Configuration of resource access explaining the performance of community forest farmer groups in Gunungkidul, Yogyakarta

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Abstract. After more than 10 years managing state forestland under a social forestry program, community forestry’s farmer groups in Gunungkidul have shown differences in terms of their performance quality. The resource accesses (defined as the ability to benefit from certain resources) as stated by the theory of access (Ribot and Peluso, 2003) could affect their performance and subsequently their overall benefits from the social forestry program. This study aims to understand which configurations of resource access affecting the performance quality of forest farmer groups. In-depth interview and observation were carried out on the six forest farmer groups, covering the different degrees of success. The data were collected to measure the level of conditional variables (resource access) and outcome variable (the performance). The level of performances are indicated by forest conditions, institutional and business aspects. This paper applied Qualitative Comparative Analysis (QCA) with a four-value fuzzy set methodology to conduct a systematic cross-case comparison using fsQCA software to analyze the relationship between the condition and outcome variables. The results showed that two configurations of resource access profoundly explained the successful performance of the farmer groups. The first combination consists of access to knowledge, technology, financial, market, and social capital which can be found in Sedyo Rukun and Sido Maju II. Each of the access in the first combination contributes 30% towards the performance. The second combination consists of access to knowledge, technology, financial, labor, and social capital which explained the condition of Sedyo Lestari, Sedyo Makmur, dan Sido Dadi. Each of the access contributes 56% towards the performance. The prime implicant for successful quality performance is found in access to knowledge, indicating that farmer-to-farmer learning and extension services from third parties are required to be encouraged in social forestry programs.

Keywords: theory of access, social forestry, knowledge, qualitative comparative analysis, Indonesia

1. Introduction
To reach economic welfare in such a way that forest-dependent people have legal rights to gain benefit from the forest resources, the Ministry of Environment and Forestry released a regulation Nr. P.83/2016 about Social Forestry [1]. The regulation acknowledges seven social forestry schemes including village forest, people’s plantation forest, community forest, forestry partnership, customary forest, and private forest. Gunungkidul is one of the districts that has implemented the concept of community forest or hutan kemasyarakatan (HKm) since 1995 [2]. The HKm scheme is based on the granted management rights by the Regent of Gunungkidul district, given to 35 farmer groups in 2007. In this case, the community forest scheme fits the property-rights theory where it is a common pool resources with the...
farms as the proprietor [3]. In 2017, the Ministry of Environment and Forestry published their assessment report on the general performance of HKm’s farmer groups [4]. The report describes four categories of performance from an unsuccessful to utterly successful group. The category is assessed on the basis of key performance indicators for forest condition, institutional and business aspects. The result shows that some groups did not satisfy the full criteria and some others were able to achieve successful performance with different levels of success, from fair to successful. The report suggests that management rights only does not enough to ensure the group in gaining benefit from the forest resources. The groups require power, not only legal access, which ensures their ability to derive benefits from forest resources.

[5] stated that the access mechanisms could be sourced from knowledge, technology, capital, market, labor, authority, negotiation informal in social relationships, and social identity. These accesses could determine the performance of the groups in exercising their power and thus could explain the failure or success of community-based forest management. Therefore, this study aims to find the access configurations influencing the success and failure of the groups. The assumption in this study is that full management rights in HKm scheme are fully implemented to the forest farmer groups, including the rights to harvest timber and non-timber forest products.

2. Methods
We conducted in-depth interview, observation and study documents to the key informants and the group activities from six forest farmer groups of HKm in Gunungkidul. The groups were selected purposively to represent the different degrees of success. The data were collected to gain information on the two variables: conditions and outcome variables. Conditions are a set of causal variables that influence the circumstance of certain outcomes. In this paper, the condition variable refers to the set theory of access, whereas the outcome variable refers to the performance of the community forest farmer groups, indicated by their forest conditions, institutional and business aspects. For the outcome variable, the questions include “What are the forest conditions in your management areas? How many assets that you earn from the forest and forest-related products and business?” The questions regarding access mechanisms are, for example, “How did your group acquire financial capital in the first place?” as one of the questions for access to financial capital. For market access, we asked: “What kind of production system is being applied for the business unit?” and “what kind of informal negotiation towards formal actors that have been done by the group?” as the question for access to social capital. Each variable has its score and indicators as explained in Table 1 – 4.

