sample of 60 the SEM-PLS software was already able to estimate highly enough, a further research needs to use samples in accordance with the recommendation of Maximum Likelihood Estimation (MLE). Bigger samples can provide a good basis for estimation and result in data stability. Big-sized samples (>250) can enhance the accuracy and consistency of the estimated results of SEM-PLS [17].
References

[1] Deutsches Institut für Entwicklungspolitik (DIE)/ German Development Institute “The Sustainable Development Goals of the Post-2015 Agenda: Comments on the OWG and SDSN Proposals” https://www.oecd.org [Online] Available: https://www.google.co.id/search?q=German+Development+Institute+%2F+DeutschesInstitutf%C3%BCrEntwicklungspolitik+(GDI%2F+DIE).+2015.+The+Sustainable+Development+Goals+of+the+Post2015&amp;q=German+Development+Institute+%2F+DeutschesInstitutf%C3%BCrEntwicklungspolitik+(GDI%2F+DIE).+2015.+The+Sustainable+Development+Goals+of+the+Post2015&amp;sourceid=chrome&amp;ie=UTF-8 [Accessed: 13-09-2017]

[2] Soepijanto B 2014 Forests of Indonesia are Independent, Sovereign and Personality (Tangerang: Penerbit Wana Aksara) pp 70-5

[3] Awang S A, Wiyono E B and Sadiyo S 2007 Private Forest Management Unit: Local Knowledge Construction Process (Yogyakarta: Banyumili Art Network) pp 13-5

[4] Lembaga Ekolabel Indonesia (LEI) “PHBML Certification Guidelines” https://www.lei.or.id 2016 [Online] Available: https://www.google.co.id/search?q=lembaga+ekolabel+indonesia.or.id&oq=lembaga+ekolabel+indonesia.or.id&amp;qscroll=chrome&amp;ie=UTF-8 [Accessed: 13-09-2017]

[5] UMHR Wono Lestari Pajangan 2015 Document of Submission of Certification of Sustainable Community Based Forest Management (Yogyakarta: PHBML) pp 7-11

[6] Suprayitno A R 2008 Local Community Involvement: Efforts to Empower Communities Toward Sustainable Forest Jurnal Penyuluhan 4(2) pp 135-8

[7] Karsidi R 1999 Studi on the success of occupation transformation from farmer to small-scale industry worker Thesis Dissertaiton (Bogor: Graduate School of Institut Pertanian Bogor) p 46

[8] Nasdian F T 2015 Community Development (Jakarta: Yayasan Pustaka Obor Indonesia) pp 96-7

[9] Ife J 2002 Community Development: Creating Community Alternatives Vision Analysis and Practice (Sydney: Addison Wesley Longman Australia Pty Ltd) p 53

[10] Rustiadi E, Sunsun S and Dyah R P 2011 Planning and Regional Development (Jakarta: Crestpent Press and Yayasan Pustaka Obor Indonesia) p 365

[11] Narayan D 2002 Empowerment and Poverty Reduction: A Sourcebook (Washington DC: The World Bank) p 14

[12] Cernea M M 1988 Put People first in Development: Sociological Variables in Rural Development Publication of the World Bank (Jakarta: UI-Press) pp 341-373

[13] Nitiwijaya Y S 2013 The factors affecting empowerment farmers surrounding forest Thesis Dissertation (Surakarta: Graduate School of Universitas Sebelas Maret) p 56

[14] Mardikanto T 2013 Models of Community Empowerment (Surakarta: UNS Press) pp 185-200

[15] Babbie E 1983 The Practice of Social Research 3rd Edition (California: Wadsworth Publishing Company) p 209

[16] Widoyoko E P 2013 Technique of Research Instrument Preparation (Yogyakarta: Pustaka Pelajar) p 104

[17] Hair J, C Ringle and Sartstedt M 2013 A Primer on Partial Least Squares Structural Equation Modelling (PLS-SEM) (Los Angeles: Sage) p 16