Ex-Post Project Evaluation 2019
Package III-5:
Qualitative Comparative Analysis (QCA) Paper
(Forest Sector in India)

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Summary

Background: JICA implemented forest sector projects in India are unique in that they involve various interventions in addition to afforestation activities. Moreover, the project environment, such as climate, nature, social conditions, and economic conditions, is also diverse. Qualitative Comparative Analysis (QCA) is one of the evaluation methods that can respond to both the diversities of project activities and project environments. The uniqueness of QCA is to organize a causal relationship that exists between an outcome and a combination of conditions[1] by set theory. This study applied QCA to the forest sector projects in India and organized causal relationships based on the hypnoses of presumed causalities on a trial basis.

Purpose: This study has the following purposes: (1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement," "improvement of livelihood," and "empowerment of women," and (2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

Methodology: A questionnaire survey was conducted in 36 Joint Forest Management Committees (JFMC) which JICA supported through the ODA loan projects in India "Tripura Forest Environmental Improvement and Poverty Alleviation Project" and the "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project." In each JFMC, one respondent was selected as a representative from each of the forest departments, the JFMC, and the Self-Help Group (SHG). The working framework was designed by using existing information. In the framework, the "outcomes" were organized into five superordinate constructs and conditions were organized into six "superordinate constructs." It is also assessed that some "superordinate constructs" for outcomes were used as conditions for other outcomes. From among possible QCA analytical methods, crisp set QCA was employed in this study to attempt to determine what kind of the conditions trigger outcomes.

Results: On "environmental improvement," the conditions in "intervention of JICA project," "commitment of forest department," and "improvement of livelihood" were the sufficient conditions for the outcome in "reforestation." For the outcomes in "sustainability of JFMC," the conditions of "commitment of forest department" and "current situation of JFMC" were the sufficient conditions. Second, on the outcomes in "improvement of livelihood," the conditions in "intervention of JICA project," "current situation of JFMC," "programs other than afforestation," and "improvement of women's social and economic capabilities" were the sufficient conditions. Finally, on "empowerment of women," the conditions of "intervention of JICA project." and "programs other than afforestation" were the sufficient conditions for the outcomes in "improvement of women's social and economic capabilities." In addition, the conditions in "intervention of JICA project" were the sufficient conditions for the outcome in "sustainability of SHG." A summary of the analytical results is shown in Figure 1.

Considerations: QCA found that the JICA projects' interventions contributed to the expected effects "reforestation," "improvement of livelihood," "improvement of women's social and economic capabilities" and the "sustainability of SHG." However, QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." A possible explanation for this result is that it takes a long period for the sustainability of JFMC to make a clear difference in forest regeneration. In addition, the novel coronavirus (hereafter referred as COVID-19) related limitations in target selection and the interpretation of results can also be presumed. Taking these limitations into account, the arguments inferred from this study can be found in the main topic section.

Conclusion: (1) Based on the analytical results of each project and the integrated data of both projects, it is inferred that the conditions in "intervention of JICA project" have relationships to "environmental improvement," "improvement of livelihood," and "empowerment of women." Since the above results were obtained in both states, which have very different environments,

[1] In this study, a condition means a factor assumed to cause outcomes.

JICA projects in social forestry in India contribute to the improvement of the above three project effects.

(2) As for a recommendation, the discussion on the conditions related to the occurrence of the main project effects recommended long-term support by forest departments (hiring JFMC members for activities of forest departments and other organizations), and, as for lessons learned, suggested the promotion of collaboration within a community (implementation of team-building training and assessment of training center/community places), and efforts to create long-term livelihoods for SHGs (specifically, sophistication in the areas of existing knowledge).

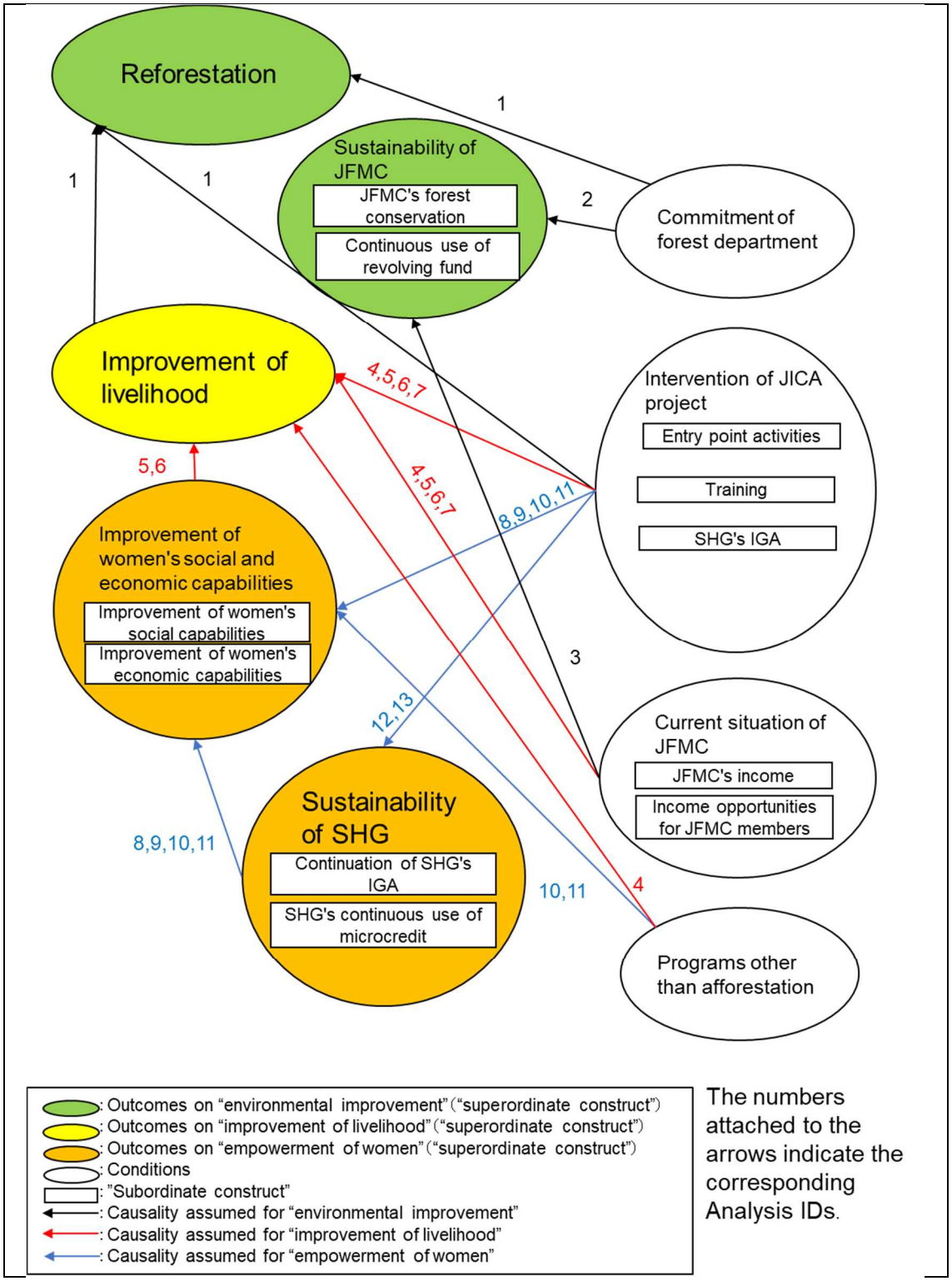


Figure 1: Analytical Results of this Study

Main Topics:

- On "environmental improvement," JFMCs in which wastelands were significantly reduced had the combination of conditions: the choice of training centers/community places for the entry point activity[2] and the employment by the forest departments. Both training centers and community places are used for gathering in the communities where JFMCs are located, and the selection of training center/community place demonstrates a degree of collaboration within the community. It is inferred that the forest departments' employment of residents would strengthen the tendency of the whole community to conserve forest in such social environment.
- On "improvement of livelihood," the increases in income and expenditure of JFMC members had the sufficient conditions including the choice of training centers/community places for entry point activity. This condition is combined with other conditions indicating additional income (employment by the forest departments, the increase in income of SHG members). The analytical results show that additional income tends to bring improvement of livelihood in JFMC where cooperative relationship is established.
- The several outcomes relevant with "empowerment of women" are associated with both entry point activities (the choice of training center/community place) and the condition that more than a certain number of female SHG members continue income generation activities (IGA). The analytical results suggest the importance of continuous IGA in a favorable social environment for improvement of women's social and economic capabilities. The results also indicated that, in addition to the continuation of SHG activities, an increase in savings of SHG members requires continuous support after the project completion.
- In a wide range of the outcomes, entry point activities (the construction of training center/community place) were relevant. Since promotion of collaboration within a community contributes to a number of different project outcomes, incorporating activities to encourage collaboration in projects is worth considering.
- QCA is a method that deepens assessments based on cases in order to explain the constructs of interest. The spread of COVID-19, which limited the period for field visits in this study, caused a situation such that the most appropriate individual cases could not be selected for the analysis. The assumed constructs, therefore, may not be explained (limitation on case selection).
- Since QCA case selection is purposeful in that assessment results are applied only to the cases in which the assumed conditions are satisfied, careful attention is required when generalizing the interpretation of results (limitation on interpretation of results).

Keywords: Qualitative Comparative Analysis (QCA), environmental improvement, improvement of livelihood, empowerment of women, participatory afforestation

[2] Based on the plans developed by the JFMCs, the entry point activities provided supports such as: small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

1 Background and Purpose of the Study

1.1 Background of the Study

The factors that lead to effective development projects include both the project environment and the project interventions. Moreover, there is no one-to-one relationship between project effects and factors, but multiple intricately related factors may lead to a specific project effect. In order to identify specific relationships between multiple factors and project effects, quantitative research can assume multiple factors and employ multiple regression analysis to construct a complex model to a certain extent. However, since multiple regression analysis requires a sufficient sample size, the use of multiple regression analysis is often difficult due to the limitations of project nature and data collection. On the other, conventional case studies can present complex causal relationships between project effects and multiple factors. However, case study analysis, in general, lacks the application of standardized research method in a systematic manner.

JICA's forest sector projects in India are distinctive because the projects involved not only afforestation activities but also numerous interventions such as livelihood improvement activities, provision of small-scale infrastructure, and establishment of forest cooperatives. In addition, the environment surrounding the projects was very diverse in terms of climate, nature, social situation, and economic conditions. Therefore, the forest sector in India required an evaluation to cope with the diverse project environment and the numerous project activities.

Qualitative Comparative Analysis (QCA) is a method that can analyze how, based on 10 to 50 cases, an outcome (an element to represent an expected result of an intervention or factor, such as a project effect) of a project is attributed to conditions (interventions or factors assumed to cause incidence of the outcomes). The uniqueness of QCA is to present causal inferences that exist between a single outcome and a combination of conditions. This time, QCA is applied to the analysis on the characteristics of the forest sector projects in India including: multiple interventions, diverse project environments, and numerous combinations of interventions and environments. This report shows the study results of QCA on the participatory afforestation projects (two projects[3]) in the Ex-Post Project Evaluation 2019: Package III-5 (India).

1.2 Purpose of the Study

The purpose of the study is as follows:

(1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement," "improvement of livelihood," and "empowerment of women"
(2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects

The following four objectives were defined as more detailed analytical goals.

a) To identify the interventions and factors that enabled "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project from a perspective that differs from evaluations based on the OECD-DAC evaluation criteria.

b) To present analytical results for each individual project, compare the analytical results of both projects, and provide background context and reasons for similarities and differences between the projects.

c) To conduct an analysis to cover both the projects by using the same variables applied to each project and identify interventions and factors that have enabled the incidence of project effects

[3] "Tripura Forest Environmental Improvement and Poverty Alleviation Project" and "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project"

in participatory afforestation projects in India.

d) Through the above analysis, derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

2 Research Questions

The research questions of this study include main questions and sub-questions as follows. The main questions are to be answered by the integration of the analytical results from each project or by the QCA analytical results on the integrated data of both projects and the sub-questions are to be answered by the analytical results of QCA for each of the target projects.

(1) Main Question

What interventions and factors, or their combination, have led to "environmental improvement," "improvement of livelihood," and "empowerment of women" in participatory afforestation projects in India?

(2) Sub-questions

What interventions and factors, or their combinations, have resulted in "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project? What are the differences among the projects?

3 Target Projects

3.1 Outline of the Projects

The projects supported social forestry in the Tripura state and the Uttar Pradesh state through ODA loans. To harmonize expansion of a forest area and community development, a Joint Forest Management (JFM) approach, in which the executing agencies and the local people undertake joint management of a forest, was adopted. To implement the projects, a Joint Forest Management Committee (JFMC) and an Eco-Development Committee (EDC) were established, and Self-Help Groups (SHGs) were also organized for income generation activities under the JFMC and the EDC. The outputs of the target projects included: afforestation, community development (entry point activities[4]), income generation activities (support to SHGs), and training for executing agency officers and for the local people. The following table summarizes the target projects:

Table 1 The Outline of the Target Projects

Project Name	Project Period	Project Cost	Project Area	Number of Establishments
Tripura Forest Environmental Improvement and Poverty Alleviation Project	March 2007 - March 2017	JPY 5,771 million	7 Districts in the Tripura state	JFMC:433 EDC:30 SHG：1,549
Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project	March 2008 – December 2017	JPY 9,169 million	14 Districts in the Uttar Pradesh state	JFMC:800 EDC:140 SHG：2,680

Source: Prepared by the author, based on the appraisal report for board members, the project completion report, and the ex-ante project evaluation sheet.

3.2 Current Situation of the Forest in the Project Area

Using satellite data, the Forest Survey of India (FSI) continuously measures forest density. FSI

[4] Based on the plans developed by the JFMCs, the project provided supports such as: small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

classifies forest density as: Very Dense Forest (VDF), Middle Dense Forest (MDF), Open Forest (OF), Scrub, and Non- Forest. The most recent data is provided in the 2017 report, and is based on the data from October 2015 to February 2016. The data for the period immediately before the commencement of the target project (October 2006 to February 2007) can be found in the 2009 report. Forest data from the 2009 and 2017 reports were compared (see Appendixes 1 and 2) to show the changes before and after the implementation of the project.

Tripura state: The total afforestation area of the target project was 53,220 ha (Project Completion Report, pp.6-7). The afforestation area of the target project is equivalent to 6.8% of the total forest area in the Tripura state in 2017. The project area is spread over the entire state of Tripura, but it mostly excludes the Dalai district. Since the Tripura state is located near the Bay of Bengal and has a humid climate, the forest cover ratio is high in the project area in general. Although afforestation was carried out under the project, a decrease in the forest area was larger than the afforestation area. For this reason, the forest area in the project area slightly decreased from 2009 to 2017. On the other hand, the area of dense forest was expanded, and the forest's quality was improved.

Uttar Pradesh state: The total afforestation area of the target project was 80,695 ha (Project Completion Report, p.iii). The afforestation area of the target project is equivalent to 5.4% of the total forest area in the Uttar Pradesh state in 2017. The project area can be broadly divided into the northern (plain area), the southern (hilly area), and the western (hilly area) parts of the state. The forest cover in the western part of the state is lower than in the other regions. The north has a higher proportion of dense forests while the south has a higher proportion of sparse forests. The forest area in the north and south remained stable between 2009 and 2017, but its density increased. For the same period, forest area, especially sparse forest, increased in the western region.

3.3 Social Situation in the Project Area

The major social conditions indicators for the project area are summarized in the attached table (see Appendix 3). The table shows district-wide figures for the literacy rate (overall and by gender), the ratio of scheduled castes, that of scheduled tribes, that of agricultural workers (both landowners and landless), and the population density based on the census data in 2011.

Tripura state: Compared with the average of the literacy rate in India (74.0%)[5], the literacy rate in the Tripura state is high for both men and women, suggesting that there is a high potential for effectiveness in the assistance of the social forestry sector, where residents are the main actors. On the other hand, the state is also characterized by a larger population of scheduled tribes, which may make establishing smooth relationships with government agencies difficult.

Uttar Pradesh state: It is noteworthy that the literacy rate in the Uttar Pradesh state was lower than the average of India (74.0%) for both the entire state and the project area, and that there was a significant gender gap. It is also notable that the scheduled castes accounted for more than 20% of the residents in the project area, and that many of the residents were engaged in agriculture without land ownership.

4 Variables and Working Framework in the Study

4.1 Variables in the Study

The variables of interest in this study are broadly classified into project effects, which in terms of QCA are outcomes, and factors and interventions for each case, which in terms of QCA are conditions. In this study, JFMC is considered a unit to represent a case. The attributes of JFMC, which are background factors, are used in the analysis as conditions if necessary. As much as

[5] Census of India 2011

possible in the selection of the variables, the variables that affect the incidence of outcomes but do not differ among JFMCs are excluded. The list of variables is shown in Appendix 4 to Appendix 12.

4.2 Working Framework

As a result of the field survey, it became clear that among the main project effects, "environmental improvement" and "empowerment of women" had several qualitatively different outcomes. For this reason, these main project effects are divided into two groups. Specifically, "environmental improvement" is divided into two groups: "reforestation" and "sustainability of JFMC," and "empowerment of women" is divided into two groups: "improvement of women's social and economic capabilities" and "sustainability of SHG." In the working framework, "sustainability of JFMC" is the condition for "reforestation" and "sustainability of SHG" is the condition for "improvement of women's social and economic capabilities." Since the former outcome takes time to be realized, the latter outcome, which is the preliminary stage of the former outcome, was also used for the analysis.

The working framework was formulated to provide an overall picture of this study, and to illustrate the causal relationships assumed for the variables (see Appendix 13). In the working framework, "superordinate constructs" and "subordinate constructs" were established for precise grouping of the variables. The "superordinate constructs" group qualitatively similar variables and are used to show the working framework in a simplified manner. The "subordinate constructs" are subgroups within the "superordinate constructs." The variables within the same category of "subordinate construct" can be treated as qualitatively consistent (i.e., variables can be synthesized), and the "subordinate constructs" are used for the analysis using the QCA software (see "6.1 Analytical Method" for more information on the software). When all variables in the "superordinate constructs" are considered qualitatively consistent, the "superordinate constructs" and the "subordinate constructs" are considered the same, and therefore these "subordinate constructs" are not shown in the figure.

5 Case Selection

5.1 Number of Cases

As mentioned above, QCA requires approximately 10 to 50 cases. The questionnaire survey in the Uttar Pradesh state was conducted from April 12 to April 30, 2021, and from June 25 to July 3, 2021. The questionnaire survey in the Tripura state was conducted from October 21 to October 30, 2021[6]. The study areas were selected according to the procedure described in the next section. Within the above period, data collection based on a questionnaire was conducted in 36 JFMCs. See Appendix 14 and Appendix 15 for a list of the JFMCs that completed the questionnaire survey. See Appendix 16 and Appendix 17 for the study area.

5.2 Procedure for Case Selection

The target projects supported the establishment and management of more than 1400 cooperatives in the Tripura state and the Uttar Pradesh state. The procedure to select cases from among a large number of possible cooperatives included the following considerations:

- Variation in the variables is essential in the analysis, but the cases themselves should be comparable. For this reason, EDC is not included as a case of this study, and JFMCs are used as a case unit.
- In order to have variation of the variables among cases, in addition to the characteristics that

[6] Initially, the target projects of this study included "Gujarat Forestry Development Project Phase 2", and a questionnaire survey in Gujarat was planned but later cancelled due to difficulties obtaining the cooperation necessary to arrange the survey from the executing agency in Gujarat, and difficulties due to the COVID-19 pandemic.

cannot be controlled by the project and the requirements related to the feasibility of the survey, the continuation and activity of JFMC were reflected in the case selection. Specifically, the activity status of JFMCs and SHGs, which are intermediate outcomes, were included as case selection conditions. Also, it was taken into account that the variables directly related to reforestation and empowerment of women may not differ among JFMCs since only a few years have passed after the completion of the project.

- The specific procedure for case selection was as follows.

STEP 1: Precipitation: Districts with annual precipitation of 700 mm or more (5-year average for 2014 - 2018) were selected. In Tripura, seven districts were selected. In Uttar Pradesh, eight districts were selected.

STEP 2: Number of JFMCs: Forest divisions (Uttar Pradesh) / sub-divisions (Tripura) with less than 10 JFMCs were excluded. The reason for exclusion was that fewer JFMCs could be compared and selected in the same division.

STEP 3: The state forest department confirmed whether a JFMC met the following criteria. JFMCs that met these criteria were defined as an Active JFMC.

- There was at least one meeting listed in the meeting register for the past one year.
- There was a member who was employed by the forest department in the past year.

STEP 4: The forest department selected 25-30 JFMCs from JFMCs that met the requirements of STEP 3, where the activities for livelihood improvement of JFMCs and SHGs continued to be active. About 25-30 JFMCs that had not organized meetings frequently/ had stopped meeting and had stopped using facilities and equipment for entry point activities were selected from the same division/ sub-division. JFMC that satisfied these criteria were defined as a Non-active JFMC.

STEP5: Whether or not the selected JFMC satisfied the following criteria was confirmed. If the criteria were not confirmed, a new JFMC that met the criteria was selected.

- Access: Within a day trip distance from the district HQ.
- Agriculture Dependency: According to the district census, more than 30% of the working population in the revenue village was engaged in agriculture. If the census did not identify the revenue village to which the JFMC belongs, the data from the identifiable neighborhoods were used to confirm this criterion.
- Women SHGs: At least one SHG for which the majority of SHG members were women.

STEP 6: From the selected 50-60 JFMCs, the questionnaire survey was planned to be conducted in JFMCs that could be accessed within the survey period. Eventually, the survey covered 36 JFMCs (18 Active, 18 Non-active).

5.3 Study Targets in a Case

Due to the wide variety of variables to be used, if the number of respondents were limited to one person for each village, it was likely that the respondent would not have the necessary information. Therefore, in each JFMC, one person from the forest department, one person from JFMC, and one person from SHG were chosen for the survey. The questionnaire was also divided into three parts: one section for a forest department officer, one for a JFMC member, and one for an SHG member.

6 Analysis Results

6.1 Analytical Method

This study integrated the questionnaire survey data of two states and used fsQCA (version 3.1b), a software for QCA, to conduct the analysis using crisp set QCA. Crisp set QCA is a method that uses binary data for outcomes and conditions. The interpretation of the analytical results using binary data becomes easier given that outcomes and causal conditions are binary numbers with

qualitatively different meanings. The analysis excluded the variables with skewed distributions in the questionnaire responses because QCA could not analyze them. The variables in the analysis are summarized in Appendix 18. On the conditions used in QCA, the necessary conditions between an outcome and conditions were calculated, and three to five variables with the highest consistency and a certain level of coverage (0.3 or higher) were selected[7]. In the preparation of the truth table, a row with a raw consistency of less than 0.8 was deleted. Parsimonious solutions, which were easy to interpret, were chosen out of the output solutions. When the solution coverage was low (below 0.7), it was concluded that the derived sufficient conditions could not adequately explain the outcome.

6.2 Constraints during the Evaluation

For interpretation of QCA analytical results, this study had assumed two field trips. The second trip was expected to conduct interviews with project stakeholders and beneficiaries; however, due to the spread of COVID-19, only one trip was conducted in February - March 2020. The field study assistants conducted the tasks planned for the second trip on a limited basis. An authentic approach for a case study is to extract cases for which sufficient conditions were applied and then re-examine the reasons and background of each case individually for further consideration of the analytical results. However, for the reasons mentioned above, the availability of qualitative information was limited. As a result, the interpretation of the QCA analytical results is mainly based on the limited knowledge obtained in the short period of the first field survey. In particular, establishing causal relationships solely based on the analytical results of QCA was difficult, and supplementing the results of this study with additional information would be desirable.

6.3 Comparison of the Study Results of Both States

Among the data collected in both projects, notable differences in the conditions include: (1) the types of intervention in "intervention of JICA project," (2) the supports for IGA after the project completion in "programs other than afforestation," and (3) JFMC's income in "current situation of JFMC." On (1) of the above, the JICA supported project introduced agroforestry in Tripura but agroforestry was not introduced in Uttar Pradesh. As for the training for JFMC, in Tripura, all JFMCs had training in both afforestation and livelihood creation, while in Uttar Pradesh, some JFMCs had training only in afforestation. On (2) of the above, in Uttar Pradesh, only a few JFMCs and SHGs received support for livelihood generation after the project completion, while, in Tripura, all JFMCs and SHGs received some supports for IGAs after the project completion. On (3) of the above, in Tripura, some JFMCs had income from the sale of non- timber forest products, but in Uttar Pradesh, no JFMCs had such income.

As for the outcomes of the two projects, there was a difference in "continuous use of revolving fund" on whether JFMCs made deposits to their bank accounts. In Tripura, many JFMCs made deposits frequently, while in Uttar Pradesh no JFMC made deposits. Therefore, the analysis of "continuous use of revolving fund" was possible only in Tripura.

The analysis results of both projects are common in that "environmental improvement," "improvement of livelihood," and "empowerment of women" included the conditions within "intervention of JICA project." In both projects, "improvement of livelihood" was related to the conditions within "intervention of JICA project," "current situation of JFMC," and "improvement of women's social and economic capabilities."

There are two notable differences in the analysis results: (1) the sufficient condition for "reforestation" (specifically, forest density) could be derived in Tripura, and (2) the sufficient condition for "improvement of women's social and economic capabilities" included "influence of women" in Tripura. (See Attachment 19 and Attachment 20). It should be noted that the summary figure of the analysis results for each state is extremely simplified. The figure does not show the

[7] Referred to Daisuke Mori (2017) "How to use software for qualitative comparative analysis (QCA) : fs/QCA and R(1)", Kumamoto law review (140)

combinations of conditions in detail. On (1) of the above, employment creation through the project in "improvement of livelihood" is related to the sufficient condition of "reforestation." JFMCs under the survey in Tripura had more support for livelihood generation, and employment generation through projects was relatively more significant. This may contribute to "reforestation." The number of female executives in JFMC, which is included in "influence of women," is related to "improvement of women's social and economic capabilities." In Tripura, there were several JFMCs with more than three female executives which may have contributed to the sufficient conditions with high solution coverage. In addition, more JFMCs in Tripura had outcomes which potentially could bring about the sufficient conditions for "improvement of women's social and economic capabilities."

6.4 Analysis Results

6.4.1 Overall

A summary table for the derived sufficient conditions based on "6.1 Analytical Method" can be found in Appendix 21. The "superordinate constructs" and the "subordinate constructs" contained in the outcomes and the conditions of the derived sufficient conditions can be found in the table in Appendix 22. In addition, the derived sufficient conditions by themselves are illustrated in the figure in Appendix 23. It should be noted that the figure is extremely simplified like the summery figures for the analytical results of each state. The figure does not show the combinations of conditions in detail.

6.4.2 Environmental Improvement

(1) Reforestation

Overall subordinate construct: For *current survival rate*, the derived sufficient condition had a low solution coverage (0.25) and, thus, could not explain enough cases. Interpreting the sufficient condition for *forest density after project completion* was difficult. For *barren land after project completion*, a sufficient condition, in which both a solution consistency and a solution coverage were above certain levels, could be derived.

Barren land after project completion (Analysis ID 1[8]): *Barren land after project completion* was divided into two categories on a seven-point scale: the first step to the sixth step (other than significantly reduced) and the seventh step (significantly reduced). Conditions for JFMCs with significant reduction in wasteland after the project completion include: (a) they selected the training center/community place as the entry point activity and they have been employed by the forest department in the past three years, or (b) the forest department staff frequently visited them, and the employment opportunities for JFMC members have remained almost the same after the project completion. However, because of its low raw coverage, the condition (a) is not an important term. The one-to-one cross-tabulation for this outcome is shown in Appendix 24.

(2) Sustainability of JFMC (JFMC's Forest Conservation)

Overall subordinate construct: The sufficient conditions for *fire prevention after project completion* and *monitoring after project completion* had low solution coverage (less than 0.5) and could not explain enough cases. On the other hand, the sufficient condition for *JFMC official meeting* could be derived with certain levels of solution consistency and solution coverage.

JFMC official meeting (Analysis ID 2): *JFMC official meeting* was divided into two categories on a five-point scale, based on the first to the fourth levels (meeting in the past year) and the fifth level (no meeting in the past year). JFMCs that organize formal meetings at least once a year after the project completion have the condition: (a) forest department staff frequently visited residents and the forest departments employed residents in the past three years. The one-to-one cross-

[8] Refers to the analysis ID in the tables of Appendix 21 and Appendix 22

tabulation for this outcome is shown in Appendix 25.

(3) Sustainability of JFMC (Continuous Use of Revolving Fund)
Overall subordinate construct: A truth table could not be formulated for *withdrawal from JFMC's account*. On the other hand, the sufficient condition with the certain levels of solution consistency and solution coverage could be derived for *deposit to JFMC's account.*

Deposit to JFMC's account (Analysis ID 3): *Deposit to JFMC's account* was divided into two categories: deposit in the previous year and no deposit in the previous year. JFMC with a deposit in the previous year have the condition: (a) JFMC have income from non-timber forest products. The one-to-one cross-tabulation of this outcome is shown in Appendix 26.