Table 1. Key performance indicators for measuring the institutional aspect

| Score | Performance Indicators for Organization Management |
|-------|--------------------------------------------------|
| 0     | Listed as a member of a legal entity (farmers group/union) but never participated in any of its activities. The organizational structure is clear but it is not functional. The administrative requirements including the organizational structure board, the information regarding members and their working area board, map of the total working area, information on penalty and job description of each position are incomplete and damaged/lost. The rules for the forest management and rights/obligations of its members were made but it is not implemented. No activities have been carried out for the past five years. |
| 0,33  | Listed as a member of a legal entity but not participated in any of its activities for the past five years. The structural organization is clear but only the head of the farmer group is functional. The administrative requirements had been made but it is damaged. The rules for the forest management and rights/obligations of its members were made but it is not implemented. Group collective activities are only in the form of regular social gatherings and savings/loans. |
| 0,67  | Listed as a member of a legal entity and still participating in daily meetings. Only the core management is running in the organizational structure. The administrative |
requirements still exist. The rules for the forest management and rights/obligations of its members have a high tolerance in terms of violations. Group collective actions are less than five activities.

Listed as an active member of a legal entity by participating in union activities and pay the mandatory fees. The organizational structure is fully functional as it should be. The administrative requirements are complete and being displayed in the secretariat office. The rules for the forest management and rights/obligations of its members are being carried out by all the members. Group collective actions are more than five activities.

Table 2. Performance Indicators for Forest Site Management

| Score | Performance Indicators for Forest Site Management |
|-------|--------------------------------------------------|
| 0     | The number of trees/hectare is almost zero with the tree diameter <10 cm. The forest site condition is abandoned with unoptimized land use under the stand. There is no maintenance for more than five years. There is no annual work plan being executed or reported for the past five years. There is no activity for site security. |
| 0,33  | The number of trees is 200-500/hectare with the tree diameter around 20-40 cm. Land use under the stand has been done in the past but failed and the stands are abandoned. The maintenance for the site is only done at the beginning of planting. There is no activity for site security. |
| 0,67  | The number of trees is 500-700/hectare with the tree diameter around 40-60 cm. Land use under the stand is being optimized but only less than two types of plants. The maintenance for the site is only done by land clearing. There is a site security activity even though it is not always executed as it scheduled. |
| 1     | The number of trees is 600-900/hectare with the tree diameter 60-80 cm. The land under the stand is being cultivated with more than two types of plants. The group routinely executed more than three maintenance activities. The annual work plan is being implemented and reported every year. The site security activity is always carried out. |