6.4.3 Improvement of Livelihood
(1) Improvement of Livelihood
Overall subordinate construct: It was not possible to create truth tables for *JFMC members' saving after project*, and *JFMC members' minor produce*[9] *sales after project*. It was difficult to interpret the sufficient conditions for J*FMC members' non-agricultural income after project*, *JFMC members' expenditure after project (education)*, and *JFMC members' livestock after project (other)*. The sufficient condition with high solution coverage could not be derived for *JFMC members' expenditure after project (house)*. On the other hand, the sufficient conditions with high solution coverage for *JFMC members' household income after project*, *JFMC members' household expenditure after project*, *JFMC members' livestock after project (grazing animal),* and *JFMC members' employment opportunities after project* could be derived.

JFMC members' household income after project (Analysis ID 4): *JFMC members' household income after project* was divided into two categories on a seven-point scale: the first to the second levels (increase to some extent) and the third to the seventh levels (no change). As the sufficient condition for JFMCs with a moderate increase in members' income after project implementation, it was possible to derive two terms, one of which is insignificant due to low raw coverage. The term with high raw coverage was (a) selection of training center/community place as the entry point activity, training in both afforestation and livelihood generation, and employment by the forest departments in the last three years. The one-to-one cross-tabulation for this outcome is shown in Appendix 27.

JFMC members' household expenditure after project (Analysis ID 5): *JFMC members' household expenditure after project* was divided into two categories on a four-point scale: the first to the second levels (some increase) and the third to the fourth levels (almost no change). It was possible to derive three terms as sufficient condition for JFMCs to have a moderate increase in household expenditures after the project implementation, but two of the three terms were insignificant due to their low raw coverage. The term with high raw coverage was: (a) selection of training center/community place as the entry point activity and an increase in the income of female SHG members after the project implementation. The one-to-one cross-tabulation for this outcome is shown in Appendix 28.

JFMC members' livestock after project (grazing animal) (Analysis ID 6): *JFMC members' livestock after project (grazing animal)* was divided into two categories on a four-point scale: the first to the third levels (increase) and the fourth level (no change). In terms of sufficient condition, it was possible to derive three terms but two of the three terms were insignificant due to low raw coverage. The term with high raw coverage was (a) training in both afforestation and livelihood generation, and an increase in the income of female SHG members after the project

[9] Products that residents are allowed to harvest traditionally in the forest area (wild plants, mushrooms, honey, etc.)

implementation. The one-to-one cross-tabulation of this outcome is shown in Appendix 29.

JFMC members' employment opportunities after project (Analysis ID 7): *JFMC members' employment opportunities after project* was divided into two categories on a four-point scale: the first to the second levels (some increase) and the third to the fourth levels (almost no change). Conditions in JFMCs where their members had more employment opportunities to some extent after the project implementation include: (a) the training center/community place was selected as the entry point activity or (b) they were employed by the forest departments in the past three years. The one-to-one cross-tabulation of this outcome is shown in Appendix 30.

6.4.4 Empowerment of Women

(1) Improvement of Women's Social and Economic Capabilities (Improvement of Women's Social Capabilities)

Overall subordinate construct: the sufficient condition could be derived for *percentage of income decided by female SHG members*, and its solution consistency and solution coverage were above certain levels. On the other hand, a truth table for *change in outreach of female SHG members* could not be formulated. The derived sufficient conditions for *time for SHG activities* and *women's confidence in household decisions* had low solution coverage.

Percentage of income decided by female SHG members (Analysis ID 8): *Percentage of income decided by female SHG members* is divided into two categories: an increase by more than 50% or by less than 50% in the percentage of income that female SHG members can decide the usage after the project implementation. It was possible to derive three terms as sufficient conditions for *percentage of income decided by female SHG members*, but two of them had low raw coverage and were not important. The term with high raw coverage was: (a) selection of training center/community place as the entry point activity, selection of animal husbandry as IGA, and female members continuing IGA numbered more than 20% of the total members. The one-to-one cross-tabulation for this outcome is shown in Appendix 31.

(2) Improvement of Women's Social and Economic Capabilities (Improvement of Women's Economic Capabilities)

Overall subordinate construct: The sufficient conditions for *female SHG members' expenditure after project, SHG members' expenditure after project (education), SHG members' expenditure after project(cosmetics),* and *SHG members' livestock after project (grazing animal)* had low solution coverage and could be explained by not having enough cases. It was difficult to interpret the sufficient conditions for *SHG members' expenditure after project (ornament)* and *female SHG members' influence on household expenditure*. For *SHG members' expenditure after project (cloth)*, it was not possible to formulate a truth table. On the other hand, the sufficient conditions (with certain levels of solution consistency and solution coverage) were derived for *female SHG members' income after project*, *SHG members' saving after project*, and *SHG members' livestock after project (other)*.

Female SHG members' income after project (Analysis ID 9): *Female SHG members' income after project* is divided into two categories on a seven-point scale: the first to the second levels (some increase) and the third to the seventh levels (almost no change). Sufficient conditions for the moderate increase in the income of female SHG members, include: (a) the training center/community place was chosen as the entry point activity and the SHG held a formal meeting at least once a year, or (b) the training center/community place was chosen as the entry point activity and female members continuing IGA numbered at least 20% of the total members. The one-to-one cross-tabulation for this outcome is shown in Appendix 32.

SHG members' saving after project (Analysis ID 10): *SHG members' saving after project* was divided into two categories on a four-point scale: the first to the second levels (some increase) and the third to the fourth levels (almost no change). It was possible to determine two terms as the sufficient condition for the increase in savings of SHG members, one of which was insignificant due to its low raw coverage. The term with high raw coverage was: (a) SHG organized a formal meeting at least once a year, and SHG received support after the project completion. The one-to-one cross-tabulation for this outcome is shown in Appendix 33.

SHG members' livestock after project (other) (Analysis ID 11): *SHG members' livestock after project (other)* was divided into two categories on a four-point scale: the first to the second levels (some increase) and the third to the fourth levels (almost no change). It was possible to derive two terms as the sufficient condition for the increase in other livestock, one of which was insignificant due to low raw coverage. The term with high raw coverage was: (a) JFMC selected the training center/community place as the entry point activity, and SHG selected animal husbandry as IGA, and female members continuing IGA numbered at least 20% of the total members. The one-to-one cross-tabulation for this outcome is shown in Appendix 34.

(3) Sustainability of SHG (Continuation of SHG's IGA)
Overall subordinate construct: The only outcome variable is *female members continuing IGA,* and the sufficient condition with high solution consistency and high solution coverage was derived for this outcome.

Female members continuing IGA (Analysis ID 12): *Female members continuing IGA* was divided into two categories: more than 20% of SHG members continue IGA and less than 20% of SHG members continue IGA. The sufficient condition for more than 20% of the total number of members to continue IGA include: (a) SHG used the training knowledge for SHG activities and JFMC did not select a training centers/community place as the entry point activity, or (b) SHG selected animal husbandry as IGA and used the training knowledge for SHG activities. However, as the raw coverage of the term (a) is relatively low (0.16), it is not an important condition. The one-to-one cross-tabulation for this outcome is shown in Appendix 35.

(4) Sustainability of SHG (SHG's Continuous Use of Microcredit)
Overall subordinate construct: Of the selected outcomes, it was not possible to derive the sufficient condition with high solution coverage (0.68) for *SHG's loans.* On the other hand, the sufficient condition with a relatively high solution coverage could be derived for *SHG's official meeting.*

SHG's official meeting (Analysis ID 13): *SHG's official meeting* was divided into two categories on a six-point scale: the first to the fifth levels (meeting in the past year) and the sixth level (no meeting in the past year). SHG's formal meetings at least once a year had the sufficient condition: (a) they used the training knowledge for SHG activities. The one-to-one cross-tabulation for this outcome is shown in Appendix 36.

6.5 Considerations

The considerations of the analytical results for "subordinate constructs" are as follows:

Reforestation: The appropriate sufficient condition was derived for the reduction of wastelands. JFMCs with a significant reduction in wastelands have a combined condition: the training centers/community places as the entry point activity and employment by the forest departments. Both the training centers and the community places are used for gatherings in the communities where JFMCs are located, suggesting that there is cooperative relationship within the

communities. It is also presumed that the forest departments' employment of residents in such a situation strengthens the tendency that the whole community undertakes forest conservation. However, the interpretation of this result requires a caution, as some communities might have training centers/community places prior to the projects. It was not possible to derive a sufficient condition for the survival rate, suggesting the existence of important conditions (e.g., soil, slope, river, etc.) that could not be addressed in this study. No variables in the sustainability of JFMC were included in the conditions for reforestation. In light of this point, it can be inferred that the current situations do not reach the stage that the JFMC activities make a noticeable change in reforestation.

Sustainability of JFMC (JFMC's forest conservation): The appropriate sufficient condition was derived for the number of official meetings in JFMC. Those with frequent official meetings show a combination of frequent visits by the forest departments staff and the employment by the forest departments. Both conditions indicate a high level of involvement of the forest departments, and the forest departments play a crucial role in the sustainability of JFMCs.

Sustainability of JFMC (Continuous use of revolving fund): The appropriate sufficient condition was derived for the deposit to JFMC's bank account. JFMC's bank account was used for the revolving fund and JFMCs with frequent deposits to their bank accounts have income from the sale of non-timber forest products. Since it takes time to harvest timbers, JFMC's bank account is not utilized for a long period after the project completion. The harvesting of non-timber forest products is earlier than that of timber products, implying a necessity for a short- to medium-term income source for the continuous use of revolving funds after the project completion.

Improvement of livelihood: The sufficient conditions could be derived for several outcomes. For the increase in the income and the increase of expenditure among JFMC members, the sufficient conditions included the selection of training centers/community places as the entry point activity, which is combined with the conditions suggesting additional income (employment by forest departments, and the increase in SHG members' income). The results show that additional income is more likely to lead to the improvement of livelihoods in JFMCs in which a cooperative relationship is established. As for the increase in the number of grazing animals owned by JFMC members, the increase in the income of SHG members was included in the terms of the sufficient condition section, implying that the results of SHG activities are being used for animal husbandry. In addition, individuals harvested non-timber forest products such as bamboo shoots and produced bamboo products and brooms in Tripura. Similarly, in Uttar Pradesh, individuals harvested medicinal herbs and fodders and produced bidi (a type of tobacco).

Improvement of women's social and economic capabilities (Improvement of women's social capabilities): The appropriate sufficient condition was derived for an increase in the percentage of income that female SHG members can decide. The choice of the training centers/community places for the entry point activity was a sufficient condition indicating the cooperative relationship of the community. Moreover, SHG members' experience of autonomous activities contributes to this outcome, as a certain number of SHG members continue IGA, including animal husbandry. It can be inferred that continuous IGA in a favorable social environment leads to confidence in making decisions on how to spend their incomes.

Improvement of women's social and economic capabilities (Improvement of women's economic capabilities): Appropriate sufficient conditions were derived for; the increase in income of female SHG members, the increase in savings of SHG members, and the increase in other livestock owned by SHG members. The increase in income and the number of SHG members' other livestock are related to both the choice of training centers/community places in the entry point

activity and the certain number of female members continuing IGA. The sufficient condition for the increase in savings of SHG members includes a combination of SHG's holding a formal meeting at least once a year and supporting SHGs after the project completion. The increase of savings among SHG members was found to need, not only the continuation of SHG activities but also continued support after project completion.

Sustainability of SHG (continuation of SHG's IGA): As for SHG in which women continuing IGA are more than 20% of the total members, it was found that the members practice animal husbandry and fully utilize the training contents in their activities. In both states, women are traditionally engaged in animal husbandry and had some knowledge in the field at the time of the project implementation. The use of training knowledge in the areas for which knowledge already existed can be inferred to have led to the continuation of SHG activities.

Sustainability of SHG (SHG's continuous use of microcredit): Since there are very few SHG which provide microcredit frequently, the frequency of official meetings in SHG was used as a proxy condition for potential future use of microcredit. As an analytical result, the condition for the official meeting of SHG at least once a year was: the use of the training contents by SHG members. However, it is concluded that the members' use of the training contents contributes to the continuity of SHG activities in general, not only the usage of microcredit.

7 Limitations and Issues in the Future

QCA methodology in regards to target selection and comparability, and in regards to the interpretation of results encountered limitations and restrictions. For future reference, this section mentions some specific limitations that arose in this research and assessment.

Issues in case selection and data management

Although the questionnaire results and the judgments of the forest departments on the case selection may have differed in some cases, due to restrictions related to COVID-19, this study could not track down and confirm the accuracy of the data. It should be noted that, even in such cases, the analysis in this study was based on the results of the questionnaire survey. QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." This issue presumably affects the above result.

Issues in the preparation of the data used for analysis

To avoid a problem caused by the methodological nature of QCA that prevents a comparison among cases if a distribution is skewed to either 0 or 1, the determinations of 0 and 1 for the same conditions and outcomes were based on different choices for each state (Uttar Pradesh and Tripura). In other words, this study conducted a trial and exploratory analysis having chosen choices with smaller skewness for each state. In principle, the choices to be used for the determination of conditions and outcomes should have been decided in advance, and comparisons should have been conducted using the same choices in both states. However, due to the skewness in the collected cases, the above measure (the determinations of 0 and 1 for the same conditions and outcomes were based on different choices) was taken. This point should be kept in mind when interpreting the comparisons made in this report between the two states.

Issues related to robustness of results

As the analysis was based on a single question to determine 0 or 1 for an outcome or a condition, this resulted in a situation that robustness of construct validity could not be ensured. Since each question was regarded as a single condition, various analyses, depending on several conditions, could find a variety of results. In such cases, formulating a synthetic variable with multiple conditions, in line with the design of the survey questionnaire, is possible. Specifically, it is

possible to take measures such as organizing and integrating outcomes and conditions from multiple questions along with a certain "superordinate construct" for comprehensive determination of 0 or 1. However, as this analysis did not perform integration of conditions, consideration needs to be taken into account when interpreting individual results.

Issues related to interpretation (setting a coverage at 0.7 or higher)
Although determining whether the consistency exceeds a threshold is necessary, causal inference is possible even if a coverage is low. In general, causality is inferred when a coverage is low but consistency is 1 or very close to 1 (0.9 or higher) because this suggests that there is a 90% chance or higher that the outcome will be 1. Although sufficient conditions with a coverage of 0.7 or higher were selected for this study, the coverage can only indicate what percentage of cases with an outcome of 1 can be explained by the condition. It should be noted that, because multiple conditions can be assumed to lead to the same outcome, interpretive limitations exist when explaining more than 70% of the cases with outcome of 1 by a single sufficient condition. QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." This issue presumably affects the above result.

8 Conclusion

Based on the factors and interventions related to the occurrence of the main project effects, the conclusions of this report are presented below.

(1) Results of Analysis

Common finings of both projects: It was inferred that both projects are common in that "environmental improvement," "improvement of livelihood," and "empowerment of women" included the conditions within "intervention of JICA project." In both projects, "improvement of livelihood" was related to the conditions within "intervention of JICA project," "current situation of JFMC," and "improvement of women's social and economic capabilities."

Different finings between both projects: On "environmental improvement," the sufficient conditions for "reforestation" and "sustainability of JFMC" could be derived in the Tripura state while only that of "sustainability of JFMC" was derived in the Uttar Pradesh state. In addition, on "empowerment of women," the sufficient condition for "improvement of women's social and economic capabilities" included "influence of women" in Tripura.

Findings from data integrating both projects: The analytical results show that the conditions in "intervention of JICA project" are related to all of the main project effects: "environmental improvement," "improvement of livelihood," and "empowerment of women." Since the above results were obtained in both states, which have very different environments, this analytical result is presumed to be applicable to some extent to other regions. Therefore, it is suggested that the improvement of project interventions for the social forestry in India contributes to the enhancement of the above project effects. Next, in a wide range of outcomes, the construction of training centers/ community places in the entry point activity is relevant. Both the training centers and the community places are frequently used for gatherings within the communities, and it can be inferred that communities which chose to build such facilities have established cooperative relationships. Moreover, the results suggest that the involvement of the forest department (frequent visits, employment of forest departments) after the project completion is an important factor contributing to the continuation of JFMC activities. According to the interviews of residents, frequent visits provided opportunities to consult with forest department staff and to build good relationships with them even though the forest departments did not offer employment. Lastly, for the several outcomes related to "empowerment of women," the sufficient conditions included a certain number of SHG members continuing in IGA.

(2) Recommendations

Long-term support by forest departments: The employment by the forest department after the project completion has also contributed to the improvement of JFMC members' livelihoods. In addition to periodic employment of JFMC members in various forest department programs, it is desirable that the activities of other departments and NGOs provide opportunities for JFMC members to continue their forest conservation. Specifically, it would be meaningful to employ JFMC members for activities such as afforestation, bush clearing, and nursery through the activities of forest departments, other departments, and NGOs. In the Tripura state, forest department officials shared knowledge of assistance programs by other departments and NGOs with JFMCs and SHGs, and introducing residents to other departments in some cases.

(3) Lessons Learned

Facilitating collaboration within community: As promoting collaboration in communities contributes to the effectiveness of the project in various areas, promoting collaboration activities in future projects is worth considering. For example, incorporating team-building training in training programs provided by social forestry projects would be meaningful. A team-building training includes the preparation of team rules, role-playing (e.g., experiencing a leadership position), and a short-term collaborative work. Since the sufficient conditions for many of the outcomes include the combination of the construction of a training center/community places and other conditions, it would be meaningful to clarify the mechanism of project effects through analysis of individual cases.

Sustainability of IGA in SHG: As mentioned earlier, it is inferred that the sustainability of IGA can be enhanced when knowledge is provided for areas in which women are traditionally engaged, such as animal husbandry. Therefore, when providing training to SHGs, it is recommended to identify the fields in which women are traditionally engaged and extend efforts to add more value to the products in these areas. However, it should be noted that before the introduction of this recommendation in future projects, further individual case analysis is needed. This recommendation is based on the presumption that the provision of knowledge through training for the areas in which women are traditionally engaged would lead to IGA continuity.

Appendix 1: Forest Area in the Tripura State

	Geo-area km2	2009 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total	10,491	111	4,770	3,192	8,073	76.95	75
Project area (districts)*	8,089	108	3,441	2,521	6,070	75.04	64
North Tripura	2,039	10	925	541	1,476	72.39	34
South Tripura	3,057	73	1,390	1,013	2,476	80.99	23
West Tripura	2,993	25	1,126	967	2,118	70.77	7

	Geo-area km2	2017 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total	10,486	656	5,246	1,824	7,726	73.68	15
Project area (districts)*	8,086	540	3,779	1,427	5,746	71.06	14
North Tripura	2,036	50	1,054	374	1,478	72.59	12
South Tripura	3,057	241	1,583	453	2,277	74.48	0
West Tripura	2,993	249	1,142	600	1,991	66.52	2

	2009/2017 Changes (%) VDF km2	MDF km2	OF km2	Total km2	Scrub km2
State Total	491%	10%	-43%	-4%	-80%
Project area (districts)*	400%	10%	-43%	-5%	-78%
North Tripura	400%	14%	-31%	0%	-65%
South Tripura	230%	14%	-55%	-8%	-100%
West Tripura	896%	1%	-38%	-6%	-71%

Source: Forest Survey of India "STATE OF FOREST REPORT 2009", Forest Survey of India "STATE OF FOREST REPORT 2017"

Appendix 2: Forest Area in the Uttar Pradesh State

		Geo-area km2	2009 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total		240,928	1,626	4,563	8,152	14,341	5.95	745
Project target area		60,354	1,315	3,167	4,590	9,062	15.01	436
North	Pilibhit	3,499	340	158	200	698	19.95	0
	Kheri	7,680	409	485	436	1,320	17.19	1
	Bahraich & Shravasti	6,878	290	315	243	848	12.33	4
	Balrampur	2,981	225	188	116	529	17.75	3
West	Lalitpur	5,039	0	128	442	570	11.31	41
	Jhansi	5,024	0	33	167	200	3.98	121
	Mahoba	2,884	0	22	73	95	3.29	96
	Hamirpur	4,282	0	66	108	174	4.06	39
South	Chitrakoot	3,092	0	358	203	561	18.14	15
	Allahabad	5,137	0	27	68	95	1.85	23
	Mirzapur	4,521	0	323	543	866	19.16	44
	Sonbhadra	6,788	45	870	1,626	2,541	37.43	38
	Chandauli	2,549	6	194	365	565	22.17	11

		Geo-area km2	2017 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total		240,928	2,617	4,069	7,993	14,679	6.09	551
Project target area		61,399	2,179	2,705	4,345	9,229	15.03	323
North	Pilibhit	3,686	471	86	131	688	18.67	2
	Kheri	7,680	805	158	311	1,274	16.59	4
	Bahraich	5,267	240	156	153	549	10.48	9
	Shravasti	1,640	152	85	48	285	17.38	0
	Balrampur	3,349	279	154	91	524	15.65	3
West	Lalitpur	5,039	0	129	458	587	11.65	31
	Jhansi	5,024	0	42	261	303	6.03	40
	Mahoba	3,144	0	21	149	170	5.41	62
	Hamirpur	4,021	0	80	147	227	5.65	14
South	Chtrakoot	3,216	81	319	186	586	18.22	37
	Allahabad	5,482	6	26	95	127	2.32	36
	Mirzapur	4,405	8	290	507	805	18.27	47
	Sonbhadra	6,905	130	967	1,442	2,539	36.77	28
	Chandauli	2,541	7	192	366	565	22.24	10

		2009/2017 Changes (%) VDF km2	MDF km2	OF km2	Total km2	Scrub km2
State Total		61%	-11%	-2%	2%	-26%
Project target area		66%	-15%	-5%	2%	-26%
North	Pilibhit	39%	-46%	-35%	-1%	NA
	Kheri	97%	-67%	-29%	-3%	300%
	Bahraich Shravasti	35%	-23%	-17%	-2%	125%
	Balrampur	24%	-18%	-22%	-1%	0%
West	Lalitpur	NA	1%	4%	3%	-24%
	Jhansi	NA	27%	56%	52%	-67%
	Mahoba	NA	-5%	104%	79%	-35%
	Hamirpur	NA	21%	36%	30%	-64%
South	Chtrakoot	NA	-11%	-8%	4%	147%
	Allahabad	NA	-4%	40%	34%	57%
	Mirzapur	NA	-10%	-7%	-7%	7%
	Sonbhadra	189%	11%	-11%	0%	-26%
	Chandauli	17%	-1%	0%	0%	-9%

Source: Forest Survey of India "STATE OF FOREST REPORT 2009", Forest Survey of India "STATE OF FOREST REPORT 2017"

Appendix 3: Social Situation in the Project Area

		Literartes			Scheduled	Scheduled		Agri.	Popolation
		Total	Male	Female	Castes	Tribes	Cultivators	Labourers	Density
		%	%	%	%	%	%	%	Person/Km2
Tripura State		87.22	91.53	82.73	17.83	31.76	20.14	24.06	350
Project area (districts)*		86.95	91.20	82.53	17.39	30.08	19.88	23.47	401.67
	North Tripura	87.50	91.13	83.75	16.57	25.86	19.82	17.69	341
	South Tripura	84.66	89.98	79.09	16.00	39.36	23.32	30.35	287
	West Tripura	88.69	92.50	84.75	19.59	25.03	16.50	22.36	577
Uttar Pradesh State		67.68	77.28	57.18	20.70	0.57	28.96	30.30	829
Project area (districts)		64.02	74.47	52.32	22.19	2.54	32.22	36.86	507
North	Pilibhit	61.47	71.70	50.00	16.42	0.08	34.99	36.24	551
	Kheri	60.56	69.57	50.42	26.40	1.33	41.85	33.38	524
	Shravasti	46.74	57.16	34.78	16.94	0.50	40.48	40.90	681
	Balrampur	49.51	59.73	38.43	12.90	1.16	36.38	43.24	642
West	Lalitpur	63.52	74.98	50.84	19.69	5.86	53.16	26.10	242
	Jhansi	75.05	85.38	63.49	28.14	0.19	28.09	30.44	398
	Mahoba	65.27	75.83	53.22	25.22	0.07	32.67	37.30	279
	Hamirpur	68.77	79.76	55.95	21.84	0.04	29.37	40.9	275
South	Chitrakoot	65.05	75.80	52.74	26.89	0.04	40.61	38.23	308
	Allahabad	72.32	82.55	60.97	22.00	0.13	22.46	25.62	1086
	Mirzapur	68.48	78.97	56.86	26.48	0.81	20.20	37.91	567
	Sonbhadra	64.03	74.92	52.14	22.64	20.67	19.31	50.83	270
	Chandauli	71.48	81.72	60.35	22.88	2.14	19.31	38.11	769

Source: Directorate od Census Operations Uttar Pradesh ” Census of India 2011 Uttar Pradesh” , Directorate od Census Operations Tripura ” Census of India 2011 Tripura”

Note: *Districts are based on the classification before the reorganization in 2012.