Table 3. Performance Indicators for Business Unit Management

| Score | Performance Indicators for Business Unit Management |
|-------|--------------------------------------------------|
| 0     | No business unit besides the cultivated area since the beginning of group establishment. |
| 0,33  | No business unit being carried out for the past five years. It was only in the beginning because of external assistance. |
| 0,67  | A savings/loan business run by the head of the farmer’s group and treasure only. The group capital depends on external assistance. |
| 1     | More than two business units with structured management. Profit-sharing is applied. |
| Access                  | Description                                                                 | Element                                                                 | Score  | Score | Score | Score |
|------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------|--------|-------|-------|-------|
| Knowledge              | Information regarding the community forest management received by the group | The knowledge level about community forest management                    | 0      | 0.33  | 0.67  | 1     |
|                        |                                                                            | Group did not receive any training and technical guidance and do not have the experience of managing forest |        |       |       |       |
|                        |                                                                            | Group understands the system of community forest management theoretically but failed to execute it |        |       |       |       |
|                        |                                                                            | Group received information, understands, applies, and analyses the community forest management system by personal experience or technical guidance |        |       |       |       |
| Technology             | The use of production facilities and gadgets by the group to support its forest management | The availability of the tools                                             | No use and ownership of production facilities for agriculture or forest activities | Has to be done by renting | Only in form of basic tools | Fully owned and supported by other machine asset |
|                        |                                                                            | The ability to use the tools                                             | Unavailable | <30% of the members are able to use the tools | 30%-60% of the members are able to use the tools | >60% of the members are able to use the tools |
|                        |                                                                            | The use of gadget (smartphone) as the supporting tool                    | No use of gadget | <30% of the members are already using gadget | 30%-60% of the members are already using gadget | >60% of the members are already using gadget |
| Capital                | Access to wealth in the form of finance and equipment                       | Capital source                                                           | No capital source | Only from savings/loan activity and regular fees | From external help which then used for the planned business unit | From external help which then used for developing other business units |
|                        |                                                                            | Group assets                                                             | No group assets | <10 million IDR | 11-50 million IDR | >50 million IDR |
| Market                 | The medium of product sales                                                | Product distribution area                                                | No product | A subsistent product | Product distribution covers the village area, a pre-order product, and use a retailer | A ready stock product and distributed in and out the village |
| Access | Description                                                                 | Element                                      | Score  |
|--------|------------------------------------------------------------------------------|----------------------------------------------|--------|
|        |                                                                             | 0                                            | 0,33   |
|        |                                                                             | 0,67                                         | 1      |
| Product chain | No product chain | Only between internal members | Using 1 retailer | No middlemen |
| Labor  | People who do certain efforts to gain benefits from the resources            | The total number of members                  | <10 people | 11-50 people | 51-100 people | >100 people |
|        |                                                                             | Circle of relations                          | No relation | One community | Two communities | More than two communities |
| Social Capital | Informal relations in shaping trust and cooperation in a community         | Informal negotiation frequency               | Never done any informal negotiation | Informal negotiation at the site level | Informal negotiation at plot and RPH level | Informal negotiation at the site, plot, RPH, BDH, and KPH level |
|        |                                                                             | Communication through messenger app (Paguyuban Bukit Seribu Whatsapp Group) | No communication | Only by direct meetings | Join the Whatsapp group but seldom participating in a discussion | Join the Whatsapp group and actively participating |
| Social Identity | Grouping individual based on age, sex, religion, ethnicity and race.       | The core organizational structure filled with women | No position | One position | Two positions | More than two positions |
The interview guide was being used for the interview process. It took place in six separate villages in Gunungkidul with a total of eight respondents from each of the community farmer groups. As we can see in Table 1, most of the key informants are and have been serving as the head of the farmer group for more than eight years. The exception in Wana Lestari I case is because of the newly elected head does not hold the amount of information as much as the former one.

| No | Key Informant | Community forest farmer group’s name | Title |
|----|---------------|-------------------------------------|-------|
| 1  | Sudarmi       | Sedyo Rukun                         | Head of the Farmer Group |
| 2  | Sardi         | Sedyo Lestari                       | Head of the Farmer Group |
| 3  | Tambiyto      | Sedyo Makmur                        | Head of the Farmer Group |
| 4  | Ngadiman      | Sido Maju II                        | Head of the Farmer Group |
| 5  | Marsono       | Handayani                           | Head of the Farmer Group |
| 6  | Wariyo        | Wana Lestari I                      | Former Head of the Farmer Group |
| 7  | Sumarsono     | Mintasari                           | Head of the Farmer Group |
| 8  | Sumadi        | Sido Dadi                           | Head of the Farmer Group |

All the collected information in each case will be identified, scored, and categorized based on the four-value fuzzy set according to Qualitative Comparative Analysis (QCA) method. QCA is used for analyzing the influence of certain conditions towards the outcomes [6]. The score consists of 0, 0.33, 0.67, and 1 with each of its indicators. For instance, condition in access to knowledge, 0 represents the group who does not receive training nor technical guidance and does not possess the experience in managing forest site before; 0.33 represents the group who understands forest management theoretically but failed to execute it; 0.67 is for the group who received, understands, executes, and analyzes the management system of community forest from their personal experience or technical guidance; and 1 for the group who received, understands, executes, analyzes, produces, and evaluates the whole community forest management system from their experience or technical guidance.

We used the indicators for outcomes as stated in the monitoring and evaluation report with a slight of modification. For the conditions, we created it in accordance to its type of access. If a case meets a certain threshold consistency and indicator, then that case is considered a member of a set and vice versa [7]. Once the scores for both variables are set, the objective in this paper can be executed using the help of fsQCA software.