Appendix 4: Main Project Effect “Environmental Improvement” (Reforestation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Reforestation	Reforestation	Barren land after project completion	Did barren land in the forest area afforested by this Project increase after the project completion?	Ⅰ25
			Forest density after project completion	How is the forest density of the forest area afforested by this Project after the project completion?	Ⅰ24
			Current survival rate	How much is the survival rate for the afforestation of this Project today?	Ⅰ14
Conditions (Factors /Interventions)	Reduction of burden on forest	Reduction of burden on forest	Compliance with grazing rules	Did JFMC members stop animal grazing in the forest area planted by this Project? Does the JFMC members comply with the rules of animal grazing?	Ⅰ19 II22
			Use of LPG	What percentage does households have an LPG gas connection in this JFMC?	Ⅱ23
			Control of logging	Is tree-cutting without an official permission stopped in the forest area?	Ⅱ24
	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after this Project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last three years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Programs other than afforestation	Programs other than afforestation	(Reference) Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	II25
	Improvement of livelihood	Improvement of livelihood	JFMC members’ income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ33 Ⅱ34
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ37 Ⅱ38
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ45
	Sustainability of JFMC	JFMC’S forest conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after this project completion? What is the reason for the above answer?	Ⅰ20 Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
		Continuous use of revolving fund	Deposit to JFMC’s account *Source to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account *Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32

Appendix 5: Main Project Effect ”Environmental Improvement” (JFMC’s Forest Conservation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	JFMC’s Forest Conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after the project completion? What is the reason for the above answer?	Ⅰ20, Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 6: Main Project Effect “Environmental Improvement” (Continuous Use of Revolving Fund)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	Continuous use of revolving fund	Deposit to JFMC’s account *Source of payment to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account*Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 7: Main Project Effect “Improvement of Livelihood” (Improvement of Livelihood)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of livelihood	Improvement of livelihood	JFMC members’ household income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 33 Ⅱ 34
			JFMC members’ non-agricultural income after project	Is the non-agriculture household income increased in this JFMC due to this Project?	Ⅱ 35
			JFMC members’ minor produce sales after project	Is the sales of minor produce increased in this JFMC due to this Project? (Fodder, leaf, medicinal herbs, etc.)	Ⅱ 36
			JFMC members’ saving after project	Does JFMC members increase saving due to this Project?	Ⅱ 42
			JFMC members’ livestock after project (grazing animals, others)	Do the JFMC members increase the number of grazing animals (buffalo/cow/goats/sheep) due to this Project? Do the JFMC members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅱ 43 Ⅱ 44
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 37 Ⅱ 38
			JFMC members’ expenditure (education, mobile phone, house)	Does JFMC members increase the expenses for education due to this Project? Does JFMC members purchase mobile phones due to this Project? Does JFMC members increase the expenses for construction or improvement of house due to this Project?	Ⅱ 39 Ⅱ 41 Ⅱ 40
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ 45
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ 12
			(Reference)Use of facilities/equipment for IGA	Do JFMC members earn income by using the facilities and equipment provided by this Project? How JFMC members use the facilities and equipment for earning the income?	Ⅱ 13 Ⅱ 14
		Training	Type of training for JFMC members	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ 15
			(Reference) Use of training knowledge for IGA	Do JFMC members earn income by using the skill learned from the training provided by this Project? How JFMC members use the skill for earning the income?	Ⅱ 16 Ⅱ 17
			(Reference) Matching of training with facilities/equipment	Does the skill training match the facilities/equipment by this Project? What is the reason for the above answer?	Ⅱ 18 Ⅱ 19
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ 12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ 13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ 15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ 16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ 6
	Current situation of JFMC	Income opportunities for JFMC members	Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ 21
			Allocation from revolving fund	Does the JFMC distribute benefits, which is from a revolving fund, to JFMC members?	Ⅱ 27
			Income other than agriculture and animal husbandry	Do the JFMC members have income except the income of agriculture and animal husbandry?	Ⅱ 26

	Programs other than afforestation	Programs other than afforestation	Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	Ⅱ 25
	Improvement of women's social and economic capabilities	Improvement of women's economic capabilities	Female SHG members' income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer?	Ⅲ21 Ⅲ22

Appendix 8: Main Project Effect “Empowerment of Women” (Improvement of Women’s Social Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s social capabilities	Change in outreach of female SHG members	How far did you go alone in the last year? How far did you go alone before this Project?	Ⅲ18 Ⅲ19
			Percentage of income decided by female SHG members	How much percent can female members of this SHG decide freely on her personal income today? How much percent could female members of this SHG decide freely on her personal income before this Project? What is the reason for the change of the percentage?	Ⅲ31 Ⅲ32 Ⅲ33
			Time for SHG activities	How many hours does a SHG member spend for SHG activities for a week now? (average of SHG members, 1 day = 8hours)	Ⅲ15
			Women’s confidence in household decisions	Do you feel more confident in your decision on family matters due to this Project?	Ⅲ20
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Sustainability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of micro credit	SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 9: Main Project Effect “Empowerment of Women” (Improvement of Women’s Economic Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s economic capabilities	Female SHG members’ income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer？	Ⅲ21 Ⅲ22
			Female SHG members’ expenditure after project	Was the personal expenditure of female members of this SHG increased due to this Project?	Ⅲ26
			SHG members’ expenditure after project (education, ornaments, cosmetics, cloth)	Do SHG members increase the expenses for education due to this Project? Do SHG members increase the expenses for ornaments due to this Project? Do SHG members increase the expenses for cosmetics due to this Project? Do SHG members increase the expenses for clothes due to this Project?	Ⅲ27 Ⅲ28 Ⅲ29 Ⅲ30
			SHG members’ saving after project	Do the SHG members increase saving due to this Project?	Ⅲ23
			SHG members’ livestock after project (grazing animals, others)	Do the SHG members increase the number of grazing animals (buffalo /cow/goats/sheep) due to this Project? Do SHG members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅲ24 Ⅲ25
			Female SHG members’ influence on household expenditure	Is your opinion on household spending accepted more due to this Project?	Ⅲ34
Conditions (Factors /Interventions)	Intervention of JICA Project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅱ18
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 10: Main Project Effect “Empowerment of Women” (Continuation of SHG’s IGA)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

Appendix 11: Main Project Effect “Empowerment of Women” (SHG’s Continuous Use of Microcredit)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	SHG’s continuous use of microcredit	SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

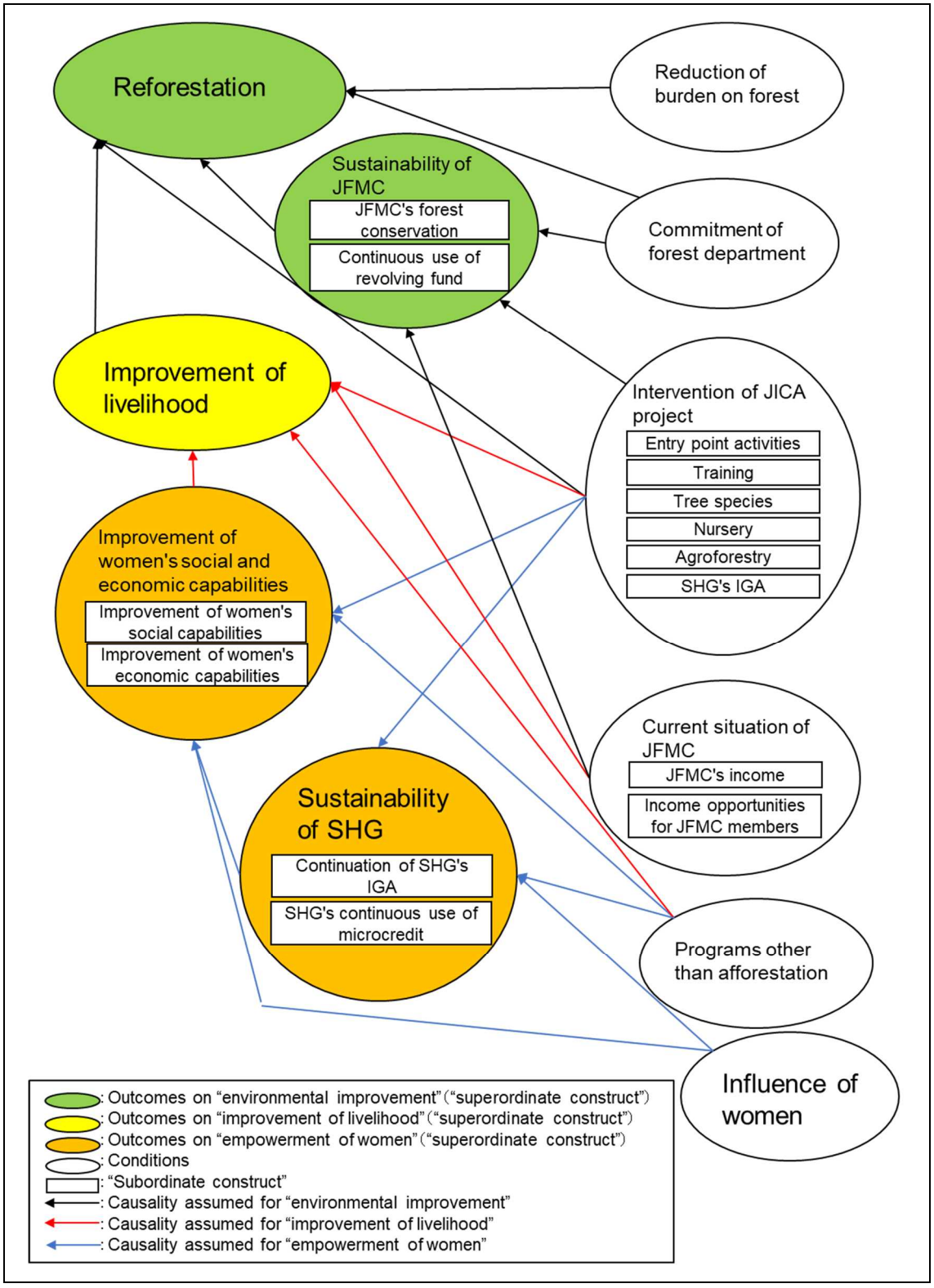
Appendix 12: Attributes

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Attribute	Attributes of JFMC	Area of forest land	Area of forest land	How many hectares is the area planted by this Project?	Ⅰ10
		Number of households	Households in JFMC at project implementation	How many households was in the JFMC during the project implementation phase?	Ⅱ5
		Literacy rate	Literacy rate	Census Data	
		Fish farming	Fish farming	Does the JFMC conduct fish farming in a check dam made by this Project?	Ⅰ17
		Market for products	Market where products are sold	Is there a market which the JFMC can sell products?	Ⅱ29
		Distance to market	Distance to market (km)	Where is the market which JFMC members can sell their products?	Ⅱ28
		Gender of SHG members	Gender of SHG members	How many members does the SHG have? (number of male, number of female)	Ⅲ6
		Female members	Number of female SHG members (fSHG)	How many female members does the SHG have?	Ⅲ6
		Percentage of women in households of JFMC	Percentage of women in households of JFMC (ratio of fJFMC)	What is the proportion of women in the households joining the JFMC?	Ⅱ7
		Female literacy rate	(Reference) Female literacy rate	Census Data	

Note:

- Outcomes in project evaluation are described as “Main project effects” for distinguishing them from the technical term in QCA (Outcomes),
- “Superordinate construct” and “Subordinate construct” are the same across the tables but the variables under “Subordinate construct” are changed in each table.
- The variables with (Reference) are ones to be unused in the analysis in principle. They are used as conditions in the analysis if it is appropriate.
- In the “Questionnaire” column, questionnaire numbers are shown. The questions with I for forest department officers, those with II for JFMC members, and those with III for SHG members.

Appendix 13: Working Framework of the Study



Appendix 14: JFMC in the Study (Tripura State)

Sadar (Active 2 & non-active 2) = 4				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Subalsingh	Gangadhan Chowdhury	Active	Yak Baksa
2	Subalsingh	Athokiri	Active	Yapri Thamsa
3	Subalsingh	Ganthalwng	Non-active	Hamari
4	Subalsingh	Dumrakaridak	Non-active	Jorakwlal

Sabroom (Active 3 & non-active 3) = 6				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Srinagar	Bangamura	Active	Hambai
2	Satchand	Puranvita	Active	Radhakrishna
3	Satchand	Kumilla Roaja Para	Non-active	Hambai
4	Srinagar	Nitya Roaja Para	Active	Sampari
5	Satchand	Jagatram Para	Non-active	Maa Kali
6	Satchand	Pushparam Roaja Para	Non-active	Naithok

Kanchanpur (Active 5 & non-active 5) = 10				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Kanchanpur	Tauboihatai Para	Active	Naithauki
2	Kanchanpur	Gobinda Para	Active	Chathak
3	Kanchanpur	Khumtaihatai Para	Active	Naithok
4	Kanchanpur	Brikhyaram Para	Active	Humlaiti
5	Kanchanpur	Khakchang	Active	Khumpui
6	Kanchanpur	Banasree	Non-active	Banalaxmi
7	Kanchanpur	Khasirai Para	Non-active	Tuisana
8	Kanchanpur	Sananda Para	Non-active	Khakchang
9	Kanchanpur	Sadaiham Para	Non-active	Kchuter
10	Kanchanpur	Nabajoy Para	Non-active	Khakchangha

Appendix 15: JFMC in the Study (Uttar Pradesh State)

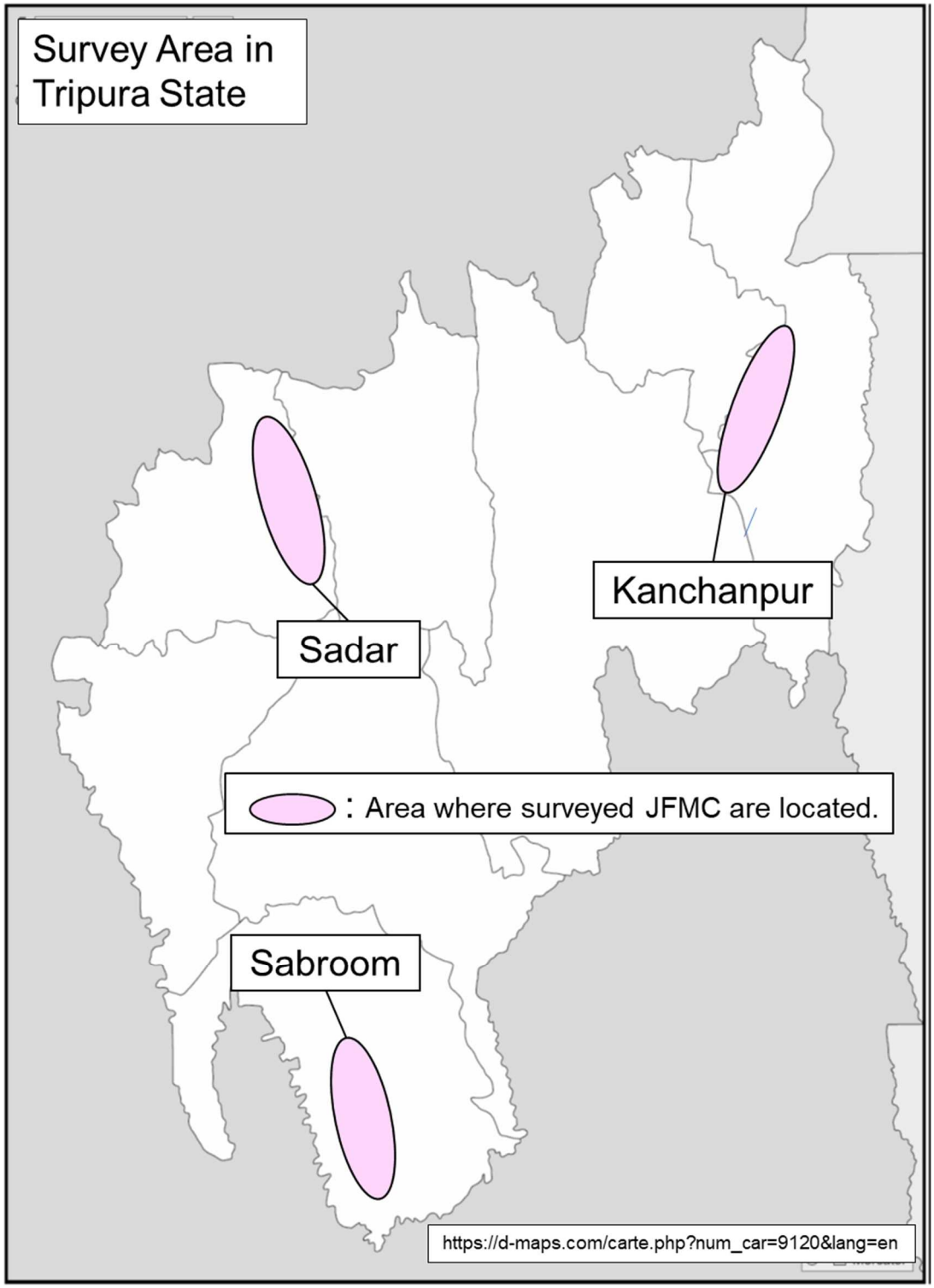
North Kheri (Active 1 & non-active 1) = 2				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	North Nighasan	Latthauha	Active	Guru Govind Singh SHG
2	North Nighasan	Murtiha	Non-Active	Veer Baba SHG

Mirzapur (Active 4 & non-active 4) = 8				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Shukrit	Lohra	Active	Jai Bharti SHG
2	Madihan	Dhekwah	Active	Saraswati SHG
3	Lalganj	Vijaypur	Active	Garib Nawaz SHG
4	Dramandganj	Naugawan	Non-Active	Jai Hanuman SHG
5	Mirzapur	Dhanwal	Non-Active	Hari om SHG
6	Chunaar	Ballipur	Non-Active	Jai Maa Durga SHG
7	Wyndham Falls	Siddhi	Active	Baba Ravidas SHG
8	Patehra	Gorthara	Non-Active	Lakshmi SHG

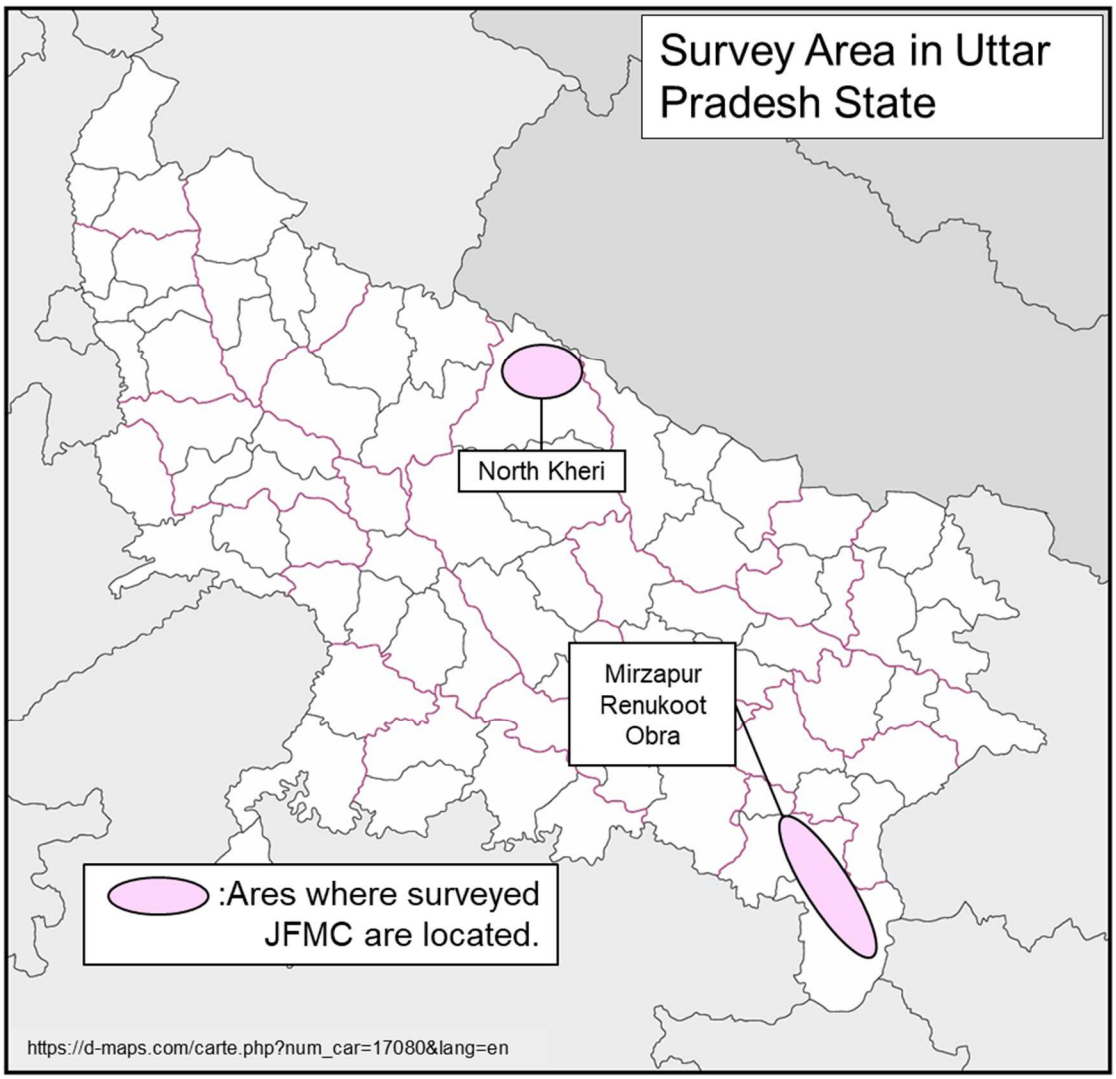
Renukoot (Active 2 & non-active 2) = 4				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Jarha	Injani	Non-Active	Lakshmi SHG
2	Dudhi	Majhauli	Active	Bhole Nath SHG
3	Dudhi	Rajkhar	Active	Maa Durge SHG
4	Vendhamganj	Gulariya	Non-Active	Saraswati SHG

Obra (Active 1 & non-active 1) = 2				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Jugail	Beejaura	Active	Chirag SHG
2	Dala	Panari	Non-Active	Rang Basia SHG

Appendix 16: Survey Area (Tripura State)



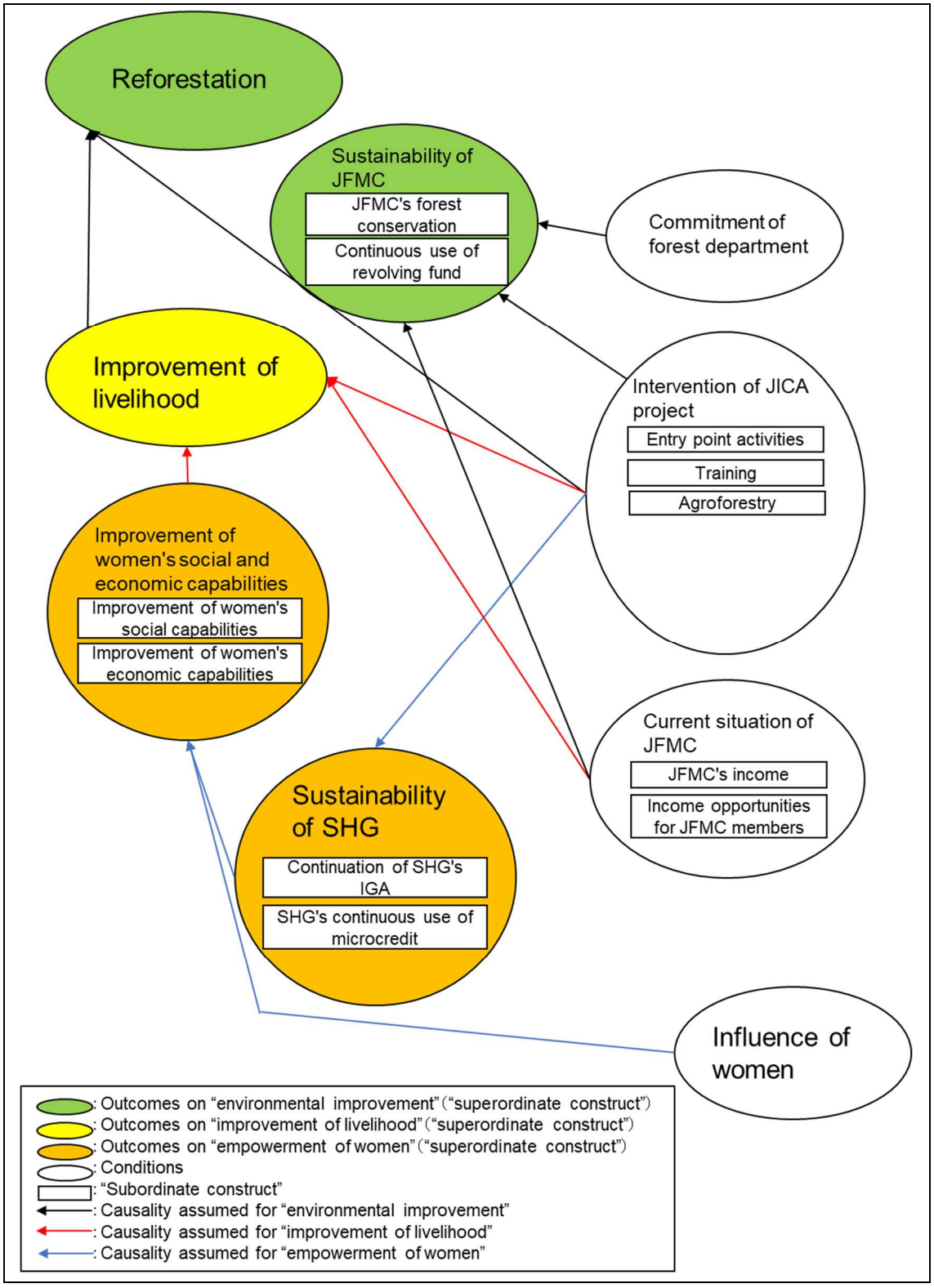
Appendix 17: Survey Area (Uttar Pradesh State)



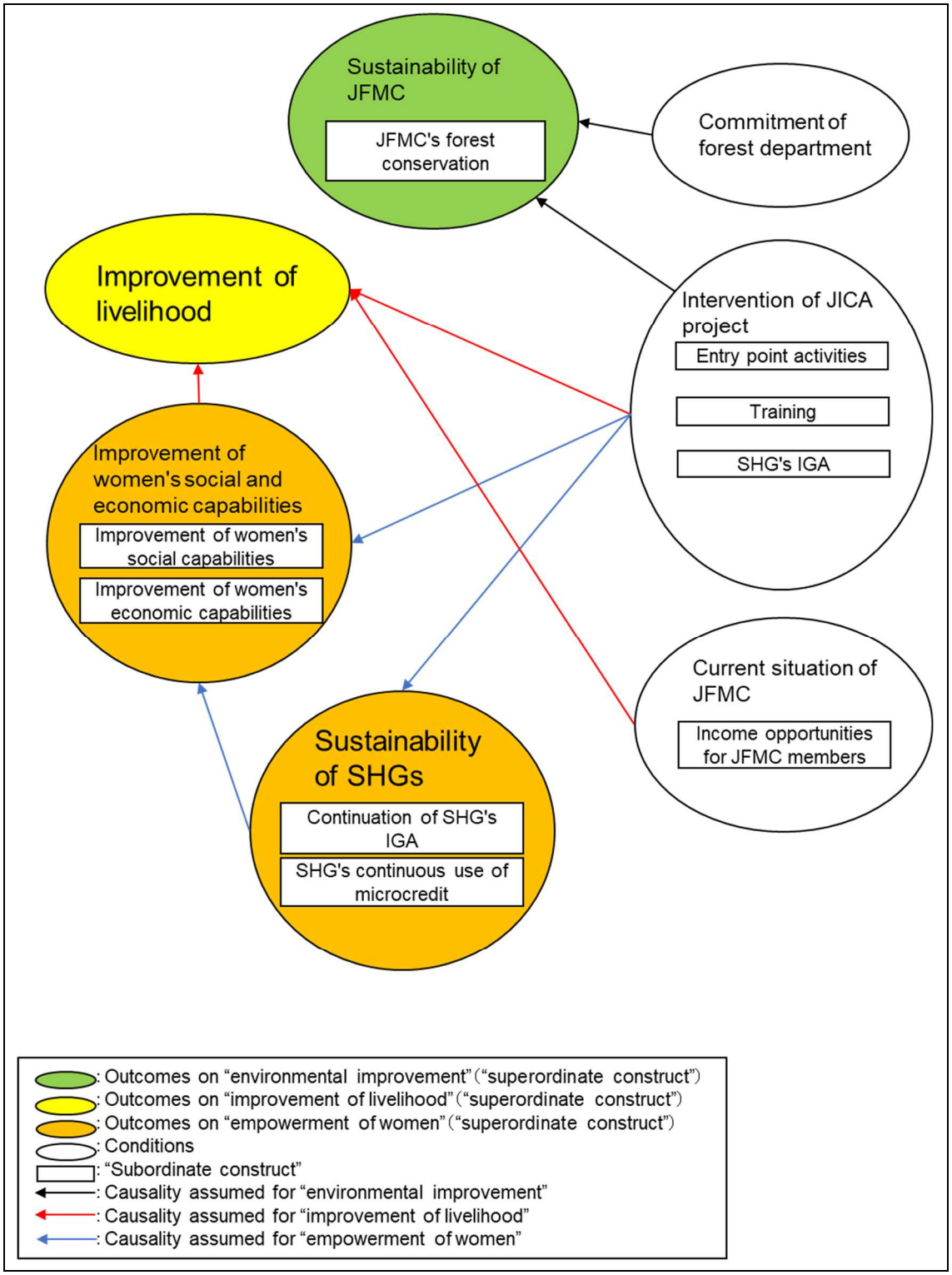
Appendix 18: Variables Used in the Analysis

Questionnaire	V. name	Variables	Classification
I-14	survive	Current survival rate (High, Low)	1: 50%-100%, 0: 0%-25%
I-19	FD_grazing	Compliance with grazing rules (Yes, No)	1: Complied completely, 0: Some don't
I-20	fire	Fire prevention after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-22	monitoring	Monitoring after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-24	forest_dens	Forest density after project completion (Increased significantly,	1: Increased significantly, 0:Increased moderately
I-25	forest_barr	Barren land after project completion (Decreased moderately , Almost same)	1: Decreased moderately, 0: Almost same
I-24&25	forest_recov	Reforestation after project completion (Significant recovery, Other)	1: Singificant recoverry in density and barren land, 0: Other
II-5	HH_number	Households in JFMC at project implementation(Many, Few)	1: More than 100 households, 0: 100 households or less
II-9	JF_female	JFMC's female executive after project completion (Many, Few)	1: Three or more, 0: Two (smallest under rule)
II-11	JF_meeting	JFMC's official meeting (Yes, No)	1: Yes for the past year, 0: No for the past year
II-12	Entry1	Type of entry point activity 1 (Basic infrastructure, Other)	1: Road&Water supply, 0: Other
II-12	Entry2	Type of entry point activity 2 (Community place, Other)	1: Community place, 0: Other
II-13	Income_P	Use of facilities/equipment for IGA (Yes, No)	1: Yes, 0: No
II-15	training	Type of training (Both, Other)	1: Plantaion&IGA, 0: Other
II-16	JF_knowledge	(Reference)Use of training knowledge for IGA (Yes, No)	1: Yes, 0: No
II-18	train_equip	(Reference)Matching of training with facilities/equipment (Yes, No)	1: Yes, 0: No
II-20	FD_visits	Visits by forest department staff (Many, Few)	1: Many (five or more), 0: Few (fewer tha five)
II-21	FD_employ	Employment by forest department (Yes, No)	1: Yes, 0: No
II-22	JF_grazing	Compliance with grazing rules (Yes, No)	1: Complied completely, 0: Some don't
II-23	LPG	Use of LPG (High, Low)	1: 60% or more, 0:Less than 60%
II-24	cutting	Control of logging (Controlled, Not controlled)	1: Complied completely, 0: Some don't
II-25	IGA_other	(Reference) Livelihood program after project completion(Yes, No)	1: Yes, 0: No
II-26	other_income	Income other than agriculture and animal husbandry (Yes, No)	1: Yes, 0: No
II-33	JF_income	JFMC members' household income after project (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
II-35	JF_otherinc	JFMC members' non-agricultural income after project (Increased	1: Increased moderately , 0: Almost same
II-37	JF_expense	JFMC members' household expenditure after project (Increased	1: Increased, 0: Almost same
II-39	JF_education	JFMC members' expenditure after project (education) (Increased, Same)	1: Increased, 0: Same
II-40	JF_house	JFMC members' expenditure after project (house) (Increased, Same)	1: Increased, 0: Same
II-42	JF_saving	JFMC members' saving after project (Increased, Same)	1: Increased, 0: Same
II-43	JF_granimal	JFMC members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
II-44	JF_othanimal	JFMC members' livestock after project (other) (Increased, Same)	1: Increased, 0: Same
II-45	JF_employ	JFMC members' employment opportunities after project (Increased probably, No increase)	1: Increased probably, 0: No increased
III-9	vill_female	Female panchayat head (Yes, No)	1: Yes, 0: No
III-10	SHG_actgrani	SHG activities 1 (Husbandry of grazing animal, Other)	1: Husbandry of grazing animal, 0: Other
III-10	SHG_actagri	SHG activities 2 (Agriculture, Other)	1: Agriculture, 0: Other
III-11	IGA_cont	Female members continuing IGA (20% or more, Less than 20%)	1: 20% or more, 0:Less than 20%
III-12	SHG_training	Type of training for SHG (Both, Other)	1: SHG Admin&IGA, 0: Other
III-13	SHG_know	(Reference)Use of training knowledge for SHG activities (Yes, No)	1: Yes, 0: No
III-14	SHG_meeting	SHG's official meeting (Yes, No)	1: Yes for the past year, 0: No for the past year
III-15	SHG_hours	Time for SHG activities (Yes, No)	1: One hour or more, 0: Less than One hour
III-16	SHG_loans	SHG's loans (Yes, No)	1: Yes, 0: No
III-17	SHG_supports	Support to SHG after project completion (Yes, No)	1: Yes, 0: No
III-18	goout_after	Current outreach of female SHG members (Long, Short)	1: Outside of panchayat, 0: Within panchayat
III-19	goout_before	Pre-project outreach of female SHG members (Long, Short)	1: Outside of panchayat, 0: Within panchayat
Ⅲ18&19	goout	Change in outreach of female SHG members (Longer, Other)	1: Longer, 2: Other
III-20	decision	Women's confidence in household decisions (Increased significantly, Other)	1: Increased significantly, 0: Other
III-21	SHG_income	Female SHG members' income after project (Increased moderately , Almost same)	1: Increased, 0: Almost same
III-23	SHG_saving	SHG members' saving after project (Increased, Same)	1: Increased, 0: Same
III-24	SHG_granimal	SHG members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
III-25	SHG_othanimal	SHG members' livestock after project (other) (Increased, Same)	1: Increased, 0: Same
III-26	SHG_expense	Female SHG members' expenditure after project (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-27	SHG_education	SHG members' expenditure after project(education) (Increased, Same)	1: Increased, 0: Same
III-28	SHG_ornament	SHG members' expenditure after project (ornament) (Increased, Same)	1: Increased, 0: Same
III-29	SHG_cosme	SHG members' expenditure after project (cosmetics) (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-30	SHG_cloth	SHG members' expenditure after project (cloth) (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-31	decide_after	Percentage of income decided by female SHG members (Much, Moderate)	1: 80% or more, 0: Less than 80%
III-32	decide_before	Percentage of income decided by female SHG members (Much, Moderate)	1: 80% or more, 0: Less than 80%
III-31&32	decide	Percentage of income decided by female SHG members (Increased significantly, Increased)	1: Increased by 50% or more, 0: Increased by less than 50%
III-34	effect_income	Female SHG members' influence on household expenditure (Agreed, Other)	1: Agreed, 0: Other

Appendix 19: Analytical Results in Tripura State



Appendix 20: Analytical Results in Uttar Pradesh State



Appendix 21: Summary Table for Analytical Results (No.1)

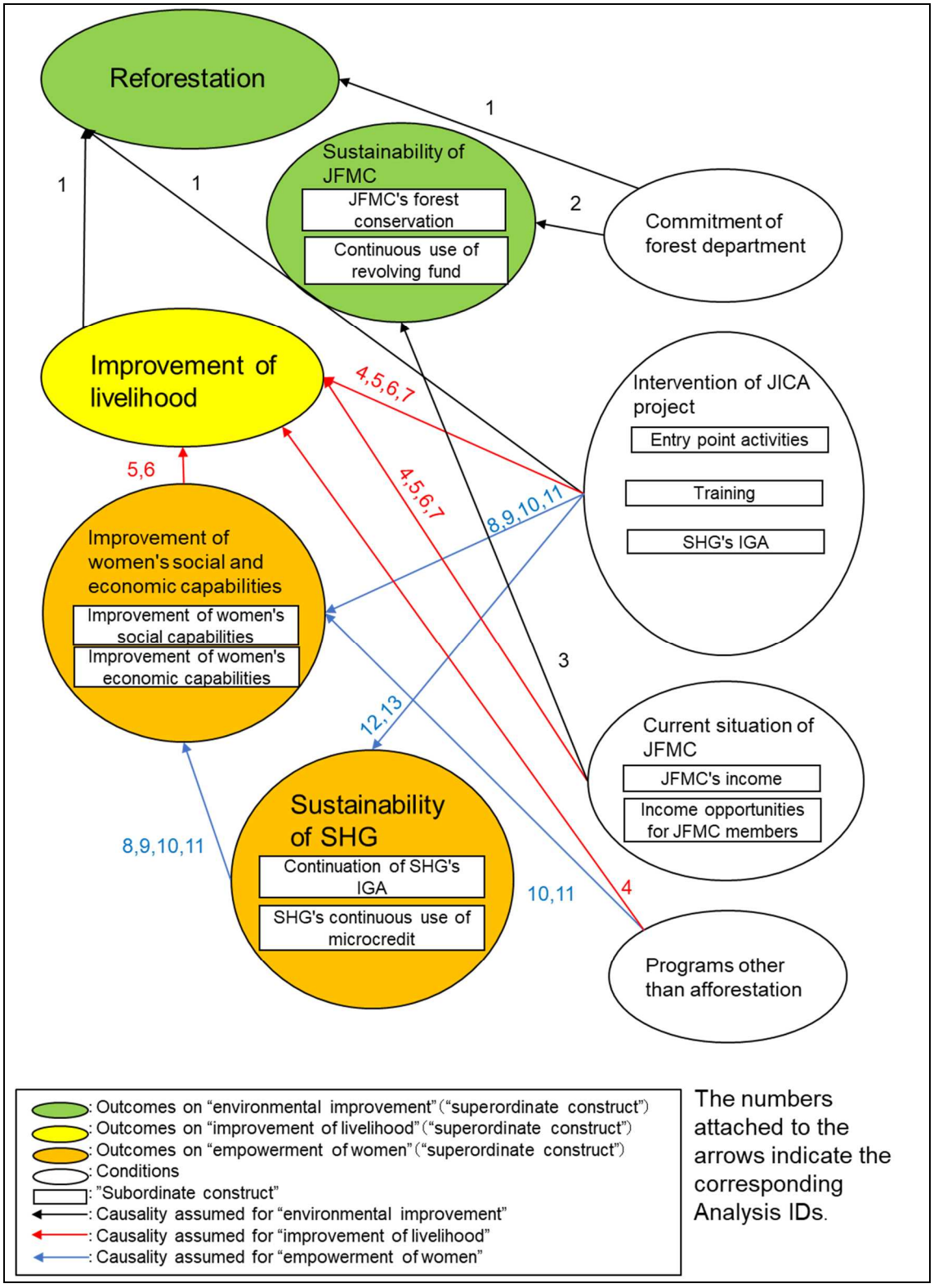
		Necessary conditions *			Parsimonious solution					
Analysis id	Model formula	Condition	Consistency	Coverage	Consistency cutoff	Solution	Raw coverage	Unique coverage	Consistency	Solution Coverage	Solution Consistency
1	FOREST_BARR = f(ENTRY3, FD_VISITS, FD_EMPLOY, JF_EMPLOY)	FD_EMPLOY	0.862069	0.892857	0.95	ENTRY3*FD_EMPLOY	0.793103	0.758621	0.958333	0.827586	0.96
		JF_EMPLOY	0.862069	0.833333		FD_VISITS*~JF_EMPLOY	0.0689655	0.0344828	1		
2	JF_MEETING = f(ENTRY3, TRAINING, FD_VISITS, FD_EMPLOY)	TRAINING	0.875	0.724138	0.842105	FD_VISITS*FD_EMPLOY	0.916667	0.916667	0.88	0.916667	0.88
		FD_VISITS	0.916667	0.785714							
		FD_EMPLOY	1	0.857143							
3	JF_DEPOSIT = f(AGROF, ENTRY3, TRAINING, FD_VISITS, FD_EMPLOY, NON_TIMBER)	AGROF	1	0.8	0.857143	NON_TIMBER	0.875	0.875	0.875	0.875	0.875
		ENTRY3	1	0.592593							
		TRAINING	1	0.551724							
		FD_VISITS	0.875	0.5							
		FD_EMPLOY	1	0.571429							
		NON_TIMBER	0.875	0.875							
4	JF_INCOME = f(ENTRY3, INCOME_P, TRAINING, FD_EMPLOY, IGA_OTHER)	ENTRY3	0.875	0.777778	0.9	~ENTRY3*FD_EMPLOY*~IGA_OTHER	0.0833333	0.0833334	1	0.916667	0.916667
		TRAINING	0.916667	0.758621		ENTRY3*TRAINING*FD_EMPLOY	0.833333	0.833333	0.909091		
		FD_EMPLOY	1	0.857143							
5	JF_EXPENSE = f(ENTRY3, TRAINING, FD_EMPLOY, SHG_INCOME)	ENTRY3	0.869565	0.740741	0.842105	ENTRY3*SHG_INCOME	0.826087	0.695652	0.863636	0.913043	0.875
		TRAINING	0.913043	0.724138		~ENTRY3*TRAINING*FD_EMPLOY*~SHG_INCOME	0.0434783	0.0434783	1	1	
		FD_EMPLOY	0.869565	0.714286		~FD_EMPLOY*SHG_INCOME	0.130435	0.0434783			
		SHG_INCOME	0.913043	0.84							
6	JF_GRANIMAL = f(ENTRY3, TRAINING, FD_EMPLOY, SHG_INCOME)				0.947368	ENTRY3*~TRAINING	0.0689655	0.0689655	1	0.965517	0.965517
						TRAINING*SHG_INCOME	0.758621	0.758621	0.956522		
						~ENTRY3*~FD_EMPLOY*~SHG_INCOME	0.137931	0.137931	1		
7	JF_EMPLOY = f(ENTRY3, TRAINING, FD_EMPLOY, IGA_OTHER, SHG_INCOME)	ENTRY3	0.866667	0.962963	0.944444	ENTRY3	0.866667	0.1	0.962963	1	0.967742
		TRAINING	0.9	0.931035		FD_EMPLOY	0.9	0.133333	0.964286		
		FD_EMPLOY	0.9	0.964286							
8	DECIDE = f(ENTRY3, SHG_ACTANIM, IGA_CONT)				0.833333	ENTRY3*~SHG_ACTANIM*~IGA_CONT	0.08	0.08	1	0.72	0.857143
						~ENTRY3*~SHG_ACTANIM*IGA_CONT	0.04	0.04	1		
						ENTRY3*SHG_ACTANIM*IGA_CONT	0.6	0.6	0.833333		
9	SHG_INCOME = f(ENTRY3, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	ENTRY3	0.88	0.814815	0.941176	ENTRY3*SHG_MEETING	0.84	0.08	0.954545	0.88	0.956522
		IGA_CONT	0.88	0.88		ENTRY3*IGA_CONT	0.8	0.04	0.952381		
		SHG_MEETING	0.92	0.821429							
10	SHG_SAVING = f(ENTRY3, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	ENTRY3	0.95	0.703704	0.823529	SHG_MEETING*SHG_SUPPORTS	0.8	0.8	0.842105	0.9	0.857143
		SHG_ACTANIM	0.85	0.586207		ENTRY3*SHG_ACTANIM*~SHG_SUPPORTS	0.1	0.1	1		
		IGA_CONT	0.9	0.72							
		SHG_MEETING	0.95	0.678571							
11	SHG_OTHANIMAL = f(ENTRY3, SHG_ACTOTHA, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	ENTRY3	1	0.592593	1	~SHG_ACTANIM*IGA_CONT*SHG_SUPPORTS	0.0625	0.0625	1	0.9375	1
		SHG_ACTOTHA	0.9375	0.789474		ENTRY3*SHG_ACTOTHA*IGA_CONT	0.9375	0.9375	1		
		SHG_ACTANIM	0.9375	0.517241							
		IGA_CONT	1	0.64							
		SHG_MEETING	1	0.571429							
		SHG_SUPPORTS	1	0.727273							
12	IGA_CONT = f(SHG_ACTANIM, SHG_KNOW, ENTRY3)	SHG_KNOW	0.92	0.92	0.941176	SHG_KNOW*~ENTRY3	0.16	0.04	1	0.8	0.952381
						SHG_ACTANIM*SHG_KNOW	0.76	0.64	0.95		
13	SHG_MEETING = f(ENTRY3, SHG_ACTANIM, SHG_KNOW, SHG_SUPPORTS)	SHG_KNOW	0.892857	1	1	SHG_KNOW	0.892857	0.892857	1	0.892857	:1

*Conditions with consistancy 0.85 or more are shown.

Appendix 22: Summary Table for Analytical Results (No.2)

Analysis id	Model formula	Parsimonious solution	Outcome		Condition 1		Condition 2		Condition 3		Conditions 4	
		Solution	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct
1	FOREST_BARR = f(ENTRY3, FD_VISITS, FD_EMPLOY, JF_EMPLOY)	ENTRY3*FD_EMPLOY	reforestation	reforestation	intervention of JICA project	entry point activities	commitment of forest department	commitment of forest department				
		FD_VISITS*~JF_EMPLOY			commitment of forest department	commitment of forest department	improvement of livelihood	improvement of livelihood				
2	JF_MEETING = f(ENTRY3, TRAINING, FD_VISITS, FD_EMPLOY)	FD_VISITS*FD_EMPLOY	sustainability of JFMC	JFMC's forest conservation	commitment of forest department	commitment of forest department	commitment of forest department	commitment of forest department				
3	JF_DEPOSIT = f(AGROF, ENTRY3, TRAINING, FD_VISITS, FD_EMPLOY, NON_TIMBER)	NON_TIMBER	sustainability of JFMC	continuous use of revolving fund	current situation of JFMC	JFMC's income						
4	JF_INCOME = f(ENTRY3, INCOME_P, TRAINING, FD_EMPLOY, IGA_OTHER)	~ENTRY3*FD_EMPLOY*~IGA_OTHER	improvement of livelihood	improvement of livelihood	intervention of JICA project	entry point activities	current situation of JFMC	income opportunities for JFMC members	programs other than afforestation	programs other than afforestation		
		ENTRY3*TRAINING*FD_EMPLOY			intervention of JICA project	entry point activities	intervention of JICA project	training	current situation of JFMC	income opportunities for JFMC members		
5	JF_EXPENSE = f(ENTRY3, TRAINING, FD_EMPLOY, SHG_INCOME)	ENTRY3*SHG_INCOME	improvement of livelihood	improvement of livelihood	intervention of JICA project	entry point activities	improvement of women's social and economic capabilities	improvement of women's economic capabilities	current situation of JFMC	income opportunities for JFMC members	improvement of women's social and economic capabilities	improvement of women's economic capabilities
		~ENTRY3*TRAINING*FD_EMPLOY*~SHG_INCOME			intervention of JICA project	entry point activities	intervention of JICA project	training				
		~FD_EMPLOY*SHG_INCOME			current situation of JFMC	income opportunities for JFMC members	improvement of women's social and economic capabilities	improvement of women's economic capabilities				
6	JF_GRANIMAL = f(ENTRY3, TRAINING, FD_EMPLOY, SHG_INCOME)	ENTRY3*~TRAINING	improvement of livelihood	improvement of livelihood	intervention of JICA project	entry point activities	intervention of JICA project	training				
		TRAINING*SHG_INCOME			intervention of JICA project	training	improvement of women's social and economic capabilities	improvement of women's economic capabilities				
		~ENTRY3*~FD_EMPLOY*~SHG_INCOME			intervention of JICA project	entry point activities	current situation of JFMC	income opportunities for JFMC members	improvement of women's social and economic capabilities	improvement of women's economic capabilities		
7	JF_EMPLOY = f(ENTRY3, TRAINING, FD_EMPLOY, IGA_OTHER, SHG_INCOME)	ENTRY3	improvement of livelihood	improvement of livelihood	intervention of JICA project	entry point activities						
		FD_EMPLOY			current situation of JFMC	income opportunities for JFMC members						
8	DECIDE = f(ENTRY3, SHG_ACTANIM, IGA_CONT)	ENTRY3*~SHG_ACTANIM*~IGA_CONT	improvement of women's social and economic capabilities	improvement of women's social capabilities	intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	sustainability of SHG	continuation of SHG's IGA		
		~ENTRY3*~SHG_ACTANIM*IGA_CONT			intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	sustainability of SHG	continuation of SHG's IGA		
		ENTRY3*SHG_ACTANIM*IGA_CONT			intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	sustainability of SHG	continuation of SHG's IGA		
9	SHG_INCOME = f(ENTRY3, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	ENTRY3*SHG_MEETING	improvement of women's social and economic capabilities	improvement of women's economic capabilities	intervention of JICA project	entry point activities	sustainability of SHG	SHG's continuous use of microcredit				
		ENTRY3*IGA_CONT			intervention of JICA project	entry point activities	sustainability of SHG	continuation of SHG's IGA				
10	SHG_SAVING = f(ENTRY3, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	SHG_MEETING*SHG_SUPPORTS	improvement of women's social and economic capabilities	improvement of women's economic capabilities	sustainability of SHG	SHG's continuous use of microcredit	programs other than afforestation	programs other than afforestation				
		ENTRY3*SHG_ACTANIM*~SHG_SUPPORTS			intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	programs other than afforestation	programs other than afforestation		
11	SHG_OTHANIMAL = f(ENTRY3, SHG_ACTOTHA, SHG_ACTANIM, IGA_CONT, SHG_MEETING, SHG_SUPPORTS)	~SHG_ACTANIM*IGA_CONT*SHG_SUPPORTS	improvement of women's social and economic capabilities	improvement of women's economic capabilities	intervention of JICA project	SHG's IGA	sustainability of SHG	continuation of SHG's IGA	programs other than afforestation	programs other than afforestation		
		ENTRY3*SHG_ACTOTHA*IGA_CONT			intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	sustainability of SHG	continuation of SHG's IGA		
12	IGA_CONT = f(SHG_ACTANIM, SHG_KNOW, ENTRY3)	SHG_KNOW*~ENTRY3	sustainability of SHG	continuation of SHG's IGA	intervention of JICA project	training	intervention of JICA project	entry point activities				
		SHG_ACTANIM*SHG_KNOW			intervention of JICA project	SHG's IGA	intervention of JICA project	training				
13	SHG_MEETING = f(ENTRY3, SHG_ACTANIM, SHG_KNOW, SHG_SUPPORTS)	SHG_KNOW	sustainability of SHG	SHG's continuous use of microcredit	intervention of JICA project	training						

Appendix 23: Analytical Results of this Study



Appendix 24: Cross-Tabulation　Barren Land after Project Completion

REPLANT	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	23	30	20.7%	100.0%
= 1	0	6	6	coverage	coverage
Total	7	29	36	100.0%	20.7%

NURSERY	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	23	29	20.7%	85.7%
= 1	1	6	7	coverage	coverage
Total	7	29	36	85.7%	20.7%

AGROF	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	9	16	69.0%	100.0%
= 1	0	20	20	coverage	coverage
Total	7	29	36	100.0%	69.0%

HARVEST	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	14	21	51.7%	100.0%
= 1	0	15	15	coverage	coverage
Total	7	29	36	100.0%	51.7%

NEWPROJECT	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	23	30	20.7%	100.0%
= 1	0	6	6	coverage	coverage
Total	7	29	36	100.0%	20.7%

FD_GRAZING	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	21	22	27.6%	57.1%
= 1	6	8	14	coverage	coverage
Total	7	29	36	57.1%	27.6%

FIRE	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	17	20	41.4%	75.0%
= 1	4	12	16	coverage	coverage
Total	7	29	36	75.0%	41.4%

MONITORING	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	0	7	100.0%	100.0%
= 1	0	29	29	coverage	coverage
Total	7	29	36	100.0%	100.0%

JF_MEETING	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	8	12	72.4%	87.5%
= 1	3	21	24	coverage	coverage
Total	7	29	36	87.5%	72.4%

ENTRY1	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	14	21	51.7%	100.0%
= 1	0	15	15	coverage	coverage
Total	7	29	36	100.0%	51.7%

ENTRY2	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	20	24	31.0%	75.0%
= 1	3	9	12	coverage	coverage
Total	7	29	36	75.0%	31.0%

ENTRY3	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	5	9	82.8%	88.9%
= 1	3	24	27	coverage	coverage
Total	7	29	36	88.9%	82.8%

FD_VISITS	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	82.8%	85.7%
= 1	4	24	28	coverage	coverage
Total	7	29	36	85.7%	82.8%

FD_EMPLOY	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	4	8	86.2%	89.3%
= 1	3	25	28	coverage	coverage
Total	7	29	36	89.3%	86.2%

JF_GRAZING	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	9	11	69.0%	80.0%
= 1	5	20	25	coverage	coverage
Total	7	29	36	80.0%	69.0%

LPG	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	0	11	11	62.1%	72.0%
= 1	7	18	25	coverage	coverage
Total	7	29	36	72.0%	62.1%

CUTTING	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	16	19	44.8%	76.5%
= 1	4	13	17	coverage	coverage
Total	7	29	36	76.5%	44.8%

JF_DEPOSIT	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	13	20	55.2%	100.0%
= 1	0	16	16	coverage	coverage
Total	7	29	36	100.0%	55.2%

JF_DRAW	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	16	19	44.8%	76.5%
= 1	4	13	17	coverage	coverage
Total	7	29	36	76.5%	44.8%

JF_INCOME	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	7	12	75.9%	91.7%
= 1	2	22	24	coverage	coverage
Total	7	29	36	91.7%	75.9%

JF_EXPENSE	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	8	13	72.4%	91.3%
= 1	2	21	23	coverage	coverage
Total	7	29	36	91.3%	72.4%

JF_EMPLOY	FOREST_BARR		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	4	6	86.2%	83.3%
= 1	5	25	30	coverage	coverage
Total	7	29	36	83.3%	86.2%

*necessary condition
**sufficient condition

Appendix 25: Cross-Tabulation JFMC's Official Meeting

REPLANT	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	18	30	25.0%	100.0%
= 1	0	6	6	coverage	coverage
Total	12	24	36	100.0%	25.0%
NURSERY	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	19	29	20.8%	71.4%
= 1	2	5	7	coverage	coverage
Total	12	24	36	71.4%	20.8%
AGROF	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	8	16	66.7%	80.0%
= 1	4	16	20	coverage	coverage
Total	12	24	36	80.0%	66.7%
HARVEST	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	10	21	58.3%	93.3%
= 1	1	14	15	coverage	coverage
Total	12	24	36	93.3%	58.3%
NEWPROJECT	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	19	30	20.8%	83.3%
= 1	1	5	6	coverage	coverage
Total	12	24	36	83.3%	20.8%
ENTRY1	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	12	21	50.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	12	24	36	80.0%	50.0%
ENTRY2	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	16	24	33.3%	66.7%
= 1	4	8	12	coverage	coverage
Total	12	24	36	66.7%	33.3%
ENTRY3	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	83.3%	74.1%
= 1	7	20	27	coverage	coverage
Total	12	24	36	74.1%	83.3%
TRAINING	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	3	7	87.5%	72.4%
= 1	8	21	29	coverage	coverage
Total	12	24	36	72.4%	87.5%
FD_VISITS	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	91.7%	78.6%
= 1	6	22	28	coverage	coverage
Total	12	24	36	78.6%	91.7%
FD_EMPLOY	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	83.3%	74.1%
= 1	7	20	27	coverage	coverage
Total	12	24	36	74.1%	83.3%
NON_TIMBER	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	8	20	66.7%	100.0%
= 1	0	16	16	coverage	coverage
Total	12	24	36	100.0%	66.7%

*necessary condition
**sufficient condition

Appendix 26: Cross-Tabulation Deposit to JFMC's Account

REPLANT	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	19	11	30	31.3%	83.3%
= 1	1	5	6	coverage	coverage
Total	20	16	36	83.3%	31.3%
NURSERY	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	16	13	29	18.8%	42.9%
= 1	4	3	7	coverage	coverage
Total	20	16	36	42.9%	18.8%
AGROF	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	16	0	16	100.0%	80.0%
= 1	4	16	20	coverage	coverage
Total	20	16	36	80.0%	100.0%
HARVEST	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	18	3	21	81.3%	86.7%
= 1	2	13	15	coverage	coverage
Total	20	16	36	86.7%	81.3%
NEWPROJECT	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	19	11	30	31.3%	83.3%
= 1	1	5	6	coverage	coverage
Total	20	16	36	83.3%	31.3%
ENTRY1	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	18	3	21	81.3%	86.7%
= 1	2	13	15	coverage	coverage
Total	20	16	36	86.7%	81.3%
ENTRY2	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	13	24	18.8%	25.0%
= 1	9	3	12	coverage	coverage
Total	20	16	36	25.0%	18.8%
ENTRY3	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	0	9	100.0%	59.3%
= 1	11	16	27	coverage	coverage
Total	20	16	36	59.3%	100.0%
TRAINING	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	0	7	100.0%	55.2%
= 1	13	16	29	coverage	coverage
Total	20	16	36	55.2%	100.0%
FD_VISITS	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	87.5%	50.0%
= 1	14	14	28	coverage	coverage
Total	20	16	36	50.0%	87.5%
FD_EMPLOY	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	0	9	100.0%	59.3%
= 1	11	16	27	coverage	coverage
Total	20	16	36	59.3%	100.0%
NON_TIMBER	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	18	2	20	87.5%	87.5%
= 1	2	14	16	coverage	coverage
Total	20	16	36	87.5%	87.5%

*necessary condition
**sufficient condition

Appendix 27: Cross-Tabulation　JFMC Members' Household Income after Project

NURSERY	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	20	29	16.7%	57.1%
= 1	3	4	7	coverage	coverage
Total	12	24	36	57.1%	16.7%

AGROF	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	6	16	75.0%	90.0%
= 1	2	18	20	coverage	coverage
Total	12	24	36	90.0%	75.0%

HARVEST	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	9	21	62.5%	100.0%
= 1	0	15	15	coverage	coverage
Total	12	24	36	100.0%	62.5%

ENTRY1	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	11	21	54.2%	86.7%
= 1	2	13	15	coverage	coverage
Total	12	24	36	86.7%	54.2%

ENTRY2	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	16	24	33.3%	66.7%
= 1	4	8	12	coverage	coverage
Total	12	24	36	66.7%	33.3%

ENTRY3	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	3	9	87.5%	77.8%
= 1	6	21	27	coverage	coverage
Total	12	24	36	77.8%	87.5%

INCOME_P	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	4	14	83.3%	90.9%
= 1	2	20	22	coverage	coverage
Total	12	24	36	90.9%	83.3%

TRAINING	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	2	7	91.7%	75.9%
= 1	7	22	29	coverage	coverage
Total	12	24	36	75.9%	91.7%

*necessary condition
**sufficient condition

JF_KNOWLEDGE	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	95.8%	82.1%
= 1	5	23	28	coverage	coverage
Total	12	24	36	82.1%	95.8%

TRAIN_EQUIP	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	4	13	83.3%	87.0%
= 1	3	20	23	coverage	coverage
Total	12	24	36	87.0%	83.3%

FD_EMPLOY	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	0	8	100.0%	85.7%
= 1	4	24	28	coverage	coverage
Total	12	24	36	85.7%	100.0%

IGA_OTHER	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	4	12	83.3%	83.3%
= 1	4	20	24	coverage	coverage
Total	12	24	36	83.3%	83.3%

OTHER_INCOME	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	70.8%	77.3%
= 1	5	17	22	coverage	coverage
Total	12	24	36	77.3%	70.8%

DISTRIBUTION	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	21	33	12.5%	100.0%
= 1	0	3	3	coverage	coverage
Total	12	24	36	100.0%	12.5%

SHG_INCOME	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	4	11	83.3%	80.0%
= 1	5	20	25	coverage	coverage
Total	12	24	36	80.0%	83.3%

Appendix 28: Cross-Tabulation　JFMC Members' Household Expenditure after Project

NURSERY	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	18	29	21.7%	71.4%
= 1	2	5	7	coverage	coverage
Total	13	23	36	71.4%	21.7%

AGROF	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	7	16	69.6%	80.0%
= 1	4	16	20	coverage	coverage
Total	13	23	36	80.0%	69.6%

HARVEST	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	9	21	60.9%	93.3%
= 1	1	14	15	coverage	coverage
Total	13	23	36	93.3%	60.9%

ENTRY1	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	11	21	52.2%	80.0%
= 1	3	12	15	coverage	coverage
Total	13	23	36	80.0%	52.2%

ENTRY2	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	15	24	34.8%	66.7%
= 1	4	8	12	coverage	coverage
Total	13	23	36	66.7%	34.8%

ENTRY3	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	3	9	87.0%	74.1%
= 1	7	20	27	coverage	coverage
Total	13	23	36	74.1%	87.0%

INCOME_P	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	6	14	73.9%	77.3%
= 1	5	17	22	coverage	coverage
Total	13	23	36	77.3%	73.9%

TRAINING	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	2	7	91.3%	72.4%
= 1	8	21	29	coverage	coverage
Total	13	23	36	72.4%	91.3%

*necessary condition
**sufficient condition

JF_KNOWLEDGE	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	91.3%	75.0%
= 1	7	21	28	coverage	coverage
Total	13	23	36	75.0%	91.3%