3. Results
3.1 Quality Performance as the Outcome
Table 2 summarizes the performance of eight cases in empowering locals (Organization), improving the forest condition (Forest Site), and enhancing livelihoods (Business Unit) in each of the farmer groups.

| No | Farmer Group’s Name | Organization | Forest Site | Work Unit | Performance |
|----|---------------------|--------------|-------------|-----------|-------------|
| 1  | Sedyo Rukun         | 1            | 0.67        | 1         | 1           |
| 2  | Sedyo Lestari       | 1            | 1           | 1         | 1           |
| 3  | Wana Lestari I      | 0.33         | 0           | 0.33      | 0.33        |
| 4  | Mintasari           | 0.33         | 0           | 0.67      | 0.33        |
| 5  | Handayani           | 0.33         | 0.33        | 0.67      | 0.33        |
| 6  | Sido Dadi           | 1            | 0.33        | 1         | 0.67        |
Performance obtains the average score that has been calibrated to present the overall performance. Three cases indicate an utterly successful quality performance, two cases show a successful quality performance, and the rest of it is in the category of not successful enough. The scores in each indicator also differ depending on the case. To strengthen the result of the calibrated score performance, we directly display one case for each of the quality performance.

The participation degree for Sedyo Rukun is relatively high proven by the active attendance of its members in numerous events, either for group-only or outside the group. The organizational structure is also clear and fully functional as it should be. As for the condition of their working forest area, it is in a good condition although there are only 500-700 trees per hectare and one type of agricultural plant under the stand structure. To gain another financial resource besides the agricultural product, Sedyo Rukun is doing a saving and loan activity for its members, optimizing the group’s ownership of livestock to develop a cattle breeding, and selling the traditional herbal drink made by leaves, secang wood, and ginger.

Another example for the second quality performance which is a successful enough category belongs to Sido Maju II. For this case, only the head of the farmer’s group runs this organization. The rest of the members are merely following whatever decisions that has been made, so it is a bit challenging to receive comments or feedback from the members regarding certain matters in the group. With the total number of trees around 500-700 per hectare, their working forest area is unoptimized at all because there is not a single agriculture plant at all. While most of the farmer groups provide a saving and loan activity, Sido Maju II admitted that their installment capacity is atrocious, therefore, the activity had stopped. The only source of income for the group is from a rental of corn and paddy chopper tools.

The preceding example is Wana Lestari I whom checked all the indicators for a not successful enough quality performance. Although the head of the farmer’s group is still occupying the position, the group disbanded themselves in February 2016 because there is no collective action happening anymore in the group. The forest site is completely ruined by the illegal group of people and a couple of their own members who cut down the remaining teak stands. Before the disbandment, Wana Lestari I solely conducted a saving and loan activity.

3.2 The Mechanism of Access as the Condition
Two out of eight type of access stated by [5] are access to authority and informal negotiation in social relationship. After much considerations such as the meaning of each access and the exact indicator to portray it, we decided to combine those two into access to social capital. Table 3 describes the transformed score from the qualitative data.

| No | Farmer Group’s Name | Knowledge | Technology | Capital | Market | Labor | Social Capital | Social Identity |
|----|---------------------|------------|------------|---------|--------|------|----------------|----------------|
| 1  | Sedyo Rukun         | 0,67       | 0,67       | 1       | 0,33   | 1    | 1              | 1              |
| 2  | Sedyo Lestari       | 0,67       | 1          | 1       | 1      | 1    | 0              | 0              |
| 3  | Wana Lestari I      | 0,67       | 0,67       | 0,33    | 1      | 0,33 | 0              | 0              |
In Sedyo Lestari case, access to knowledge along with labor and social capital scores very high which means it is an active and well-functioning group that has a lot of prominent formal actors’ connection. With over than 100 members, represented by their head of the farmer groups, it shows how Sedyo Makmur maintains a beneficial relationship with many various actors, be it a local NGO or the local government by inviting them to every occasion they have. This group is capable to comprehend how the management should be undertaken for the organization and the forest site itself. They have gathered enough information about the harvesting which comprise the last step in forest management before marketing. They are close to obtain the significant benefit in form of woods from the forest site they have been working on since 2007. The score for access to technology is the same as the rest of the groups because the lack of using a smartphone or laptop to support the group’s activity when it comes to drafting letters, proposals or archiving their agenda. For that reason, they sometimes encounter difficulty in completing their paperwork. This group also scores significantly high in terms of access to capital and market. They gain a financial benefit and able to fulfill their daily needs and constitute their source of income. They primarily gain their income from a cattle breeding that they sell directly in the market. Another work unit is a tractor rental, a chopper for spices and cassava, and they also sell a garut flour and emping (both are local food). For access to social identity, we use the participation from female members as the indicator. Our hypothesis was farmer groups would benefit more in terms of the types of management activity for forest or the marketing strategy for their product. The score for this access is zero considering they never have any female member in Sedyo Makmur acting as the head, treasurer, or secretary.