TRAIN_EQUIP	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	5	13	78.3%	78.3%
= 1	5	18	23	coverage	coverage
Total	13	23	36	78.3%	78.3%

FD_EMPLOY	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	3	8	87.0%	71.4%
= 1	8	20	28	coverage	coverage
Total	13	23	36	71.4%	87.0%

IGA_OTHER	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	78.3%	75.0%
= 1	6	18	24	coverage	coverage
Total	13	23	36	75.0%	78.3%

OTHER_INCOME	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	6	14	73.9%	77.3%
= 1	5	17	22	coverage	coverage
Total	13	23	36	77.3%	73.9%

DISTRIBUTION	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	13	20	33	13.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	13	23	36	100.0%	13.0%

SHG_INCOME	JF_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	2	11	91.3%	84.0%
= 1	4	21	25	coverage	coverage
Total	13	23	36	84.0%	91.3%

Appendix 29: Cross-Tabulation　JFMC Members' Livestock after Project (Grazing Animal)

NURSERY	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	22	29	24.1%	100.0%
= 1	0	7	7	coverage	coverage
Total	7	29	36	100.0%	24.1%

AGROF	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	12	16	58.6%	85.0%
= 1	3	17	20	coverage	coverage
Total	7	29	36	85.0%	58.6%

HARVEST	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	14	21	51.7%	100.0%
= 1	0	15	15	coverage	coverage
Total	7	29	36	100.0%	51.7%

ENTRY1	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	16	21	44.8%	86.7%
= 1	2	13	15	coverage	coverage
Total	7	29	36	86.7%	44.8%

ENTRY2	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	19	24	34.5%	83.3%
= 1	2	10	12	coverage	coverage
Total	7	29	36	83.3%	34.5%

ENTRY3	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	79.3%	85.2%
= 1	4	23	27	coverage	coverage
Total	7	29	36	85.2%	79.3%

INCOME_P	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	10	14	65.5%	86.4%
= 1	3	19	22	coverage	coverage
Total	7	29	36	86.4%	65.5%

TRAINING	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	82.8%	82.8%
= 1	5	24	29	coverage	coverage
Total	7	29	36	82.8%	82.8%

*necessary condition
**sufficient condition

JF_KNOWLEDGE	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	82.8%	85.7%
= 1	4	24	28	coverage	coverage
Total	7	29	36	85.7%	82.8%

TRAIN_EQUIP	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	9	13	69.0%	87.0%
= 1	3	20	23	coverage	coverage
Total	7	29	36	87.0%	69.0%

FD_EMPLOY	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	79.3%	82.1%
= 1	5	23	28	coverage	coverage
Total	7	29	36	82.1%	79.3%

IGA_OTHER	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	10	12	65.5%	79.2%
= 1	5	19	24	coverage	coverage
Total	7	29	36	79.2%	65.5%

OTHER_INCOME	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	12	14	58.6%	77.3%
= 1	5	17	22	coverage	coverage
Total	7	29	36	77.3%	58.6%

DISTRIBUTION	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	26	33	10.3%	100.0%
= 1	0	3	3	coverage	coverage
Total	7	29	36	100.0%	10.3%

SHG_INCOME	JF_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	6	11	79.3%	92.0%
= 1	2	23	25	coverage	coverage
Total	7	29	36	92.0%	79.3%

Appendix 30: Cross-Tabulation　JFMC Members' Employment Opportunities after Project

NURSERY	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	24	29	20.0%	85.7%
= 1	1	6	7	coverage	coverage
Total	6	30	36	85.7%	20.0%

AGROF	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	11	16	63.3%	95.0%
= 1	1	19	20	coverage	coverage
Total	6	30	36	95.0%	63.3%

HARVEST	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	15	21	50.0%	100.0%
= 1	0	15	15	coverage	coverage
Total	6	30	36	100.0%	50.0%

ENTRY1	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	16	21	46.7%	93.3%
= 1	1	14	15	coverage	coverage
Total	6	30	36	93.3%	46.7%

ENTRY2	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	18	24	40.0%	100.0%
= 1	0	12	12	coverage	coverage
Total	6	30	36	100.0%	40.0%

ENTRY3	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	86.7%	96.3%
= 1	1	26	27	coverage	coverage
Total	6	30	36	96.3%	86.7%

INCOME_P	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	9	14	70.0%	95.5%
= 1	1	21	22	coverage	coverage
Total	6	30	36	95.5%	70.0%

TRAINING	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	3	7	90.0%	93.1%
= 1	2	27	29	coverage	coverage
Total	6	30	36	93.1%	90.0%

*necessary condition
**sufficient condition

JF_KNOWLEDGE	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	3	8	90.0%	96.4%
= 1	1	27	28	coverage	coverage
Total	6	30	36	96.4%	90.0%

TRAIN_EQUIP	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	8	13	73.3%	95.7%
= 1	1	22	23	coverage	coverage
Total	6	30	36	95.7%	73.3%

FD_EMPLOY	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	3	8	90.0%	96.4%
= 1	1	27	28	coverage	coverage
Total	6	30	36	96.4%	90.0%

IGA_OTHER	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	7	12	76.7%	95.8%
= 1	1	23	24	coverage	coverage
Total	6	30	36	95.8%	76.7%

OTHER_INCOME	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	9	14	70.0%	95.5%
= 1	1	21	22	coverage	coverage
Total	6	30	36	95.5%	70.0%

DISTRIBUTION	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	27	33	10.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	6	30	36	100.0%	10.0%

SHG_INCOME	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	7	11	76.7%	92.0%
= 1	2	23	25	coverage	coverage
Total	6	30	36	92.0%	76.7%

Appendix 31: Cross-Tabulation　Percentage of Income Decided by Female SHG Members

JF_FEMALE	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	13	16	48.0%	60.0%
= 1	8	12	20	coverage	coverage
Total	11	25	36	60.0%	48.0%
ENTRY1	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	13	21	48.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	11	25	36	80.0%	48.0%
ENTRY2	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	18	24	28.0%	58.3%
= 1	5	7	12	coverage	coverage
Total	11	25	36	58.3%	28.0%
ENTRY3	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	76.0%	70.4%
= 1	8	19	27	coverage	coverage
Total	11	25	36	70.4%	76.0%
VILL_FEMALE	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	21	29	16.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	11	25	36	57.1%	16.0%
SHG_ACTGRANI	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	15	20	40.0%	62.5%
= 1	6	10	16	coverage	coverage
Total	11	25	36	62.5%	40.0%
SHG_ACTOHA	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	64.0%	84.2%
= 1	3	16	19	coverage	coverage
Total	11	25	36	84.2%	64.0%
SHG_ACTANIM	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	80.0%	69.0%
= 1	9	20	29	coverage	coverage
Total	11	25	36	69.0%	80.0%
IGA_CONT	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	5	11	80.0%	80.0%
= 1	5	20	25	coverage	coverage
Total	11	25	36	80.0%	80.0%
SHG_KNOW	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	4	11	84.0%	84.0%
= 1	4	21	25	coverage	coverage
Total	11	25	36	84.0%	84.0%
SHG_SUPPORTS	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	8	14	68.0%	77.3%
= 1	5	17	22	coverage	coverage
Total	11	25	36	77.3%	68.0%

*necessary condition
**sufficient condition

Appendix 32: Cross-Tabulation　Female SHG Members' Income after Project

JF_FEMALE	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	9	16	64.0%	80.0%
= 1	4	16	20	coverage	coverage
Total	11	25	36	80.0%	64.0%

ENTRY1	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	12	21	52.0%	86.7%
= 1	2	13	15	coverage	coverage
Total	11	25	36	86.7%	52.0%

ENTRY2	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	16	24	36.0%	75.0%
= 1	3	9	12	coverage	coverage
Total	11	25	36	75.0%	36.0%

ENTRY3	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	3	9	88.0%	81.5%
= 1	5	22	27	coverage	coverage
Total	11	25	36	81.5%	88.0%

VILL_FEMALE	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	19	29	24.0%	85.7%
= 1	1	6	7	coverage	coverage
Total	11	25	36	85.7%	24.0%

SHG_ACTGRANI	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	14	20	44.0%	68.8%
= 1	5	11	16	coverage	coverage
Total	11	25	36	68.8%	44.0%

SHG_ACTOHA	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	64.0%	84.2%
= 1	3	16	19	coverage	coverage
Total	11	25	36	84.2%	64.0%

*necessary condition
**sufficient condition

SHG_ACTANIM	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	4	7	84.0%	72.4%
= 1	8	21	29	coverage	coverage
Total	11	25	36	72.4%	84.0%

IGA_CONT	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	3	11	88.0%	88.0%
= 1	3	22	25	coverage	coverage
Total	11	25	36	88.0%	88.0%

SHG_KNOW	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	2	11	92.0%	92.0%
= 1	2	23	25	coverage	coverage
Total	11	25	36	92.0%	92.0%

SHG_MEETING	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	92.0%	82.1%
= 1	5	23	28	coverage	coverage
Total	11	25	36	82.1%	92.0%

SHG_LOANS	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	19	30	24.0%	100.0%
= 1	0	6	6	coverage	coverage
Total	11	25	36	100.0%	24.0%

SHG_SUPPORTS	SHG_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	72.0%	81.8%
= 1	4	18	22	coverage	coverage
Total	11	25	36	81.8%	72.0%

Appendix 33: Cross-Tabulation SHG Members' Saving after Project

JF_FEMALE	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	7	16	65.0%	65.0%
= 1	7	13	20	coverage	coverage
Total	16	20	36	65.0%	65.0%

ENTRY1	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	9	21	55.0%	73.3%
= 1	4	11	15	coverage	coverage
Total	16	20	36	73.3%	55.0%

ENTRY2	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	12	24	40.0%	66.7%
= 1	4	8	12	coverage	coverage
Total	16	20	36	66.7%	40.0%

ENTRY3	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	1	9	95.0%	70.4%
= 1	8	19	27	coverage	coverage
Total	16	20	36	70.4%	95.0%

VILL_FEMALE	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	15	14	29	30.0%	85.7%
= 1	1	6	7	coverage	coverage
Total	16	20	36	85.7%	30.0%

SHG_ACTGRANI	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	13	20	35.0%	43.8%
= 1	9	7	16	coverage	coverage
Total	16	20	36	43.8%	35.0%

SHG_ACTOHA	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	5	17	75.0%	78.9%
= 1	4	15	19	coverage	coverage
Total	16	20	36	78.9%	75.0%

*necessary condition
**sufficient condition

SHG_ACTANIM	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	3	7	85.0%	58.6%
= 1	12	17	29	coverage	coverage
Total	16	20	36	58.6%	85.0%

IGA_CONT	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	2	11	90.0%	72.0%
= 1	7	18	25	coverage	coverage
Total	16	20	36	72.0%	90.0%

SHG_KNOW	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	1	11	95.0%	76.0%
= 1	6	19	25	coverage	coverage
Total	16	20	36	76.0%	95.0%

SHG_MEETING	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	95.0%	67.9%
= 1	9	19	28	coverage	coverage
Total	16	20	36	67.9%	95.0%

SHG_LOANS	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	14	16	30	20.0%	66.7%
= 1	2	4	6	coverage	coverage
Total	16	20	36	66.7%	20.0%

SHG_SUPPORTS	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	4	14	80.0%	72.7%
= 1	6	16	22	coverage	coverage
Total	16	20	36	72.7%	80.0%

Appendix 34: Cross-Tabulation SHG Members' Livestock after Project (Other)

JF_FEMALE	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	4	16	75.0%	60.0%
= 1	8	12	20	coverage	coverage
Total	20	16	36	60.0%	75.0%
ENTRY1	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	17	4	21	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	20	16	36	80.0%	75.0%
ENTRY2	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	12	12	24	25.0%	33.3%
= 1	8	4	12	coverage	coverage
Total	20	16	36	33.3%	25.0%
ENTRY3	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	0	9	100.0%	59.3%
= 1	11	16	27	coverage	coverage
Total	20	16	36	59.3%	100.0%
VILL_FEMALE	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	17	12	29	25.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	20	16	36	57.1%	25.0%
SHG_ACTGRANI	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	10	20	37.5%	37.5%
= 1	10	6	16	coverage	coverage
Total	20	16	36	37.5%	37.5%
SHG_ACTOHA	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	16	1	17	93.8%	78.9%
= 1	4	15	19	coverage	coverage
Total	20	16	36	78.9%	93.8%

*necessary condition
**sufficient condition

SHG_ACTANIM	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	1	7	93.8%	51.7%
= 1	14	15	29	coverage	coverage
Total	20	16	36	51.7%	93.8%
IGA_CONT	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	0	11	100.0%	64.0%
= 1	9	16	25	coverage	coverage
Total	20	16	36	64.0%	100.0%
SHG_KNOW	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	11	0	11	100.0%	64.0%
= 1	9	16	25	coverage	coverage
Total	20	16	36	64.0%	100.0%
SHG_MEETING	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	0	8	100.0%	57.1%
= 1	12	16	28	coverage	coverage
Total	20	16	36	57.1%	100.0%
SHG_LOANS	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	17	13	30	18.8%	50.0%
= 1	3	3	6	coverage	coverage
Total	20	16	36	50.0%	18.8%
SHG_SUPPORTS	SHG_OTHANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	14	0	14	100.0%	72.7%
= 1	6	16	22	coverage	coverage
Total	20	16	36	72.7%	100.0%

Appendix 35: Cross-Tabulation　Female Members Continuing IGA

JF_FEMALE	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	9	16	64.0%	80.0%
= 1	4	16	20	coverage	coverage
Total	11	25	36	80.0%	64.0%
ENTRY1	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	12	21	52.0%	86.7%
= 1	2	13	15	coverage	coverage
Total	11	25	36	86.7%	52.0%
ENTRY2	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	17	24	32.0%	66.7%
= 1	4	8	12	coverage	coverage
Total	11	25	36	66.7%	32.0%
ENTRY3	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	84.0%	77.8%
= 1	6	21	27	coverage	coverage
Total	11	25	36	77.8%	84.0%
VILL_FEMALE	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	10	19	29	24.0%	85.7%
= 1	1	6	7	coverage	coverage
Total	11	25	36	85.7%	24.0%
SHG_ACTGRANI	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	14	20	44.0%	68.8%
= 1	5	11	16	coverage	coverage
Total	11	25	36	68.8%	44.0%
SHG_ACTOHA	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	64.0%	84.2%
= 1	3	16	19	coverage	coverage
Total	11	25	36	84.2%	64.0%
SHG_ACTANIM	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	4	7	84.0%	72.4%
= 1	8	21	29	coverage	coverage
Total	11	25	36	72.4%	84.0%
SHG_KNOW	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	2	11	92.0%	92.0%
= 1	2	23	25	coverage	coverage
Total	11	25	36	92.0%	92.0%
SHG_SUPPORTS	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	72.0%	81.8%
= 1	4	18	22	coverage	coverage
Total	11	25	36	81.8%	72.0%

*necessary condition
**sufficient condition

Appendix 36: Cross-Tabulation SHG's Official meeting

JF_FEMALE	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	12	16	57.1%	80.0%
= 1	4	16	20	coverage	coverage
Total	8	28	36	80.0%	57.1%
ENTRY1	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	15	21	46.4%	86.7%
= 1	2	13	15	coverage	coverage
Total	8	28	36	86.7%	46.4%
ENTRY2	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	19	24	32.1%	75.0%
= 1	3	9	12	coverage	coverage
Total	8	28	36	75.0%	32.1%
ENTRY3	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	78.6%	81.5%
= 1	5	22	27	coverage	coverage
Total	8	28	36	81.5%	78.6%
VILL_FEMALE	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	21	29	25.0%	100.0%
= 1	0	7	7	coverage	coverage
Total	8	28	36	100.0%	25.0%
SHG_ACTGRANI	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	15	20	46.4%	81.3%
= 1	3	13	16	coverage	coverage
Total	8	28	36	81.3%	46.4%
SHG_ACTOHA	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	12	17	57.1%	84.2%
= 1	3	16	19	coverage	coverage
Total	8	28	36	84.2%	57.1%
SHG_ACTANIM	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	82.1%	79.3%
= 1	6	23	29	coverage	coverage
Total	8	28	36	79.3%	82.1%
SHG_KNOW	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	3	11	89.3%	100.0%
= 1	0	25	25	coverage	coverage
Total	8	28	36	100.0%	89.3%
SHG_SUPPORTS	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	9	14	67.9%	86.4%
= 1	3	19	22	coverage	coverage
Total	8	28	36	86.4%	67.9%

*necessary condition
**sufficient condition

Ex-Post Project Evaluation 2019: Package III-5 (India)
Qualitative Comparative Analysis (QCA) Paper (Tripura State)

May 18, 2022

Nobuyuki Kobayashi, OPMAC Corporation

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Summary

Background: JICA implemented forest sector projects in India are unique in that they involve various interventions in addition to afforestation activities. Moreover, the project environment, such as climate, nature, social conditions, and economic conditions, is also diverse. Qualitative Comparative Analysis (QCA) is one of the evaluation methods that can respond to both the diversities of project activities and project environments. The uniqueness of QCA is to organize a causal relationship that exists between an outcome and a combination of conditions[1] by set theory. This study applied QCA to the forest sector projects in India and organized causal relationships based on the hypnoses of presumed causalities on a trial basis.

Purpose: This study has the following purposes: (1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement," "improvement of livelihood," and "empowerment of women," and (2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

Methodology: A questionnaire survey was conducted in 20 Joint Forest Management Committees (JFMCs) which JICA supported through the ODA loan project in India "Tripura Forest Environmental Improvement and Poverty Alleviation Project." In each JFMC, one respondent was selected as a representative from each of the forest departments, the JFMC, and the Self-Help Group (SHG). The working framework was designed by using existing information. In the framework, the outcomes were organized into five "superordinate constructs" and conditions were organized into six "superordinate constructs." It is also assessed that some "superordinate constructs" for outcomes were used as conditions for other outcomes. From among possible QCA analytical methods, crisp set QCA was employed in this study to attempt to determine what kind of the conditions trigger outcomes.

Results: On "environmental improvement," the conditions identified in "intervention of JICA project" and "improvement of livelihood" were sufficient conditions for the outcome in "reforestation." For the outcomes in "sustainability of JFMC," the conditions in "commitment of forest department," "intervention of JICA project" and "current situation of JFMC" were sufficient conditions. Second, the conditions in "intervention of JICA project," "current situation of JFMC," and "improvement of women's social and economic capabilities" were the sufficient conditions for the outcomes in "improvement of livelihood." Finally, on "empowerment of women," the conditions of "intervention of JICA project," "influence of women," and "sustainability of SHG" were sufficient conditions for the outcomes in "improvement of women's social and economic capabilities." Moreover, the conditions in "intervention of JICA project" were the sufficient conditions for the outcome in "sustainability of SHG." A summary of the analytical results is shown on Figure 1.

Considerations: QCA found that the JICA project's interventions contributed to the expected effects "reforestation," "sustainability of JFMC," "improvement of livelihood," and "sustainability of SHG." However, QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." A possible explanation for this result is that it takes a long period for the sustainability of JFMC to make a clear difference in forest regeneration. In addition, the novel coronavirus (hereafter referred as COVID-19) related limitations in target selection and the interpretation of results can also be presumed. Taking these limitations into account, the arguments inferred from this study can be found in the main topic section.

Conclusion: (1) It is inferred that the conditions in "intervention of JICA project" have relationships to "environmental improvement," "improvement of livelihood, "and "empowerment of women," suggesting that the JICA project contributes to the improvement of the above three project effects.

(2) As for lessons learned, the discussion on the conditions related to the occurrence of the main project effects suggests combining awareness of forest conservation with means of

[1] In this study, a condition means a factor assumed to cause outcomes.

livelihood without burden on forest, incorporating agroforestry within the project scope, efforts to create long-term livelihoods for SHGs (e.g., a wide variety of training and further sophistication in the areas of exiting knowledge), and analysis on the impact of the training center on outcomes.

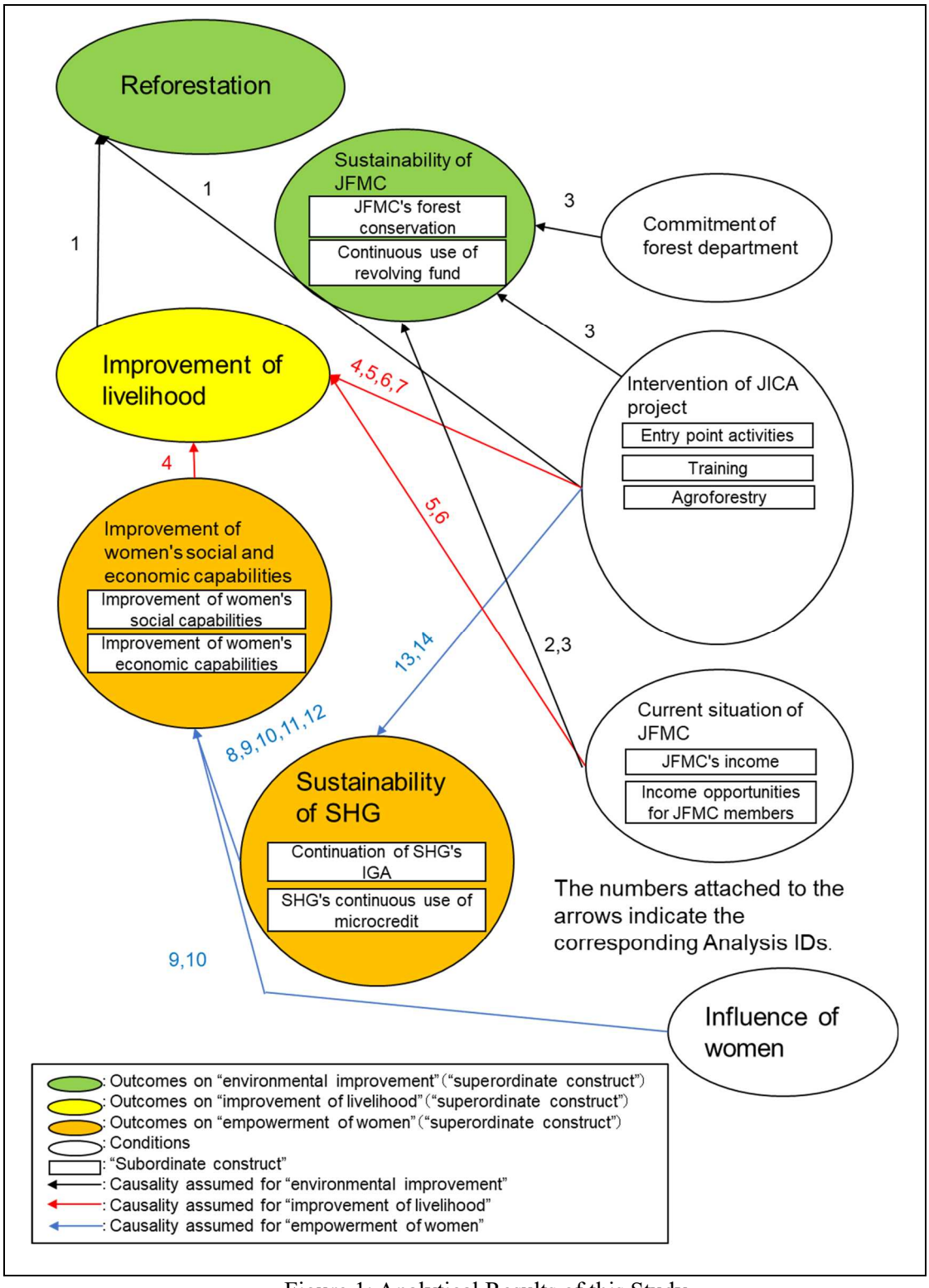


Figure 1: Analytical Results of this Study

Main Topics:

- On "environmental improvement," JFMCs with moderate forest density improvement selected training centers as an entry point activity[2], and, after the project, employment opportunities were created. JFMCs that selected the training centers tend to be more devoted to project activities in general, suggesting a greater awareness of the interrelationship between forest conservation and obtaining a means of livelihood that does not place a burden on the forest.
- Agroforestry harvest was associated with many "improvement of livelihood" outcomes. The project presumably created new income to JFMCs in which agroforestry performed well as it introduced agroforestry in wastelands (providing individuals the right of use).
- For many of the "empowerment of women" outcomes, several members continuing in income generation activities (IGA) (at the time of the study) are associated with those outcomes' sufficient conditions. SHGs that included fish farming in their various activities tended to continue IGA.
- For many outcomes of the "environmental improvement" and "improvement of livelihood," JFMC's choice of training centers was associated with those outcome's sufficient conditions. However, this study did not reach a clear conclusion whether this sufficient condition was due to the intervention itself (training center) or the nature of the communities that selected the training centers. To determine the influence of training centers on the outcome, establishing clear conditional paths to the effects would be desirable.
- QCA is a method that deepens assessments based on cases in order to explain the constructs of interest. The spread of COVID-19, which limited the period for field visits in this study, caused a situation such that the most appropriate individual cases could not be selected for the analysis. The assumed constructs, therefore, may not be explained (limitation on case selection).
- Since QCA case selection is purposeful in that assessment results are applied only to the cases in which the assumed conditions are satisfied, careful attention is required when generalizing the interpretation of results (limitation on interpretation of results).

Keywords: Qualitative Comparative Analysis (QCA), environmental improvement, improvement of livelihood, empowerment of women, participatory afforestation

[2] Based on the plans developed by the JFMCs, the entry point activities provided supports such as: small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

1 Background and Purpose of the Study

1.1 Background of the Study

The factors that lead to effective development projects include both the project environment and the project interventions. Moreover, there is no one-to-one relationship between project effects and factors, but multiple intricately related factors may lead to a specific project effect. In order to identify specific relationships between multiple factors and project effects, quantitative research can assume multiple factors and employ multiple regression analysis to construct a complex model to a certain extent. However, since multiple regression analysis requires a sufficient sample size, the use of multiple regression analysis is often difficult due to the limitations of project nature and data collection. On the other, conventional case studies can present complex causal relationships between project effects and multiple factors. However, case study analysis, in general, lacks the application of standardized research method in a systematic manner.

JICA's forest sector projects in India are distinctive because the projects involved not only afforestation activities but also numerous interventions such as livelihood improvement activities, provision of small-scale infrastructure, and establishment of forest cooperatives. In addition, the environment surrounding the projects was very diverse in terms of climate, nature, social situation, and economic conditions. Therefore, the forest sector in India required an evaluation to cope with the diverse project environment and the numerous project activities.

Qualitative Comparative Analysis (QCA) is a method that can analyze how, based on 10 to 50 cases, an outcome (an element to represent an expected result of an intervention or factor, such as a project effect) of a project is attributed to conditions (interventions or factors assumed to cause incidence of the outcomes). The uniqueness of QCA is to present causal inferences that exist between a single outcome and a combination of conditions. This time, QCA is applied to the analysis on the characteristics of the forest sector projects in India including: multiple interventions, diverse project environments, and numerous combinations of interventions and environments. This report shows the study results of QCA on the ODA loan project in India "Tripura Forest Environmental Improvement and Poverty Alleviation Project," out of the participatory afforestation projects (two projects[3]) in the Ex-Post Project Evaluation 2019: Package III-5 (India).

1.2 Purpose of the Study

The purpose of the study is as follows:

(1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement," "improvement of livelihood," and "empowerment of women"
(2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects

The following four objectives were defined as more detailed analytical goals.

a) To identify the interventions and factors that enabled "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project from a perspective that differs from evaluations based on the OECD-DAC evaluation criteria.

b) To present analytical results for each individual project, compare the analytical results of both projects, and provide background context and reasons for similarities and differences between the projects.

[3] "Tripura Forest Environmental Improvement and Poverty Alleviation Project" and "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project"

c) To conduct an analysis to cover both the projects by using the same variables applied to each project and identify interventions and factors that have enabled the incidence of project effects in participatory afforestation projects in India.

d) Through the above analysis, derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

2 Research Questions

The research questions of this study include main questions and sub-questions as follows. The main questions are to be answered by the integration of the analytical results from each project or by the QCA analytical results on the integrated data of both projects and the sub-questions are to be answered by the analytical results of QCA for each of the target projects.

(1) Main Question

What interventions and factors, or their combination, have led to "environmental improvement," "improvement of livelihood," and "empowerment of women" in participatory afforestation projects in India?

(2) Sub-questions

What interventions and factors, or their combinations, have resulted in "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project? What are the differences among the projects?

3 Target Project

3.1 Outline of the Project

The project supported social forestry in the Tripura state through an ODA loan. To harmonize expansion of a forest area and community development, a Joint Forest Management (JFM) approach, in which the executing agency and the local people undertake joint management of a forest, was adopted. To implement the project, a Joint Forest Management Committee (JFMC) and an Eco-Development Committee (EDC) were established, and Self-Help Groups (SHGs) were also organized for income generation activities under the JFMC and the EDC. The outputs of the target project included afforestation, community development (entry point activities[4]), income generation activities (support to SHG), and training for the executing agency officers and local people. The following table summarizes the target project:

Table 1 The Outline of the Target Project

Project Name	Project Period	Project Cost	Project Area	Number of Establishments
Tripura Forest Environmental Improvement and Poverty Alleviation Project	March 2007 - March 2017	JPY 5,771 million	7 Districts in the Tripura state	JFMC:433 EDC:30 SHG：1,549

Source: Prepared by the author, based on the appraisal report for board members, the project completion report, the ex-ante project evaluation sheet

3.2 Current Situation of the Forest in the Project Area

Using satellite data, the Forest Survey of India (FSI) continuously measures forest density.

[4] Based on the plan developed by the JFMC, the project provided support including small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

FSI' classifies forest density as: Very Dense Forest (VDF), Middle Dense Forest (MDF), Open Forest (OF), Scrub, and Non- Forest. The most recent data is provided in the 2017 report and provides the data from October 2015 to February 2016. The data for the period immediately before the commencement of the target project (October 2006 to February 2007) can be found in the 2009 report. The 2009 and 2017 forest data were compared (see Appendix 1) to show the changes before and after the implementation of the project.

The total afforestation area of the target project was 53,220 ha (Project Completion Report, pp.6-7). The afforestation area of the target project is equivalent to 6.8% of the total forest area in the Tripura state in 2017. The project area is spread over the entire state of Tripura, but it mostly excludes the Dalai district. Since the Tripura state is located near the Bay of Bengal and has a humid climate, the forest cover ratio is high in the project area in general. Although afforestation was carried out under the project, a decrease in the forest area was larger than the afforestation area. For this reason, the forest area in the project area slightly decreased from 2009 to 2017. On the other hand, the area of dense forest was expanded, and the forest's quality was improved.

3.3 Social Situation in the Project Area

The major social conditions indicators for the project area are summarized in the attached table (see Appendix 2). The table shows district-wide figures for the literacy rate (overall and by gender), the ratio of scheduled castes, that of scheduled tribes, that of agricultural workers (both landowners and landless), and the population density based on the census data in 2011. Compared with the average of the literacy rate in India (74.0%), the literacy rate in the Tripura state is high for both men and women, suggesting that there is a high potential for effectiveness in the assistance of the social forestry sector, where residents are the main actors. On the other hand, the state is also characterized by a larger population of scheduled tribes, which may make establishing smooth relationships with government agencies difficult.

4 Variables and Working Framework in the Study

4.1 Variables in the Study

The variables of interest in this study are broadly classified into project effects, which in terms of QCA are outcomes, and factors and interventions for each case, which in terms of QCA are conditions. In this study, JFMC is considered a unit to represent a case. The attributes of JFMC, which are background factors, are used in the analysis as conditions if necessary. As much as possible in the selection of the variables, the variables that affect the incidence of outcomes but do not differ among JFMCs are excluded. The list of variables is shown in Appendix 3 to Appendix 11.

4.2 Working Framework

As a result of the field survey, it became clear that among the main project effects, "environmental improvement" and "empowerment of women" had several qualitatively different outcomes. For this reason, these main project effects are divided into two groups. Specifically, "environmental improvement" is divided into two groups: "reforestation" and "sustainability of JFMC," and "empowerment of women" is divided into two groups: "improvement of women's social and economic capabilities" and "sustainability of SHG." In the working framework, "sustainability of JFMC" is the condition for "reforestation" and "sustainability of SHG" is the condition for "improvement of women's social and economic capabilities." Since the former outcome takes time to be realized, the latter outcome, which is the preliminary stage of the former outcome, was also used for the analysis.

The working framework was formulated to provide an overall picture of this study, and to illustrate the causal relationships assumed for the variables (see Appendix 12). In the working framework, "superordinate constructs" and "subordinate constructs" were established for

precise grouping of the variables. The “superordinate constructs” group qualitatively similar variables and are used to show the working framework in a simplified manner. The “subordinate constructs” are subgroups within the “superordinate constructs.” The variables within the same category of “subordinate construct” can be treated as qualitatively consistent (i.e., variables can be synthesized), and the “subordinate constructs” are used for the analysis using the QCA software (see “6.1 Analytical Method” for more information on the software). When all variables in the “superordinate constructs” are considered qualitatively consistent, the “superordinate constructs” and the “subordinate constructs” are considered the same, and therefore these “subordinate constructs” are not shown in the figure.

5 Case Selection

5.1 Number of Cases

As mentioned above, QCA requires approximately 10 to 50 cases. The questionnaire survey was conducted from October 21 to October 30, 2021, in three forest subdivisions of the Tripura state: Sadar, Sabroom, and Kanchanpur. The forest subdivisions for this study were selected according to the procedure described in the next section. Data collection based on a questionnaire was conducted in 20 JFMC during the period. See Appendix 13 and Appendix 14 for JFMC under the questionnaire survey.

5.2 Procedure for Case Selection

The target project supported the establishment and management of more than 400 cooperatives in the Tripura state. The procedure to select cases from among a large number of possible cooperatives included the following considerations:

- Variation in the variables is essential in the analysis but the cases themselves should be comparable. For this reason, EDC is not included as a case of this study, and JFMCs are used as a case unit.
- In order to have variation of the variables among cases, in addition to the characteristics that cannot be controlled by the project and the requirements related to the feasibility of the survey, the continuation and activity of JFMC were reflected in the case selection. Specifically, the activity status of JFMCs and SHGs, which are intermediate outcomes, were included as case selection conditions. Also, it was taken into account that the variables directly related to reforestation and empowerment of women may not differ among JFMCs since only a few years have passed after the completion of the project.
- The specific procedure for case selection was as follows.

STEP 1: Precipitation: Districts with annual precipitation of 700 mm or more (5-year average for 2014 - 2018) were selected. In the Tripura state, seven districts were selected.

STEP 2: Number of JFMCs: Forest sub-divisions with less than 10 JFMCs were excluded. The reason for exclusion was that fewer JFMCs could be compared and selected in the same sub-division.

STEP 3: The state forest department confirmed whether a JFMC met the following criteria. JFMCs that met these criteria were defined as an Active JFMC.

- There was at least one meeting listed in the meeting register for the past one year.
- There was a member who was employed by the forest department in the past year.

STEP 4: The forest department selected 10-15 JFMCs from JFMCs that met the requirements of STEP 3, where the activities for livelihood improvement of JFMCs and SHGs continued to be active. About 10-15 JFMCs that had not organized meetings frequently/had stopped meeting and had stopped using facilities and equipment for entry point activities were selected from the same division. JFMC that satisfied these criteria were defined as a Non-active JFMC.

STEP5: Whether or not the selected JFMC satisfied the following criteria was confirmed. If the criteria were not confirmed, a new JFMC that met the criteria was selected.

- Access: Within a day trip distance from the district HQ.
- Agriculture Dependency: According to the district census, more than 30% of the working population in the revenue village was engaged in agriculture. If the census did not identify the revenue village to which the JFMC belongs, the data from the identifiable neighborhoods were used to confirm this criterion.
- Women SHGs: At least one SHG for which the majority of SHG members were women.

STEP 6: From the selected JFMCs, the questionnaire survey was planned to be conducted in JFMCs that could be accessed within the survey period. Eventually, the survey covered 20 JFMCs (10 Active, 10 Non-active).

5.3 Study Targets in a Case

Due to the wide variety of variables to be used, if the number of respondents were limited to one person for each village, it was likely that the respondent would not have the necessary information. Therefore, in each JFMC, one person from the forest department, one person from JFMC, and one person from SHG were chosen for the survey. The questionnaire was also divided into three parts: one section for a forest department officer, one for a JFMC member, and one for an SHG member.

6 Analysis Results

6.1 Analytical Method

This study used fsQCA (version 3.1b), a software for QCA, to conduct the analysis using crisp set QCA. Crisp set QCA is a method that uses binary data for outcomes and conditions. The interpretation of the analytical results using binary data becomes easier given that outcomes and causal conditions are binary numbers with qualitatively different meanings. The analysis excluded the variables with skewed distributions in the questionnaire responses because QCA could not analyze them. As a result, among the "subordinate constructs" the conditions in *programs other than afforestation* had skewed distributions as the supports for JFMCs and SHGs continued. Therefore, the "subordinate construct" was excluded from the analysis. The variables in the analysis are summarized in Appendix 15. On the conditions used in QCA, the necessary conditions between an outcome and conditions were calculated, and three to five variables with the highest consistency and a certain level of coverage (0.3 or higher) were selected[5]. In the preparation of the truth table, a row with a raw consistency of less than 0.8 was deleted. Parsimonious solutions, which were easy to interpret, were chosen out of the output solutions. When the solution coverage was low (below 0.7), it was concluded that the derived sufficient conditions could not adequately explain the outcome.

6.2 Constraints during the Evaluation

For interpretation of QCA analytical results, this study had assumed two field trips. The second trip was expected to conduct interviews with project stakeholders and beneficiaries; however, due to the spread of COVID-19, only one trip was conducted in February 2020. The field study assistants conducted the tasks planned for the second trip on a limited basis. An authentic approach for a case study is to extract cases for which sufficient conditions were applied and then re-examine the reasons and background of each case individually for further consideration of the analytical results. However, for the reasons mentioned above, the availability of qualitative information was limited. As a result, the interpretation of the QCA

[5] Referred to Daisuke Mori (2017) "How to use software for qualitative comparative analysis (QCA) : fs/QCA and R(1)", Kumamoto law review (140)

analytical results is mainly based on the limited knowledge obtained in the short period of the first field survey. In particular, establishing causal relationships solely based on the analytical results of QCA was difficult, and supplementing the results of this study with additional information would be desirable.

6.3 Analysis Results

6.3.1 Overall

A summary table for the derived sufficient conditions based on "6.1 Analytical Method" can be found in Appendix 16. The "superordinate constructs" and the "subordinate constructs" contained in the outcomes and the conditions of the derived sufficient conditions can be found in the table in Appendix 17. In addition, the derived sufficient conditions by themselves are illustrated in the figure in Appendix 18. It should be noted that the figure is extremely simplified as the figure does not show the combinations of conditions in detail.

6.3.2 Environmental Improvement

(1) Reforestation

Overall subordinate construct: *Barren land after project completion* could not be analyzed due to the skewed distribution of responses. *Current survival rate* had low solution consistency (0.5), and it was difficult to explain the outcome with the derived sufficient condition. On the derived sufficient condition *forest density after project completion,* the solution consistency and the solution coverage did not reach certain levels.

Forest density after project completion (Analysis ID 1): *Forest density after project completion* was divided into two categories on a seven-point scale: the first to second levels (some increase) and the third to seventh level (almost no change). Conditions for JFMCs with the improvement of forest density after the project completion included (a) the training center was selected as the entry point activity and JFMC members had more employment opportunities after the project completion. The one-to-one cross-tabulation of this outcome is shown in Appendix 19.

(2) Sustainability of JFMC (JFMC's Forest Conservation)

Overall subordinate construct: A truth table could not be formulated for *fire prevention after project completion*. The solution coverage was low for *monitoring after project completion* (0.125). On the other hand, the sufficient condition with certain levels of solution consistency and solution coverage were derived for *JFMC's official meeting*.

JFMC's official meeting (Analysis ID 2): *JFMC's official meeting* was divided into two categories on a five-point scale: the first to fourth levels (a meeting in the past year) and fifth (no meeting in the past year). Existing conditions for JFMCs that organized a formal meeting at least once a year after the project completion include: (a) income from non-timber forest products. Since both the solution consistency and the solution coverage are one, the income from non-timber forest products is considered a necessary and sufficient condition for official meetings of JFMC. The one-to-one cross-tabulation for this outcome is shown in Appendix 20.

(3) Sustainability of JFMC (Continuous Use of Revolving Fund)

Overall subordinate construct: A truth table could not be formulated for *withdrawal from JFMC's account*. On the other hand, the sufficient conditions with certain levels of solution consistency and the solution coverage could be derived for *deposit to JFMC's account.*

Deposit to JFMC's account (Analysis ID 3): *Deposit to JFMC's account* was divided into two categories: deposits more than four times a year and deposits less than four times a year. JFMCs that made deposits more than four times a year into the bank account were either (a) not

frequently visited by the forest department staff but had income from non-timber forest products, or (b) frequently visited by the forest department staff and had selected training centers as their entry point activities. However, the low raw coverage of the condition (a) renders it as not important. The one-to-one cross-tabulation for this outcome is shown in Appendix 21.

6.3.3 Improvement of Livelihood

(1) Improvement of Livelihood

Overall subordinate construct: The solution coverage for *JFMC members' saving after project* was low, and interpreting the solution of *JFMC members' household expenditure after project (education)* was difficult. Obtaining additional information for the interpretation of *JFMC members' household expenditure after project* and *JFMC members' livestock after project* is desirable. On the other hand, it was possible to derive the sufficient conditions with high solution coverage for *JFMC members'household income after project*, *JFMC members' non-agricultural income after project, JFMC members' expenditure after project (house),* and *JFMC members' employment opportunities after project*.

JFMC members' household income after project (Analysis ID 4): *JFMC members' household income after project* was divided into two categories on a seven-point scale: the first level (significant increase) and the second to seventh levels (other than significant increase). JFMCs for which the income of the members increased significantly after the project implementation were contingent on (1) the training centers were selected as their entry point activity and the income of SHGs' women members increased significantly due to the project implementation. The one-to-one cross-tabulation of this outcome is shown in Appendix 22.

JFMC members' non-agricultural income after project (Analysis ID 5): *JFMC members' non-agricultural income after project* was divided into two categories on a seven-point scale: the first to second levels (some increase) and the third to seventh levels (almost no change). JFMCs for which members' income increased significantly after the project implementation were contingent on, either (a) there was a harvest from agroforestry and the training centers were selected as the entry point activity, or (b) there was a harvest from agroforestry and JFMC members have income sources other than agriculture and animal husbandry. The one-to-one cross-tabulation for this outcome is shown in Appendix 23.

JFMC members' expenditure after project (house) (Analysis ID 6): *JFMC members' expenditure after project (house)* was divided into two categories on a four-point scale: the first to second levels (some increase) and the third to fourth levels (almost no change). An increase in JFMC members' expenditure for repair and improvement of house has the sufficient conditions: (a) there was a harvest from agroforestry and the members have income sources other than agriculture and animal husbandry. The one-to-one cross-tabulation for this outcome is shown in Appendix 24.

JFMC members' employment opportunities after project (Analysis ID 7): *JFMC members' employment opportunities after project* was divided into two categories on a seven-point scale: the first to the second levels (increase to some extent) and from the third to the seventh levels (almost no change). JFMCs for which the employment opportunities for the members increased to some extent after the project implementation were contingent on: (a) there was harvest from agroforestry, and training centers were selected for the entry point activity. The one-to-one cross-tabulation of this outcome is shown in Appendix 25.

6.3.4 Empowerment of Women

(1) Improvement of Women's Social and Economic Capabilities (Improvement of Women's

Social Capabilities)
Overall subordinate construct: For several outcomes; (*women's confidence in household decisions, and change in outreach of female SHG members*), truth tables could be formulated. On the other hand, sufficient conditions could be derived for *percentage of income decided by female SHG members* and *time for SHG activities.* Solution consistency and solution coverage were relatively high for these sufficient conditions.

Percentage of income decided by female SHG members (Analysis ID 8): *Percentage of income decided by female SHG members* was divided into two categories based on the percentage of income that women in SHG can freely decide to use: freely decide 50% or more, and freely decide less than 50%. An increase in the income that women in SHGs can decide its use has the sufficient condition: (a) female members continuing to engage are 20% or more of the total number of members. The one-to-one cross-tabulation for this outcome is shown in Appendix 26.

Time for SHG activities (Analysis ID 9): *Time for SHG activities* was divided into two categories: 2 hours or more per week, and less than 2 hours per week. When the members spend two hours or more per week on SHG activities, the sufficient condition was that (a) JFMC had at least three female executives and the number of female members who continued to engage in IGA were at least 20% of the total members. The one-to-one cross-tabulation for this outcome is shown in Appendix 27.

(2) Improvement of Women's Social and Economic Capabilities (Improvement of Women's Economic Capabilities)
Overall subordinate construct: The solutions for *female SHG members' income after project* and *SHG members' expenditure after project (education)* have low solution coverage. It was difficult to interpret *Female SHG members' influence on household expenditure*. Truth tables could not be formulated for *SHG members' expenditure after project (cloth)*. On the other hand, the sufficient conditions with high solution coverage can be derived for *female SHG members' expenditure after project*, *SHG members' saving after project*, and *SHG members' livestock after project (grazing animal)*.

Female SHG members' expenditure after project (Analysis ID 10): *Female SHG members' expenditure after project* was divided into two categories in the first to the third levels (increase) and the fourth level (no change) on a four-point scale. An increase in female SHG members expenditure has the sufficient condition that (a) the JFMC had at least three women executives and at least 20% of the total members were female members who continued to engage in IGA. The one-to-one cross-tabulation for this outcome is shown in Appendix 28.

SHG members' saving after project (Analysis ID 11): *SHG members' saving after project* was divided into two categories on a four-point scale: the first to the second levels (some increase) and the third to the fourth levels (almost no change). An increase in the savings of SHG members has the sufficient condition: (a) the number of female members who continued to engage in IGA were at least 20% of the total number of members. The one-to-one cross-tabulation for this outcome is shown in Appendix 29.

SHG members' livestock after project (grazing animal) (Analysis ID 12): *SHG members' livestock after project (grazing animal)* was divided into two categories on a four-point scale: the first to the third levels (increased) and the third to the fourth levels (no change). An increase in SHG members owning grazing animals has the sufficient condition: (a) female members that continued to engage in IGA were at least 20% of the total number of members. The one-to-one cross-tabulation for this outcome is shown in Appendix 30.

(3) Sustainability of SHG (Continuation of SHG's IGA)
Overall subordinate construct: The only outcome variable is *female members continuing IGA*, and the sufficient condition with high solution consistency and high solution coverage was derived for this outcome.

Female members continuing IGA (Analysis ID 13): *Female members continuing IGA* was divided into two categories: more than 20% of SHG members continue IGA and less than 20% of SHG members continue IGA. For SHGs with more than 20% of the total number of members continuing with IGA, the sufficient condition is: (a) The training knowledge is applied to SHG activities. The one-to-one cross-tabulation for this outcome is shown in Appendix 31.

(4) Sustainability of SHG (SHG's Continuous Use of Microcredit)
Overall subordinate construct: Of the outcomes for this "subordinate construct", a truth table could not be formulated for *SHG's loans*. On the other hand, the sufficient condition with a relatively high solution coverage could be derived for *SHG's official meeting*.

SHG's official meeting (Analysis ID 14): *SHG's official meeting* was divided into two categories on a six-point scale: the first to the fifth levels (meeting in the past year) and the sixth level (no meeting in the past year). For SHG to have formal meetings at least once a year, the sufficient condition is: (a) SHG members can apply the training knowledge to SHG activities. The one-to-one cross-tabulation for this outcome is shown in Appendix 32.

6.4 Considerations

The considerations of the analytical results for "subordinate constructs" are as follows:

Reforestation: The appropriate sufficient condition could be derived for forest density. In JFMCs with moderate improvement of forest density, the training centers were selected as the entry point activity, and employment opportunities were also created after the project. The employment opportunities after the project implementation increased in processing of non-timber forest products and fish farming and processing. JFMCs which selected the training centers tend to be more active in the project activities in general and this suggests that JFMCs with improvement of forest density have both an awareness on forest conservation and livelihoods that do not burden the forest. Although there were differences in the survival rate among the cases, a sufficient condition for this outcome could not be derived. This suggests the existence of important conditions (e.g., soil, slope, river, etc.) that could not be addressed in this study.

Sustainability of JFMC (JFMC's forest conservation): The appropriate sufficient condition could be derived for JFMC's official meeting. For cases that JFMCs have income from non-timber forest products, it is presumed that the JFMC organized meetings regularly out of the necessity to properly manage that income.

Sustainability of JFMC (Continuous use of revolving fund): The appropriate sufficient condition was derived for the deposits to the bank accounts of JFMC: JFMC with frequent deposits in their bank accounts selected the training centers as the entry point activity and were frequently visited by the forest department staff. Therefore, it can be inferred that both the community and the forest department were interested in forest conservation through JFMC activities.

Improvement of livelihood: The sufficient conditions can be derived for many outcomes, and those conditions are also common to many of the outcomes. On the increase of the non-

agriculture income and that of employment opportunities for JFMC members, it can be inferred that the combination of the training center and the agroforestry harvest were the sufficient conditions that motivated agroforestry to bring about income and employment opportunities. For the increase of JFMC members' expenditure on houses, the combination (training center and means of livelihood other than agriculture and animal husbandry) were the sufficient condition, which suggests that funds in addition to usual income led to the improvement of living conditions.

Improvement of women's social and economic capabilities (Improvement of women's social capabilities): The appropriate sufficient conditions were derived for both the increase in the percentage of income that women in SHGs can decide and the time for SHG activities. Both outcomes were related to a certain number of female SHG members continuing IGA after the project completion, suggesting the importance of long-term activities in the improvement of women's social capabilities. For SHG members to work more than two hours per week, another condition was that at least three female executives participate in the JFMC, in addition to the number of female SHG members that continue in IGAs. It can be inferred that women are allowed to devote more time to SHG activities in JFMCs with many influential women.

Improvement of women's social and economic capabilities (Improvement of women's economic capabilities): The appropriate sufficient conditions could be derived for both the increase in expenditure of SHG women members and for the increases in savings and grazing animals of SHG members. All of the outcomes were associated with a certain number of female members continuing IGA, implying that the income generated through long-term activities in SHG was used for savings and the purchase of livestock. In addition to the number of female members who continue IGA, an additional condition for the increase in expenditure by female SHG members was the presence of at least three women officers in the JFMC. This suggests that an environment for women to spend their income at their own discretion existed in JFMCs with many influential women.

Sustainability of SHG (continuation of SHG's IGA): SHGs, for which female members continue IGA was more than 20% of the total, replied that their members fully utilize the training contents in practice. On SHG activities, SHGs that engaged in many types of activities, especially SHGs that included fish farming in their activities, continued IGA. On the other hand, SHGs that only engaged in husbandry of other animals (mainly pigs) and microfinance tend to have less frequent activities. On fish farming, women had been engaged in this activity even before the project and were also involved in processing (mainly production of dried fish) and marketing. In addition to the existing knowledge of fish farming, this project's training made the continuation of SHG activities possible.

Sustainability of SHG (SHG's continuous use of microcredit): SHG that have official meetings at least once a year replied that their members fully utilize the training content in practice. However, a few SHG provided microcredit frequently, and the frequency of SHG official meetings was used as a proxy for the condition that may lead to microcredit in the future. Therefore, the use of training content among SHG members is expected to contribute to the continuity of SHG activities in general.

7 Limitations and Issues in the Future

QCA methodology in regards to target selection and comparability, and in regards to the interpretation of results encountered limitations and restrictions. For future reference, this section mentions some specific limitations that arose in this research and assessment.

Issues in case selection and data management

Although the questionnaire results and the judgments of the forest departments on the case selection may have differed in some cases, due to restrictions related to COVID-19 this study could not track down and confirm the accuracy of the data. It should be noted that, even in such cases, the analysis in this study was based on the results of the questionnaire survey. QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." This issue presumably affects the above result.

Issues related to robustness of results

As the analysis was based on a single question to determine 0 or 1 for an outcome or a condition, this resulted in a situation that robustness of construct validity could not be ensured. Since each question was regarded as a single condition, various analyses, depending on several conditions, could find a variety of results. In such cases, formulating a synthetic variable with multiple conditions, in line with the design of the survey questionnaire, is possible. Specifically, it is possible to take measures such as organizing and integrating outcomes and conditions from multiple questions along with a certain "superordinate construct" for comprehensive determination of 0 or 1. However, as this analysis performed integration of conditions, consideration needs to be taken into account when interpreting individual results.

Issues related to interpretation (setting a coverage at 0.7 or higher)

Although determining whether the consistency exceeds a threshold is necessary, causal inference is possible even if a coverage is low. In general, causality is inferred when a coverage is low but consistency is 1 or very close to 1 (0.9 or higher) because this suggests that there is a 90% chance or higher that the outcome will be 1. Although sufficient conditions with a coverage of 0.7 or higher were selected for this study, the coverage can only indicate what percentage of cases with an outcome of 1 can be explained by the condition. It should be noted that, because multiple conditions can be assumed to lead to the same outcome, interpretive limitations exist when explaining more than 70% of the cases with outcome of 1 by a single sufficient condition. QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." This issue presumably affects the above result.

8 Conclusion

Based on the factors and interventions related to the occurrence of the main project effects, the conclusions of this report are presented below.

(1) Results of Analysis

It is inferred that the conditions in "intervention of JICA project" are related to all of the main project effects: environmental improvement, improvement of livelihood, and empowerment of women which suggests that the improvement from project interventions contributes to the improvement of the project effects mentioned above. Next, from the discussion of the conditions in "environmental improvement," it can be inferred that a combination of awareness of forest conservation and means of livelihood with less burden on forest was important for the improvement of forest density. Moreover, the harvest of agroforestry was associated with many of the outcomes under "improvement of livelihood." Many of the outcomes related to "empowerment of women" are associated with several SHG members continuing IGA at the time of the study. Lastly, JFMCs' choice of training centers was related to the sufficient conditions for many of the outcomes related to "environmental improvement" and "improvement of livelihood." However, the qualitative differences between the training centers and other project interventions were not clear, making it difficult to interpret the results.

(2) Lessons Learned

Combination of awareness and means of livelihood: It can be inferred that a combination of awareness of forest conservation and means of livelihood with less burden on forest was related to the improvement of forest density. Incorporating both elements into project interventions in similar projects in the forest sector needs to be assessed in future. As an example, the introduction of agroforestry in wastelands, described below, includes both elements and should be considered in prospective projects of social forestry.

Importance of agroforestry: This project introduced agroforestry in wastelands (that individuals had the right to use), and this brought new income to JFMC and in turn agroforestry performed well. Activities such as harvesting agroforestry have led to an increase in local employment, and the increase of employment is also associated with the increase in forest density. Since the introduction of agroforestry in the underutilized wastelands may have brought a wide range of project effects, implementing agroforestry in social forestry should be considered.

Long-term IGA: As mentioned earlier, of the many undertakings by SHGs, activities that included fish farming had a greater tendency to continue IGAs. Trying to conduct a few types of IGAs concurrently resulted in the discontinuation of IGAs when the activities faced difficulties. Therefore, initiatives that increase IGA training categories are worth consideration. In addition, when implementing future projects, efforts to provide more advanced knowledge on fields that traditionally engage women, such as fish farming, should also be assessed.

Role of training centers: In this study, all JFMCs constructed either training centers or community places and it was therefore necessary to clarify the difference between training centers and community places for the interpretation of the sufficient conditions. However, there was no relationship between the existence of a training center and the content of the training. Moreover, after the project completion, all the buildings were used as community places. According to the interviews with the project stakeholders, the communities that chose the training centers tended to be more devoted to the project activities. On training centers' impact on the outcomes, establishing paths to reach the effects is desirable.

Appendix 1: Forest Area in the Tripura state

	Geo-area km2	2009 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total	10,491	111	4,770	3,192	8,073	76.95	75
Project area (districts)*	8,089	108	3,441	2,521	6,070	75.04	64
North Tripura	2,039	10	925	541	1,476	72.39	34
South Tripura	3,057	73	1,390	1,013	2,476	80.99	23
West Tripura	2,993	25	1,126	967	2,118	70.77	7

	Geo-area km2	2017 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total	10,486	656	5,246	1,824	7,726	73.68	15
Project area (districts)*	8,086	540	3,779	1,427	5,746	71.06	14
North Tripura	2,036	50	1,054	374	1,478	72.59	12
South Tripura	3,057	241	1,583	453	2,277	74.48	0
West Tripura	2,993	249	1,142	600	1,991	66.52	2

	2009/2017 Changes (%) VDF km2	MDF km2	OF km2	Total km2	Scrub km2
State Total	491%	10%	-43%	-4%	-80%
Project area (districts)*	400%	10%	-43%	-5%	-78%
North Tripura	400%	14%	-31%	0%	-65%
South Tripura	230%	14%	-55%	-8%	-100%
West Tripura	896%	1%	-38%	-6%	-71%

Source: Forest Survey of India "STATE OF FOREST REPORT 2009", Forest Survey of India "STATE OF FOREST REPORT 2017"

Note: *Districts are based on the classification before the reorganization in 2012.

Appendix 2: Social Situation in the Project Area

	Literartes			Scheduled	Scheduled		Agri.	Popolation
	Total	Male	Female	Castes	Tribes	Cultivators	Labourers	Density
	%	%	%	%	%	%	%	Person/Km2
Tripura State	87.22	91.53	82.73	17.83	31.76	20.14	24.06	350
Project area (districts)*	86.95	91.20	82.53	17.39	30.08	19.88	23.47	401.67
North Tripura	87.50	91.13	83.75	16.57	25.86	19.82	17.69	341
South Tripura	84.66	89.98	79.09	16.00	39.36	23.32	30.35	287
West Tripura	88.69	92.50	84.75	19.59	25.03	16.50	22.36	577

Source: Directorate od Census Operations Tripura ” Census of India 2011 Tripura”

Note: *Districts are based on the classification before the reorganization in 2012.