### 3.3 Software Solutions

The fsQCA analysis showed there are two conditions’ configurations that could produce a successful quality performance. Using 0.9 as the threshold consistency, five cases meet the threshold and are a subset of outcomes. Those are Sedyo Rukun, Sedyo Lestari, Sido Dadi, Sido Maju II, and Sedyo Makmur while Wana Lestari I, Handayani, and Mintasari are not a subset of outcomes because their consistency is only 0.66. Table 4 shows the parameters of fit based on the intermediate solution which is the most recommended solution to interpret the fsQCA result. The first configuration has 0.31 as the raw coverage which means access to knowledge, technology, capital, market, social capital, and the absence of access to labor contributes 31\% to the outcomes. Following its unique coverage, 0.19 represents the two out of five cases in this paper. Those two cases are Sedyo Rukun and Sido Maju II.

| Configuration               | cov.r | cov.u | Consistency |
|-----------------------------|-------|-------|-------------|
| K*T*C*M*~L*SC               | 0.31  | 0.19  | 1           |
| K*T*C*L*SC*~SI              | 0.56  | 0.44  | 1           |

K=Knowledge; T=Technology; C=Capital; M=Market; L=Labor; SC=Social Capital; SI=Social Identity

![Table 8. Parameters of Fit](image-url)
The second configuration has 0.56 for its raw coverage which means 56% of access to knowledge, technology, capital, labor, social capital, and the absence of social identity influence the process of producing the outcome. With 0.44 as the unique coverage, this configuration explains three out of five cases in this paper. Those are Sedyo Makmur, Sedyo Lestari, and Sido Dadi. Both configurations demonstrate a perfect consistency which means there are no cases that are not covered by this solution.

Table 9.

| Condition     | cov.r | cov.u | Consistency |
|---------------|-------|-------|-------------|
| Knowledge     | 1     | 1     | 0.89        |

Determining the prime implicant in this paper is done by implementing the parsimonious solution. As it is shown in Table 5, the prime implicant or the type of access that is necessary for a successful quality performance is access to knowledge. Both of the raw and unique coverage have a perfect score while the consistency is below 1. It is because of the three cases that are not the subset of outcomes (Mintasari, Handayani, and Wana Lestari I) since their calibrated score is 0.

4. Discussion and conclusion

Our findings support the theory of access which acts as the base of explaining both the success and failures in community-based forest management. All the farmer groups have been operating since 2007 therefore they have the same starting point and received the same treatment. The only difference is how they use their potential and ability to gain benefit from it. It is described in the set theory of access as the internal factors from each group. Seeing the raw score in access to knowledge enables us to conclude that it is the most potential condition to perform a successful performance group. It is later confirmed by using the fsQCA software that access to knowledge is a prime implicant for the outcome. It does not mean that access to knowledge is the only condition needed to produce the successful outcome but rather to be combined with other conditions as well. Based on the results, we generally know that certain conditions influence certain outcomes. Although we have only addressed a minor fraction of conditions and our sample of case studies is small, we believe our findings are still able to give a glimpse of how different accesses produce different outcomes.

In conclusion, there are two types of conditions in order to create a successful outcome. The first is a configuration of access to knowledge, technology, capital, market, social capital, and the absence of labor. The second configuration consists of access to knowledge, technology, capital, labor, social capital, and the absence of social identity. Furthermore, access to knowledge is believed to be the prime implicant in empowering local, improving the forest condition, and enhancing livelihoods in each of the farmer groups.

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