Appendix 3: Main Project Effect “Environmental Improvement” (Reforestation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Reforestation	Reforestation	Barren land after project completion	Did barren land in the forest area afforested by this Project increase after the project completion?	Ⅰ25
			Forest density after project completion	How is the forest density of the forest area afforested by this Project after the project completion?	Ⅰ24
			Current survival rate	How much is the survival rate for the afforestation of this Project today?	Ⅰ14
Conditions (Factors /Interventions)	Reduction of burden on forest	Reduction of burden on forest	Compliance with grazing rules	Did JFMC members stop animal grazing in the forest area planted by this Project? Does the JFMC members comply with the rules of animal grazing?	Ⅰ19 Ⅱ22
			Use of LPG	What percentage does households have an LPG gas connection in this JFMC?	Ⅱ23
			Control of logging	Is tree-cutting without an official permission stopped in the forest area?	Ⅱ24
	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after this Project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last three years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Programs other than afforestation	Programs other than afforestation	(Reference) Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	Ⅱ25
	Improvement of livelihood	Improvement of livelihood	JFMC members’ income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ33 Ⅱ34
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ37 Ⅱ38
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ45
	Sustainability of JFMC	JFMC’S forest conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after this project completion? What is the reason for the above answer?	Ⅰ20 Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
		Continuous use of revolving fund	Deposit to JFMC’s account *Source to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account *Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32

Appendix 4: Main Project Effect ”Environmental Improvement” (JFMC’s Forest Conservation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	JFMC’s Forest Conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after the project completion? What is the reason for the above answer?	Ⅰ20, Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 5: Main Project Effect “Environmental Improvement” (Continuous Use of Revolving Fund)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	Continuous use of revolving fund	Deposit to JFMC’s account *Source of payment to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account*Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 6: Main Project Effect “Improvement of Livelihood” (Improvement of Livelihood)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of livelihood	Improvement of livelihood	JFMC members’ household income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 33 Ⅱ 34
			JFMC members’ non-agricultural income after project	Is the non-agriculture household income increased in this JFMC due to this Project?	Ⅱ 35
			JFMC members’ minor produce sales after project	Is the sales of minor produce increased in this JFMC due to this Project? (Fodder, leaf, medicinal herbs, etc.)	Ⅱ 36
			JFMC members’ saving after project	Does JFMC members increase saving due to this Project?	Ⅱ 42
			JFMC members’ livestock after project (grazing animals, others)	Do the JFMC members increase the number of grazing animals (buffalo/cow/goats/sheep) due to this Project? Do the JFMC members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅱ 43 Ⅱ 44
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 37 Ⅱ 38
			JFMC members’ expenditure (education, mobile phone, house)	Does JFMC members increase the expenses for education due to this Project? Does JFMC members purchase mobile phones due to this Project? Does JFMC members increase the expenses for construction or improvement of house due to this Project?	Ⅱ 39 Ⅱ 41 Ⅱ 40
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ 45
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ 12
			(Reference)Use of facilities/equipment for IGA	Do JFMC members earn income by using the facilities and equipment provided by this Project? How JFMC members use the facilities and equipment for earning the income?	Ⅱ 13 Ⅱ 14
		Training	Type of training for JFMC members	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ 15
			(Reference) Use of training knowledge for IGA	Do JFMC members earn income by using the skill learned from the training provided by this Project? How JFMC members use the skill for earning the income?	Ⅱ 16 Ⅱ 17
			(Reference) Matching of training with facilities/equipment	Does the skill training match the facilities/equipment by this Project? What is the reason for the above answer?	Ⅱ 18 Ⅱ 19
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ 12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ 13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ 15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ 16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ 6
	Current situation of JFMC	Income opportunities for JFMC members	Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ 21
			Allocation from revolving fund	Does the JFMC distribute benefits, which is from a revolving fund, to JFMC members?	Ⅱ 27
			Income other than agriculture and animal husbandry	Do the JFMC members have income except the income of agriculture and animal husbandry?	Ⅱ 26
	Programs other than afforestation	Programs other than afforestation	Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	Ⅱ 25

	Improvement of women's social and economic capabilities	Improvement of women's economic capabilities	Female SHG members' income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer?	Ⅲ21 Ⅲ22

Appendix 7: Main Project Effect “Empowerment of Women” (Improvement of Women’s Social Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s social capabilities	Change in outreach of female SHG members	How far did you go alone in the last year? How far did you go alone before this Project?	Ⅲ18 Ⅲ19
			Percentage of income decided by female SHG members	How much percent can female members of this SHG decide freely on her personal income today? How much percent could female members of this SHG decide freely on her personal income before this Project? What is the reason for the change of the percentage?	Ⅲ31 Ⅲ32 Ⅲ33
			Time for SHG activities	How many hours does a SHG member spend for SHG activities for a week now? (average of SHG members, 1 day = 8hours)	Ⅲ15
			Women’s confidence in household decisions	Do you feel more confident in your decision on family matters due to this Project?	Ⅲ20
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Sustainability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of micro credit	SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 8: Main Project Effect “Empowerment of Women” (Improvement of Women’s Economic Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s economic capabilities	Female SHG members’ income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer ?	Ⅲ21 Ⅲ22
			Female SHG members’ expenditure after project	Was the personal expenditure of female members of this SHG increased due to this Project?	Ⅲ26
			SHG members’ expenditure after project (education, ornaments, cosmetics, cloth)	Do SHG members increase the expenses for education due to this Project? Do SHG members increase the expenses for ornaments due to this Project? Do SHG members increase the expenses for cosmetics due to this Project? Do SHG members increase the expenses for clothes due to this Project?	Ⅲ27 Ⅲ28 Ⅲ29 Ⅲ30
			SHG members’ saving after project	Do the SHG members increase saving due to this Project?	Ⅲ23
			SHG members’ livestock after project (grazing animals, others)	Do the SHG members increase the number of grazing animals (buffalo /cow/goats/sheep) due to this Project? Do SHG members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅲ24 Ⅲ25
			Female SHG members’ influence on household expenditure	Is your opinion on household spending accepted more due to this Project?	Ⅲ34
Conditions (Factors /Interventions)	Intervention of JICA Project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅱ18
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 9: Main Project Effect “Empowerment of Women” (Continuation of SHG’s IGA)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

Appendix 10: Main Project Effect “Empowerment of Women” (SHG’s Continuous Use of Microcredit)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	SHG’s continuous use of microcredit	SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

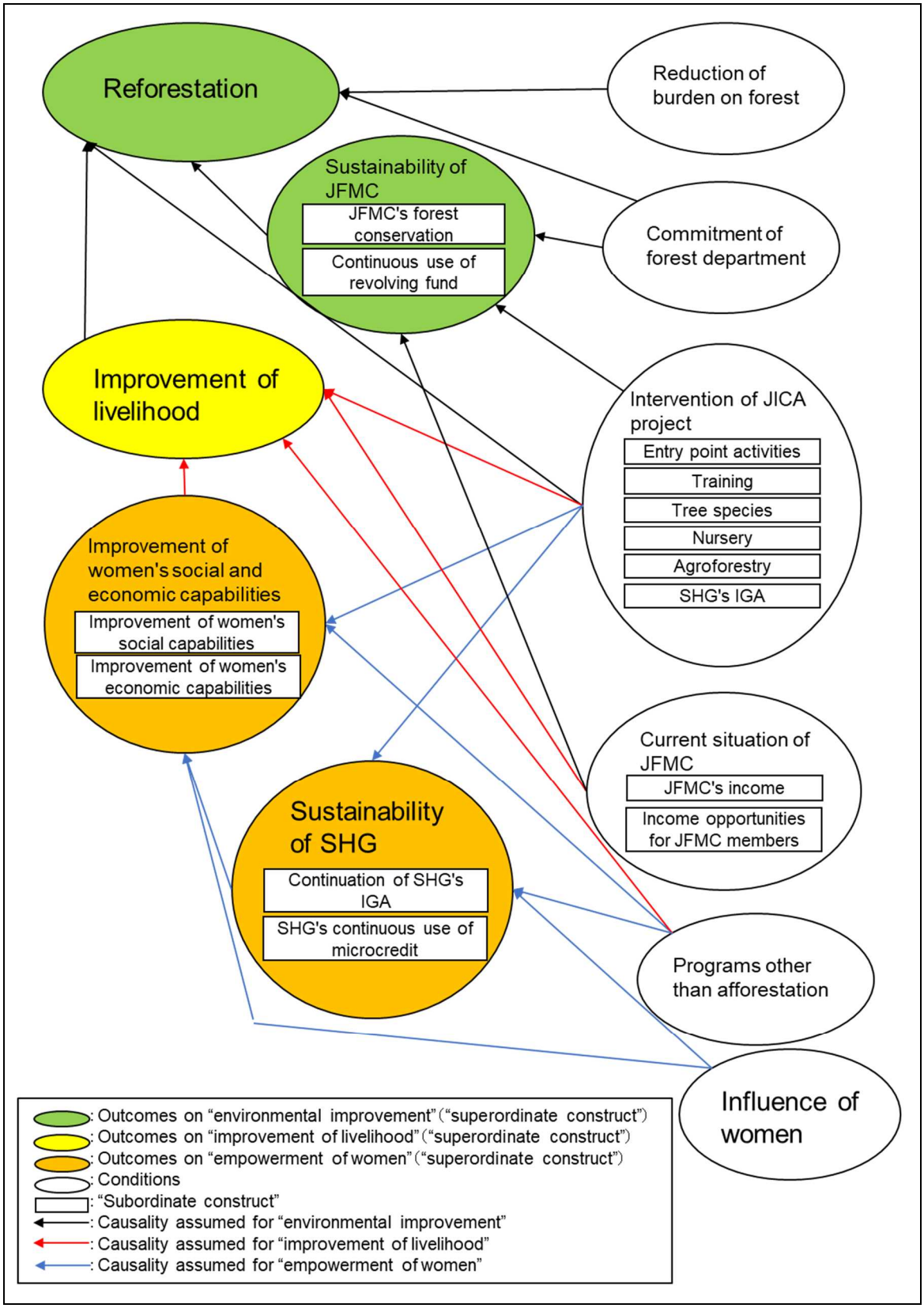
Appendix 11: Attributes

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Attribute	Attributes of JFMC	Area of forest land	Area of forest land	How many hectares is the area planted by this Project?	Ⅰ10
		Number of households	Households in JFMC at project implementation	How many households was in the JFMC during the project implementation phase?	Ⅱ5
		Literacy rate	Literacy rate	Census Data	
		Fish farming	Fish farming	Does the JFMC conduct fish farming in a check dam made by this Project?	Ⅰ17
		Market for products	Market where products are sold	Is there a market which the JFMC can sell products?	Ⅱ29
		Distance to market	Distance to market (km)	Where is the market which JFMC members can sell their products?	Ⅱ28
		Gender of SHG members	Gender of SHG members	How many members does the SHG have? (number of male, number of female)	Ⅲ6
		Female members	Number of female SHG members (fSHG)	How many female members does the SHG have?	Ⅲ6
		Percentage of women in households of JFMC	Percentage of women in households of JFMC (ratio of fJFMC)	What is the proportion of women in the households joining the JFMC?	Ⅱ7
		Female literacy rate	(Reference) Female literacy rate	Census Data	

Note:

- Outcomes in project evaluation are described as “Main project effects” for distinguishing them from the technical term in QCA (Outcomes),
- “Superordinate construct” and “Subordinate construct” are the same across the tables but the variables under “Subordinate construct” are changed in each table.
- The variables with (Reference) are ones to be unused in the analysis in principle. They are used as conditions in the analysis if it is appropriate.
- In the “Questionnaire” column, questionnaire numbers are shown. The questions with I for forest department officers, those with II for JFMC members, and those with III for SHG members.

Appendix 12: Working Framework of the Study



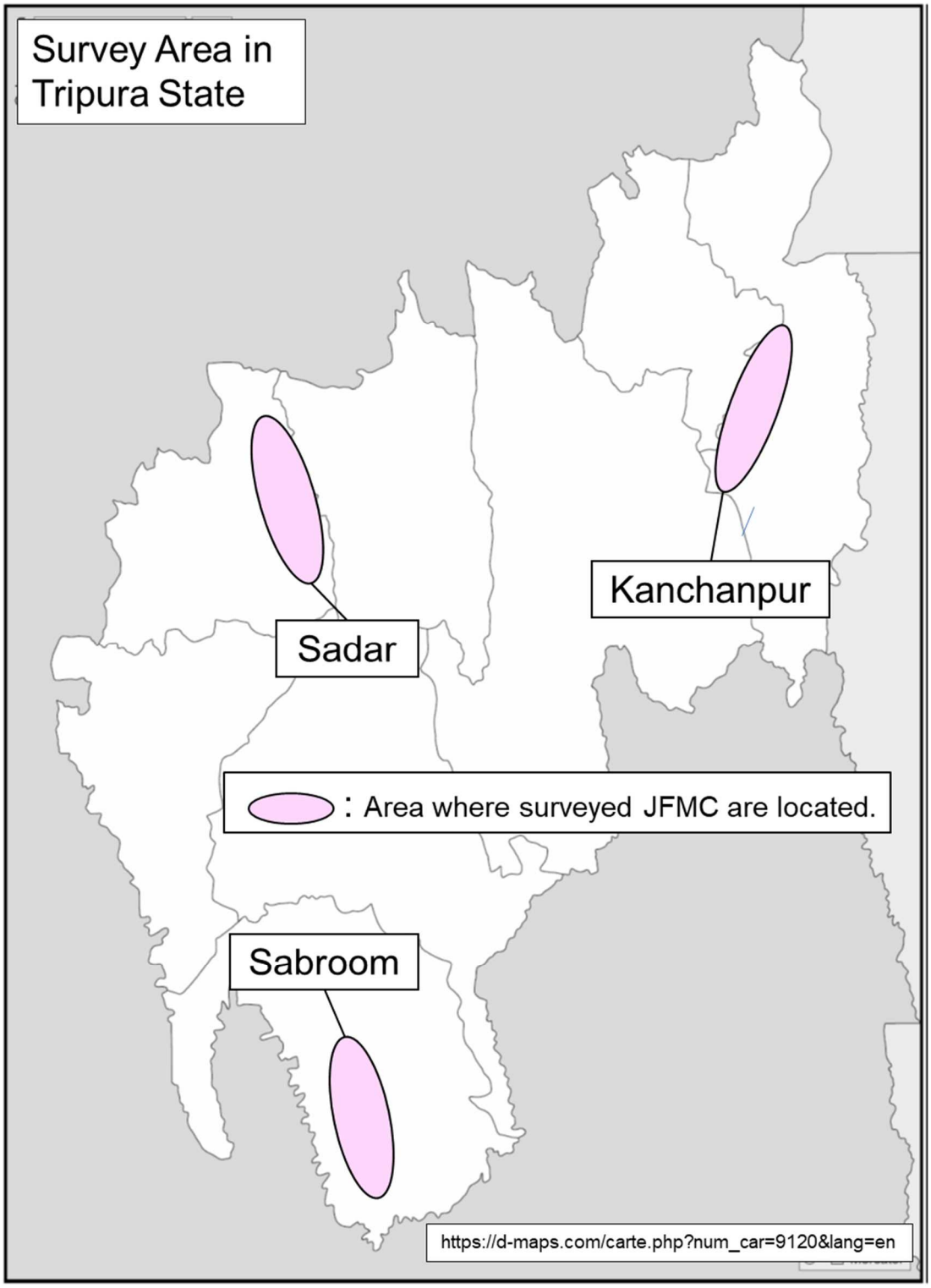
Appendix 13: JFMC in the Study

Sadar (Active 2 & non-active 2) = 4				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Subalsingh	Gangadhan Chowdhury	Active	Yak Baksa
2	Subalsingh	Athokiri	Active	Yapri Thamsa
3	Subalsingh	Ganthalwng	Non-active	Hamari
4	Subalsingh	Dumrakaridak	Non-active	Jorakwlal

Sabroom (Active 3 & non-active 3) = 6				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Srinagar	Bangamura	Active	Hambai
2	Satchand	Puranvita	Active	Radhakrishna
3	Satchand	Kumilla Roaja Para	Non-active	Hambai
4	Srinagar	Nitya Roaja Para	Active	Sampari
5	Satchand	Jagatram Para	Non-active	Maa Kali
6	Satchand	Pushparam Roaja Para	Non-active	Naithok

Kanchanpur (Active 5 & non-active 5) = 10				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Kanchanpur	Tauboihatai Para	Active	Naithauki
2	Kanchanpur	Gobinda Para	Active	Chathak
3	Kanchanpur	Khumtaihatai Para	Active	Naithok
4	Kanchanpur	Brikhyaram Para	Active	Humlaiti
5	Kanchanpur	Khakchang	Active	Khumpui
6	Kanchanpur	Banasree	Non-active	Banalaxmi
7	Kanchanpur	Khasirai Para	Non-active	Tuisana
8	Kanchanpur	Sananda Para	Non-active	Khakchang
9	Kanchanpur	Sadaiham Para	Non-active	Kchuter
10	Kanchanpur	Nabajoy Para	Non-active	Khakchangha

Appendix 14: Survey Area



Appendix 15: Variables Used in the Analysis

Questionnaire	V. name	Variables	Classification
I-11	REPLANT	Replantation for the last 3 years (Yes, No)	1: Yes, 0: No
I-13	NURSERY	JFMC's nursery (Yes, No)	1: Yes, 0: No
I-14	SURVIVE	Current survival rate (High, Low)	1: 50%-100%, 0: 0%-25%
I-16	HARVEST	Harvest of agroforestry (Yes, Almost none)	1: Yes, 0: Almost none
I-18	NEWPROJECT	New afforestation project after project completion (Yes, No)	1: Yes, 0: No
I-19	FD_GRAZING	Compliance with grazing rules (Complied mostly, Not complied)	1: Complied mostly (a few don't), 0: Not complied
I-20	FIRE	Fire prevention after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-22	MONITORING	Monitoring after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-24	FOREST_DENS	Forest density after project completion (Increased moderately , Almost same)	1: Increased moderately, 0: Almost same
II-9	JF_FEMALE	JFMC's female executive after project completion (Many, Few)	1: three or more, 0: two
II-11	JF_MEETING	JFMC's official meeting (Yes, No)	1: Yes for the past year, 0:No for the past year
II-12	ENTRY1	Type of entry point activity 1 (Training center, Other)	1: Training center, 0: Other
II-12	ENTRY2	Type of entry point activity 2 (Community place, Other)	1: Community place, 0: Other
II-13	INCOME_P	Use of facilities/equipment for IGA (Used signficantly, Other)	1: Used signficantly, 0: Other
II-16	JF_KNOWLEDGE	(Reference) Usse of training knowledge for IGA (Used signficantly, Other)	1: Used signficantly, 0: Other
II-20	FD_VISITS	Visits by forest department staff (Many, Few)	1: Many (five or more), 0: Few (five or less)
II-22	JF_GRAZING	Compliance with grazing rules (Yes, No)	1: Complied mostly, 0: A few don't
II-23	LPG	Use of LPG (High, Low)	1: 50% or more, 0: Lass than 50%
II-24	CUTTING	Control of logging (Controlled, Not controlled)	1: Complied completely, 0: Some don't
II-26	OTHER_INCOME	Income other than agriculture and animal husbandry (Moderate, Almost none)	1: Moderate, 0: Almost none
II-27	DISTRIBUTION	Distribution from revolving fund (Yes, No)	1: Yes, 0: No
II-30	NON_TIMBER	JFMC's NTFP Income (Yes, No)	1: Yes, 0: No
II-31	JF_DEPOSIT	Deposit to JFMC's account (Four times or more annually, Less than four times or more annually)	1: Four times or more annually, 0: Less than four times or more annually
II-32	JF_DRAW	Withdrawal from JFMC's account (Yes, No)	1: Yes, 0: No
II-33	JF_INCOME	JFMC members' household income after project (Increased significantly, Other)	1: Increased significantly, 0: Other
II-35	JF_OTHERINC	JFMC members' non-agricultural income after project (Increased moderately ,	1: Increased moderately , 0: Almost same
II-36	JF_MINOR	JFMC members' minor produce sales after project (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
II-37	JF_EXPENSE	JFMC members' household expenditure after project (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
II-39	JF_EDUCATION	JFMC members' household expenditure after project (education) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
II-40	JF_HOUSE	JFMC members' expenditure after project (house) (Increased moderately,	1: Increased moderately , 0: Almost same
II-42	JF_SAVING	JFMC members' saving after project (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
II-43	JF_GRANIMAL	JFMC members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
II-44	JF_OTHANIMAL	JFMC members' livestock after project (other) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
II-45	JF_EMPLOY	JFMC members' employment opportunities after project (Increased significantly, Other)	1: Increased significantly, 0: Other
III-6	SHG_GEN	Gender of SHG members (Only female, Female and male)	1: Only female, 0: Female and male
III-9	VILL_FEMALE	Female panchayat head (Yes, No)	1: Yes, 0: No
III-10	SHG_ACTGRANI	SHG activities 1 (grazing animal, other)	1: Husbandry of grazing animal, 0: Other
III-10	SHG_ACFISH	SHG activities 2 (fish farming, Other)	1: Fish farming, 0: Other
III-11	IGA_CONT	Female members continuing IGA (20% or more, Less than 20%)	1: 20% or more, 0: Less than 20%
III-13	SHG_KNOW	ReferenceUse of training knowledge for SHG activities (Yes, No)	1: Yes, 0: No
III-14	SHG_MEETING	SHG's official meeting (Yes, No)	1: Yes for the past year, 0: No for the past year
III-15	SHG_HOURS	Time for SHG activities (Yes, No)	1: Two hours or more, 0: Leass than two hours
III-16	SHG_LOANS	SHG's loans (Yes, No)	1: Yes, 0: No
III-18	GOOUT_AFTER	Current outreach of female SHG members (Long, Short)	1: Outside of neaby panchayat, 0: Within nearby
III-19	GOOUT_BEFORE	Pre-project outreach of female SHG members (Long, Short)	1: Outside of neaby panchayat, 0: Within nearby
III18&19	GOOUT	Change in outreach of female SHG members (Longer, Other)	1: Longer, 2: Other
III-20	DECISION	Women's confidence in household decisions (Increased significantly, Other)	1: Increased significantly, 0: Other
III-21	SHG_INCOME	Female SHG members' income after project (Increased significantly, Other)	1: Increased significantly, 0: Other
III-23	SHG_SAVING	SHG members' saving after project (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-24	SHG_GRANIMAL	SHG members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
III-25	SHG_OTHANIMAL	SHG members' livestock after project (other) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-26	SHG_EXPENSE	Female SHG members' expenditure after project (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-27	SHG_EDUCATION	SHG members' expenditure after project (education) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-28	SHG_ORNAMENT	SHG members' expenditure after project (ornament) (Increased, Decreased)	1: Increased, 0: Same
III-29	SHG_COSME	SHG members' expenditure after project(cosmetics) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-30	SHG_CLOTH	SHG members' expenditure after project (cloth) (Increased moderately, Almost same)	1: Increased moderately , 0: Almost same
III-31	DECIDE_AFTER	Percentage of income decided by female SHG members (Much, Moderate)	1: 80% or more, 0: Less than 80%
III-32	DECIDE_BEFORE	Percentage of income decided by female SHG members (Many, Moderate)	1: 80% or more, 0: Less than 80%
III-31&32	DECIDE	Percentage of income decided by female SHG members (Increased significantly, Increased)	1: Increased by 50% or more, 0: Increased by less than 50%
III-34	EFFECT_INCOME	Female SHG members' influence on household expenditure (Agreed, Other)	1: Agreed, 0: Other

Appendix 16: Summary Table for Analytical Results (No.1)

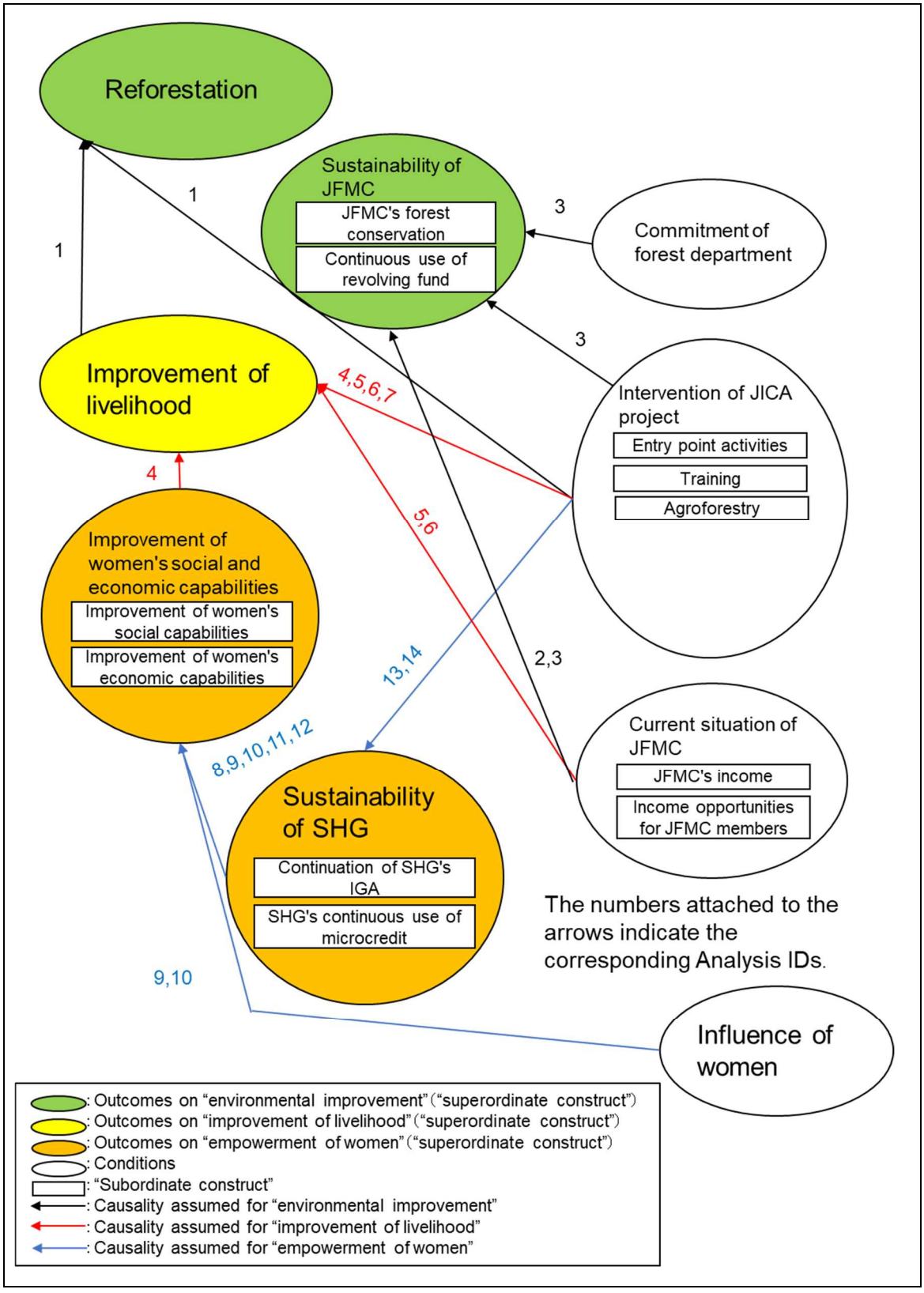
		Necessary conditions *			Parsimonious solution					
Analysis id	Model formula	Condition	Consistency	Coverage	Consistency cutoff	Solution	Raw coverage	Unique coverage	Consistency	Solution Coverage	Solution Consistency
1	FOREST_DENS = f(HARVEST, FD_GRAZING, ENTRY1, JF_EMPLOY)	HARVEST	0.909091	0.666667	0.8	ENTRY1*JF_EMPLOY	0.727273	0.727273	0.8	0.727273	0.8
		FD_GRAZING	0.909091	0.588235							
		ENTRY1	0.818182	0.60000							
		FD_VISITS	0.909091	0.58824							
		JF_EMPLOY	0.818182	0.75000							
2	JF_MEETING = f(HARVEST, ENTRY1, FD_VISITS, NON_TIMBER)	HARVEST	0.87500	0.93333	1	NON_TIMBER	1	1	1	1	1
		FD_VISITS	0.875	0.82353							
		NON_TIMBER	1	1							
3	JF_DEPOSIT = f(HARVEST, ENTRY1, FD_VISITS, NON_TIMBER)	HARVEST	0.8125	0.866667	0.9	~FD_VISITS*NON_TIMBER	0.125	0.125	1	0.875	0.933333
		ENTRY1	0.8125	0.866667		ENTRY1*FD_VISITS	0.75	0.75	0.923077		
		FD_VISITS	0.875	0.823529							
		NON_TIMBER	0.875	0.875							
4	JF_INCOME = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST	0.909091	0.666667	0.888889	ENTRY1*SHG_INCOME	0.727273	0.727273	0.888889	0.727273	0.888889
		ENTRY1	0.818182	0.6							
		OTHER_INCOME	0.909091	0.588235							
		SHG_INCOME	0.818182	0.818182							
5	JF_OTHERINC = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST	0.857143	0.8	0.888889	HARVEST*ENTRY1	0.714286	0.0714286	0.909091	0.857143	0.923077
		ENTRY1	0.857143	0.8		HARVEST*OTHER_INCOME	0.785714	0.142857	0.916667		
		OTHER_INCOME	0.928571	0.764706							
6	JF_HOUSE = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST	0.857143	0.8	0.888889	HARVEST*OTHER_INCOME	0.785714	0.785714	0.916667	0.785714	0.916667
		OTHER_INCOME	0.928571	0.764706							
7	JF_EMPLOY = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST	1	0.8	0.888889	HARVEST*ENTRY1	0.833333	0.833333	0.909091	0.833333	0.909091
		ENTRY1	0.833333	0.666667							
		OTHER_INCOME	0.833333	0.588235							
8	DECIDE = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, IGA_CONT, SHG_KNOW)	SHG_ACTFISH	0.875	0.933333	1	IGA_CONT	1	1	1	1	1
		IGA_CONT	1	1							
9	SHG_HOURS = f(JF_FEMALE, SHG_ACTFISH, IGA_CONT, SHG_KNOW)	JF_FEMALE	0.833333	0.666667	0.8	JF_FEMALE*IGA_CONT	0.833333	0.833333	0.83333	0.833333	0.833333
		SHG_ACTFISH	0.833333	0.666667							
		IGA_CONT	1	0.75							
		SHG_KNOW	1	0.705882							
10	SHG_EXPENSE = f(JF_FEMALE, SHG_ACTFISH, IGA_CONT, SHG_KNOW, SHG_MEETING)	JF_FEMALE	0.846154	0.733333	0.9	JF_FEMALE*IGA_CONT	0.846154	0.846154	0.916667	0.846154	0.916667
		SHG_ACTFISH	0.846154	0.733333							
		IGA_CONT	1	0.8125							
		SHG_KNOW	1	0.764706							
		SHG_MEETING	1	0.764706							
11	SHG_SAVING = f(SHG_ACTFISH, IGA_CONT, SHG_KNOW, SHG_MEETING)	SHG_ACTFISH	0.866667	0.866667	0.928571	IGA_CONT	1	1	0.9375	1	0.9375
		IGA_CONT	1	0.9375							
		SHG_KNOW	1	0.882353							
		SHG_MEETING	1	0.882353							
12	SHG_GRANIMAL = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, IGA_CONT, SHG_MEETING)	SHG_ACTFISH	0.875	0.933333	1	IGA_CONT	1	1	1	1	1
		IGA_CONT	1	1							
		SHG_KNOW	1	0.941176							
		SHG_MEETING	1	0.941176							
13	IGA_CONT = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, SHG_KNOW)	SHG_ACTFISH	0.875	0.933333	0.875	SHG_KNOW	1	1	0.941176	1	0.941176
		SHG_KNOW	1	0.941176							
14	SHG_MEETING = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, SHG_KNOW)	SHG_ACTFISH	0.882353	1	1	SHG_KNOW	1	1	1	1	1
		SHG_KNOW	1	1							

*Conditions with consistancy 0.8 or more are shown.

Appendix 17: Summary Table for Analytical Results (No.2)

Analysis id	Model formula	Parsimonious solution	Outcome		Condition 1		Condition 2	
		Solution	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct
1	FOREST_DENS = f(HARVEST, FD_GRAZING, ENTRY1, JF_EMPLOY)	ENTRY1*JF_EMPLOY	reforestation	reforestation	intervention of JICA project	entry point activities	improvement of livelihood	improvement of livelihood
2	JF_MEETING = f(HARVEST, ENTRY1, FD_VISITS, NON_TIMBER)	NON_TIMBER	sustainability of JFMC	JFMC's forest conservation	current situation of JFMC	JFMC's income		
3	JF_DEPOSIT = f(HARVEST, ENTRY1, FD_VISITS, NON_TIMBER)	~FD_VISITS*NON_TIMBER ENTRY1*FD_VISITS	sustainability of JFMC	continuous use of revolving fund	commitment of forest department intervention of JICA project	commitment of forest department entry point activities	current situation of JFMC commitment of forest department	JFMC's income commitment of forest department
4	JF_INCOME = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	ENTRY1*SHG_INCOME	improvement of livelihood	improvement of livelihood	intervention of JICA project	entry point activities	improvement of women's social and economic capabilities	improvement of women's economic capabilities
5	JF_OTHERINC = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST*ENTRY1 HARVEST*OTHER_INCOME	improvement of livelihood	improvement of livelihood	intervention of JICA project intervention of JICA project	agroforestry agroforestry	intervention of JICA project current situation of JFMC	entry point activities income opportunities for JFMC members
6	JF_HOUSE = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST*OTHER_INCOME	improvement of livelihood	improvement of livelihood	intervention of JICA project	agroforestry	ırrent situation of JFM	income opportunities for JFMC members
7	JF_EMPLOY = f(HARVEST, ENTRY1, OTHER_INCOME, SHG_INCOME)	HARVEST*ENTRY1	improvement of livelihood	improvement of livelihood	intervention of JICA project	agroforestry	ervention of JICA proj	entry point activities
8	DECIDE = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, IGA_CONT, SHG_KNOW)	IGA_CONT	improvement of women's social and economic capabilities	mprovement of women's social capabilities	sustainability of SHG	continuation of SHG's IGA		
9	SHG_HOURS = f(JF_FEMALE, SHG_ACTFISH, IGA_CONT, SHG_KNOW)	JF_FEMALE*IGA_CONT	improvement of women's social and economic capabilities	mprovement of women's social capabilities	influence of women	influence of women	sustainability of SHG	continuation of SHG's IGA
10	SHG_EXPENSE = f(JF_FEMALE, SHG_ACTFISH, IGA_CONT, SHG_KNOW, SHG_MEETING)	JF_FEMALE*IGA_CONT	improvement of women's social and economic capabilities	improvement of women's economic capabilities	influence of women	influence of women	sustainability of SHG	continuation of SHG's IGA
11	SHG_SAVING = f(SHG_ACTFISH, IGA_CONT, SHG_KNOW, SHG_MEETING)	IGA_CONT	improvement of women's social and economic capabilities	improvement of women's economic capabilities	sustainability of SHG	continuation of SHG's IGA		
12	SHG_GRANIMAL = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, IGA_CONT, SHG_MEETING)	IGA_CONT	improvement of women's social and economic capabilities	improvement of women's economic capabilities	sustainability of SHG	continuation of SHG's IGA		
13	IGA_CONT = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, SHG_KNOW)	SHG_KNOW	sustainability of SHG	continuation of SHG's IGA	intervention of JICA project	training		
14	SHG_MEETING = f(JF_FEMALE, ENTRY1, SHG_ACTFISH, SHG_KNOW)	SHG_KNOW	sustainability of SHG	SHG's continuous use of microcredit	intervention of JICA project	training		

Appendix 18: Analytical Results of the Study



Appendix 19: Cross-Tabulation Forest Density after Project Completion

REPLANT	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	36.4%	66.7%
= 1	2	4	6	coverage	coverage
Total	9	11	20	66.7%	36.4%

NURSERY	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	18.2%	66.7%
= 1	1	2	3	coverage	coverage
Total	9	11	20	66.7%	18.2%

HARVEST	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	1	5	90.9%	66.7%
= 1	5	10	15	coverage	coverage
Total	9	11	20	66.7%	90.9%

NEWPROJECT	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	8	14	27.3%	50.0%
= 1	3	3	6	coverage	coverage
Total	9	11	20	50.0%	27.3%

FD_GRAZING	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	1	3	90.9%	58.8%
= 1	7	10	17	coverage	coverage
Total	9	11	20	58.8%	90.9%

FIRE	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	8	16	27.3%	75.0%
= 1	1	3	4	coverage	coverage
Total	9	11	20	75.0%	27.3%

MONITORING	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	7	12	36.4%	50.0%
= 1	4	4	8	coverage	coverage
Total	9	11	20	50.0%	36.4%

JF_MEETING	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	81.8%	56.3%
= 1	7	9	16	coverage	coverage
Total	9	11	20	56.3%	81.8%

ENTRY1	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	81.8%	60.0%
= 1	6	9	15	coverage	coverage
Total	9	11	20	60.0%	81.8%

ENTRY2	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	9	15	18.2%	40.0%
= 1	3	2	5	coverage	coverage
Total	9	11	20	40.0%	18.2%

*necessary condition
**sufficient condition

FD_VISITS	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	1	3	90.9%	58.8%
= 1	7	10	17	coverage	coverage
Total	9	11	20	58.8%	90.9%

JF_GRAZING	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	5	9	54.5%	54.5%
= 1	5	6	11	coverage	coverage
Total	9	11	20	54.5%	54.5%

LPG	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	63.6%	63.6%
= 1	4	7	11	coverage	coverage
Total	9	11	20	63.6%	63.6%

CUTTING	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	36.4%	57.1%
= 1	3	4	7	coverage	coverage
Total	9	11	20	57.1%	36.4%

JF_DEPOSIT	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	81.8%	56.3%
= 1	7	9	16	coverage	coverage
Total	9	11	20	56.3%	81.8%

JF_DRAW	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	8	17	27.3%	100.0%
= 1	0	3	3	coverage	coverage
Total	9	11	20	100.0%	27.3%

JF_EXPENSE	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	81.8%	56.3%
= 1	7	9	16	coverage	coverage
Total	9	11	20	56.3%	81.8%

JF_EMPLOY	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	81.8%	75.0%
= 1	3	9	12	coverage	coverage
Total	9	11	20	75.0%	81.8%

JF_INCOME	FOREST_DENS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	5	9	54.5%	54.5%
= 1	5	6	11	coverage	coverage
Total	9	11	20	54.5%	54.5%

Appendix 20: Cross-Tabulation JFMC's Official Meeting

REPLANT	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	10	14	37.5%	100.0%
= 1	0	6	6	coverage	coverage
Total	4	16	20	100.0%	37.5%
NURSERY	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	13	17	18.8%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	16	20	100.0%	18.8%
HARVEST	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	87.5%	93.3%
= 1	1	14	15	coverage	coverage
Total	4	16	20	93.3%	87.5%
NEWPROJECT	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	11	14	31.3%	83.3%
= 1	1	5	6	coverage	coverage
Total	4	16	20	83.3%	31.3%
ENTRY1	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY2	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	12	15	25.0%	80.0%
= 1	1	4	5	coverage	coverage
Total	4	16	20	80.0%	25.0%
FD_VISITS	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	2	3	87.5%	82.4%
= 1	3	14	17	coverage	coverage
Total	4	16	20	82.4%	87.5%
NON_TIMBER	JF_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	100.0%
= 1	0	16	16	coverage	coverage
Total	4	16	20	100.0%	100.0%

*necessary condition
**sufficient condition

Appendix 21: Cross-Tabulation Deposit to JFMC's Account

REPLANT	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	11	14	31.3%	83.3%
= 1	1	5	6	coverage	coverage
Total	4	16	20	83.3%	31.3%
NURSERY	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	13	17	18.8%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	16	20	100.0%	18.8%
HARVEST	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	81.3%	86.7%
= 1	2	13	15	coverage	coverage
Total	4	16	20	86.7%	81.3%
NEWPROJECT	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	11	14	31.3%	83.3%
= 1	1	5	6	coverage	coverage
Total	4	16	20	83.3%	31.3%
ENTRY1	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	81.3%	86.7%
= 1	2	13	15	coverage	coverage
Total	4	16	20	86.7%	81.3%
ENTRY2	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	13	15	18.8%	60.0%
= 1	2	3	5	coverage	coverage
Total	4	16	20	60.0%	18.8%
FD_VISITS	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	2	3	87.5%	82.4%
= 1	3	14	17	coverage	coverage
Total	4	16	20	82.4%	87.5%
NON_TIMBER	JF_DEPOSIT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	87.5%	87.5%
= 1	2	14	16	coverage	coverage
Total	4	16	20	87.5%	87.5%

*necessary condition
**sufficient condition

Appendix 22: Cross-Tabulation JFMC Members' Household Income after Project

NURSERY	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	18.2%	66.7%
= 1	1	2	3	coverage	coverage
Total	9	11	20	66.7%	18.2%
HARVEST	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	1	5	90.9%	66.7%
= 1	5	10	15	coverage	coverage
Total	9	11	20	66.7%	90.9%
ENTRY1	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	81.8%	60.0%
= 1	6	9	15	coverage	coverage
Total	9	11	20	60.0%	81.8%
ENTRY2	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	9	15	18.2%	40.0%
= 1	3	2	5	coverage	coverage
Total	9	11	20	40.0%	18.2%
INCOME_P	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	7	12	36.4%	50.0%
= 1	4	4	8	coverage	coverage
Total	9	11	20	50.0%	36.4%
JF_KNOWLEDGE	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	3	10	72.7%	80.0%
= 1	2	8	10	coverage	coverage
Total	9	11	20	80.0%	72.7%
OTHER_INCOME	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	1	3	90.9%	58.8%
= 1	7	10	17	coverage	coverage
Total	9	11	20	58.8%	90.9%
DISTRIBUTION	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	10	17	9.1%	33.3%
= 1	2	1	3	coverage	coverage
Total	9	11	20	33.3%	9.1%
SHG_INCOME	JF_INCOME		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	2	9	81.8%	81.8%
= 1	2	9	11	coverage	coverage
Total	9	11	20	81.8%	81.8%

*necessary condition
**sufficient condition

Appendix 23: Cross-Tabulation JFMC Members' Non-agricultural Income after Project

NURSERY	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	11	17	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	6	14	20	100.0%	21.4%
HARVEST	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	85.7%	80.0%
= 1	3	12	15	coverage	coverage
Total	6	14	20	80.0%	85.7%
ENTRY1	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	85.7%	80.0%
= 1	3	12	15	coverage	coverage
Total	6	14	20	80.0%	85.7%
ENTRY2	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	12	15	14.3%	40.0%
= 1	3	2	5	coverage	coverage
Total	6	14	20	40.0%	14.3%
INCOME_P	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	6	12	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	6	14	20	100.0%	57.1%
JF_KNOWLEDGE	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	4	10	71.4%	100.0%
= 1	0	10	10	coverage	coverage
Total	6	14	20	100.0%	71.4%
OTHER_INCOME	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	1	3	92.9%	76.5%
= 1	4	13	17	coverage	coverage
Total	6	14	20	76.5%	92.9%
DISTRIBUTION	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	11	17	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	6	14	20	100.0%	21.4%
SHG_INCOME	JF_OTHERINC		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	71.4%	90.9%
= 1	1	10	11	coverage	coverage
Total	6	14	20	90.9%	71.4%

*necessary condition
**sufficient condition

Appendix 24: Cross-Tabulation JFMC Members' Expenditure after Project (House)

NURSERY	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	11	17	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	6	14	20	100.0%	21.4%
HARVEST	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	85.7%	80.0%
= 1	3	12	15	coverage	coverage
Total	6	14	20	80.0%	85.7%
ENTRY1	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	78.6%	73.3%
= 1	4	11	15	coverage	coverage
Total	6	14	20	73.3%	78.6%
ENTRY2	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	11	15	21.4%	60.0%
= 1	2	3	5	coverage	coverage
Total	6	14	20	60.0%	21.4%
INCOME_P	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	7	12	50.0%	87.5%
= 1	1	7	8	coverage	coverage
Total	6	14	20	87.5%	50.0%
JF_KNOWLEDGE	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	5	10	64.3%	90.0%
= 1	1	9	10	coverage	coverage
Total	6	14	20	90.0%	64.3%
OTHER_INCOME	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	1	3	92.9%	76.5%
= 1	4	13	17	coverage	coverage
Total	6	14	20	76.5%	92.9%
DISTRIBUTION	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	11	17	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	6	14	20	100.0%	21.4%
SHG_INCOME	JF_HOUSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	71.4%	90.9%
= 1	1	10	11	coverage	coverage
Total	6	14	20	90.9%	71.4%

*necessary condition
**sufficient condition

Appendix 25: Cross-Tabulation JFMC Members' Employment Opportunities after Project

NURSERY	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	10	17	16.7%	66.7%
= 1	1	2	3	coverage	coverage
Total	8	12	20	66.7%	16.7%
HARVEST	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	0	5	100.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	8	12	20	80.0%	100.0%
ENTRY1	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	83.3%	66.7%
= 1	5	10	15	coverage	coverage
Total	8	12	20	66.7%	83.3%
ENTRY2	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	10	15	16.7%	40.0%
= 1	3	2	5	coverage	coverage
Total	8	12	20	40.0%	16.7%
INCOME_P	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	58.3%	87.5%
= 1	1	7	8	coverage	coverage
Total	8	12	20	87.5%	58.3%
JF_KNOWLEDGE	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	4	10	66.7%	80.0%
= 1	2	8	10	coverage	coverage
Total	8	12	20	80.0%	66.7%
OTHER_INCOME	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	2	3	83.3%	58.8%
= 1	7	10	17	coverage	coverage
Total	8	12	20	58.8%	83.3%
DISTRIBUTION	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	9	17	25.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	8	12	20	100.0%	25.0%
SHG_INCOME	JF_EMPLOY		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	3	9	75.0%	81.8%
= 1	2	9	11	coverage	coverage
Total	8	12	20	81.8%	75.0%

*necessary condition
**sufficient condition

Appendix 26: Cross-Tabulation Percentage of Income Decided by Female SHG Members

JF_FEMALE	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY1	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY2	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	12	15	25.0%	80.0%
= 1	1	4	5	coverage	coverage
Total	4	16	20	80.0%	25.0%
VILL_FEMALE	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	12	16	25.0%	100.0%
= 1	0	4	4	coverage	coverage
Total	4	16	20	100.0%	25.0%
SHG_ACTGRANI	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	37.5%	85.7%
= 1	1	6	7	coverage	coverage
Total	4	16	20	85.7%	37.5%
SHG_ACTFISH	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	87.5%	93.3%
= 1	1	14	15	coverage	coverage
Total	4	16	20	93.3%	87.5%
IGA_CONT	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	100.0%
= 1	0	16	16	coverage	coverage
Total	4	16	20	100.0%	100.0%
SHG_KNOW	DECIDE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	94.1%
= 1	1	16	17	coverage	coverage
Total	4	16	20	94.1%	100.0%

*necessary condition
**sufficient condition

Appendix 27: Cross-Tabulation Time for SHG Activities

JF_FEMALE	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	83.3%	66.7%
= 1	5	10	15	coverage	coverage
Total	8	12	20	66.7%	83.3%
ENTRY1	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	66.7%	53.3%
= 1	7	8	15	coverage	coverage
Total	8	12	20	53.3%	66.7%
ENTRY2	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	8	15	33.3%	80.0%
= 1	1	4	5	coverage	coverage
Total	8	12	20	80.0%	33.3%
VILL_FEMALE	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	8	16	33.3%	100.0%
= 1	0	4	4	coverage	coverage
Total	8	12	20	100.0%	33.3%
SHG_ACTGRANI	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	41.7%	71.4%
= 1	2	5	7	coverage	coverage
Total	8	12	20	71.4%	41.7%
SHG_ACTFISH	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	83.3%	66.7%
= 1	5	10	15	coverage	coverage
Total	8	12	20	66.7%	83.3%
IGA_CONT	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	75.0%
= 1	4	12	16	coverage	coverage
Total	8	12	20	75.0%	100.0%
SHG_KNOW	SHG_HOURS		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	70.6%
= 1	5	12	17	coverage	coverage
Total	8	12	20	70.6%	100.0%

*necessary condition
**sufficient condition

Appendix 28: Cross-Tabulation Female SHG Members' Expenditure after Project

JF_FEMALE	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	84.6%	73.3%
= 1	4	11	15	coverage	coverage
Total	7	13	20	73.3%	84.6%
ENTRY1	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	69.2%	60.0%
= 1	6	9	15	coverage	coverage
Total	7	13	20	60.0%	69.2%
ENTRY2	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	9	15	30.8%	80.0%
= 1	1	4	5	coverage	coverage
Total	7	13	20	80.0%	30.8%
VILL_FEMALE	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	10	16	23.1%	75.0%
= 1	1	3	4	coverage	coverage
Total	7	13	20	75.0%	23.1%
SHG_ACTGRANI	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	8	13	38.5%	71.4%
= 1	2	5	7	coverage	coverage
Total	7	13	20	71.4%	38.5%
SHG_ACTFISH	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	84.6%	73.3%
= 1	4	11	15	coverage	coverage
Total	7	13	20	73.3%	84.6%
IGA_CONT	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	81.3%
= 1	3	13	16	coverage	coverage
Total	7	13	20	81.3%	100.0%
SHG_KNOW	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	76.5%
= 1	4	13	17	coverage	coverage
Total	7	13	20	76.5%	100.0%
SHG_MEETING	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	76.5%
= 1	4	13	17	coverage	coverage
Total	7	13	20	76.5%	100.0%
SHG_LOANS	SHG_EXPENSE		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	10	17	23.1%	100.0%
= 1	0	3	3	coverage	coverage
Total	7	13	20	100.0%	23.1%

*necessary condition
**sufficient condition

Appendix 29: Cross-Tabulation SHG Members' Saving after Project

JF_FEMALE	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	73.3%	73.3%
= 1	4	11	15	coverage	coverage
Total	5	15	20	73.3%	73.3%
ENTRY1	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	73.3%	73.3%
= 1	4	11	15	coverage	coverage
Total	5	15	20	73.3%	73.3%
ENTRY2	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	11	15	26.7%	80.0%
= 1	1	4	5	coverage	coverage
Total	5	15	20	80.0%	26.7%
VILL_FEMALE	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	11	16	26.7%	100.0%
= 1	0	4	4	coverage	coverage
Total	5	15	20	100.0%	26.7%
SHG_ACTGRANI	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	33.3%	71.4%
= 1	2	5	7	coverage	coverage
Total	5	15	20	71.4%	33.3%
SHG_ACTFISH	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	86.7%	86.7%
= 1	2	13	15	coverage	coverage
Total	5	15	20	86.7%	86.7%
IGA_CONT	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	93.8%
= 1	1	15	16	coverage	coverage
Total	5	15	20	93.8%	100.0%
SHG_KNOW	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	88.2%
= 1	2	15	17	coverage	coverage
Total	5	15	20	88.2%	100.0%
SHG_MEETING	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	88.2%
= 1	2	15	17	coverage	coverage
Total	5	15	20	88.2%	100.0%
SHG_LOANS	SHG_SAVING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	13	17	13.3%	66.7%
= 1	1	2	3	coverage	coverage
Total	5	15	20	66.7%	13.3%

*necessary condition
**sufficient condition

Appendix 30: Cross-Tabulation SHG Members' Livestock after Project (Grazing Animal)

JF_FEMALE	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY1	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY2	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	12	15	25.0%	80.0%
= 1	1	4	5	coverage	coverage
Total	4	16	20	80.0%	25.0%
VILL_FEMALE	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	12	16	25.0%	100.0%
= 1	0	4	4	coverage	coverage
Total	4	16	20	100.0%	25.0%
SHG_ACTGRANI	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	37.5%	85.7%
= 1	1	6	7	coverage	coverage
Total	4	16	20	85.7%	37.5%
SHG_ACTFISH	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	87.5%	93.3%
= 1	1	14	15	coverage	coverage
Total	4	16	20	93.3%	87.5%
IGA_CONT	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	100.0%
= 1	0	16	16	coverage	coverage
Total	4	16	20	100.0%	100.0%
SHG_KNOW	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	94.1%
= 1	1	16	17	coverage	coverage
Total	4	16	20	94.1%	100.0%
SHG_MEETING	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	94.1%
= 1	1	16	17	coverage	coverage
Total	4	16	20	94.1%	100.0%
SHG_LOANS	SHG_GRANIMAL		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	13	17	18.8%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	16	20	100.0%	18.8%

*necessary condition
**sufficient condition

Appendix 31: Cross-Tabulation Female Members Continuing IGA

JF_FEMALE	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY1	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	75.0%	80.0%
= 1	3	12	15	coverage	coverage
Total	4	16	20	80.0%	75.0%
ENTRY2	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	12	15	25.0%	80.0%
= 1	1	4	5	coverage	coverage
Total	4	16	20	80.0%	25.0%
VILL_FEMALE	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	12	16	25.0%	100.0%
= 1	0	4	4	coverage	coverage
Total	4	16	20	100.0%	25.0%
SHG_ACTGRANI	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	37.5%	85.7%
= 1	1	6	7	coverage	coverage
Total	4	16	20	85.7%	37.5%
SHG_ACTFISH	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	87.5%	93.3%
= 1	1	14	15	coverage	coverage
Total	4	16	20	93.3%	87.5%
SHG_KNOW	IGA_CONT		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	94.1%
= 1	1	16	17	coverage	coverage
Total	4	16	20	94.1%	100.0%

*necessary condition
**sufficient condition

Appendix 32: Cross-Tabulation SHG's Official Meeting

JF_FEMALE	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	76.5%	86.7%
= 1	2	13	15	coverage	coverage
Total	3	17	20	86.7%	76.5%
ENTRY1	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	4	5	76.5%	86.7%
= 1	2	13	15	coverage	coverage
Total	3	17	20	86.7%	76.5%
ENTRY2	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	13	15	23.5%	80.0%
= 1	1	4	5	coverage	coverage
Total	3	17	20	80.0%	23.5%
VILL_FEMALE	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	13	16	23.5%	100.0%
= 1	0	4	4	coverage	coverage
Total	3	17	20	100.0%	23.5%
SHG_ACTGRANI	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	41.2%	100.0%
= 1	0	7	7	coverage	coverage
Total	3	17	20	100.0%	41.2%
SHG_ACTFISH	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	88.2%	100.0%
= 1	0	15	15	coverage	coverage
Total	3	17	20	100.0%	88.2%
SHG_KNOW	SHG_MEETING		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	0	3	100.0%	100.0%
= 1	0	17	17	coverage	coverage
Total	3	17	20	100.0%	100.0%

*necessary condition
**sufficient condition

Ex-Post Project Evaluation 2019: Package III-5 (India)
Qualitative Comparative Analysis (QCA) Paper (Uttar Pradesh State)




May 18, 2022

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Summary

Background: JICA implemented forest sector projects in India are unique in that they involve various interventions in addition to afforestation activities. Moreover, the project environment, such as climate, nature, social conditions, and economic conditions, is also diverse. Qualitative Comparative Analysis (QCA) is one of the evaluation methods that can respond to both the diversities of project activities and project environments. The uniqueness of QCA is to organize a causal relationship that exists between an outcome and a combination of conditions[1] by set theory. This study applied QCA to the forest sector projects in India and organized causal relationships based on the hypnoses of presumed causalities on a trial basis.

Purpose: This study has the following purposes: (1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement", "improvement of livelihood", and "empowerment of women," and (2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

Methodology: A questionnaire survey was conducted in 16 Joint Forest Management Committees (JFMC) which were JICA supported through the ODA loan project in India "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project." In each JFMC, one respondent was selected as a representative from each of the forest departments, the JFMC, and the Self-Help Group (SHG). The working framework was designed by using existing information. In the framework, the outcomes were organized into five "superordinate constructs" and conditions were organized into six "superordinate constructs." It is also assessed that some "superordinate constructs" for outcomes were used as conditions for other outcomes. From among possible QCA analytical methods, crisp set QCA was employed in this study to attempt to determine what kind of the conditions trigger outcomes.

Results: On "environmental improvement," the conditions within "commitment of forest department" and "intervention of JICA project" were sufficient conditions for the outcome in "sustainability of JFMC." On "improvement of livelihood," the conditions of "intervention of JICA project," "current situation of JFMC," and "improvement of women's social and economic capabilities" were found to be sufficient for the outcomes in this project effect. Finally, for "empowerment of women," the conditions in "intervention of JICA project" and "sustainability of SHG" were sufficient conditions for the outcomes in "improvement of women's social and economic capabilities." Moreover, the conditions in "intervention of JICA project" were sufficient conditions for the outcomes in "sustainability of SHG." A summary of the analytical results is shown in Figure 1.

Considerations: QCA found that the JICA project's interventions contributed to the expected effects "sustainability of JFMC," "improvement of livelihood," and "improvement of women's social and economic capabilities," and the "sustainability of SHGs." However, an appropriate sufficient condition of "reforestation" could not be derived. A possible explanation for this result is it takes a long period for the sustainability of JFMC to make a clear difference in forest regeneration. In addition, limitation in the interpretation of results can also be presumed. Taking these limitations into account, the arguments inferred from this study can be found in the main topic section.

Conclusion: (1) It is inferred that the conditions in "intervention of JICA project" have relationships to "environmental improvement," "improvement of livelihood," and "empowerment of women." suggesting that the JICA project contributes to the improvement of the above three project effects.

(2) As for recommendations, the discussion on the conditions related to the occurrence of the main project effects recommended involvement of the forest department, and,as for lessons leraned, suggests efforts to encourage community collaboration, effective use of surplus funds, and assessment of the intervention theory in "improvement of women's social and economic

[1] In this study, a condition means a factor assumed to cause outcomes.

capabilities."

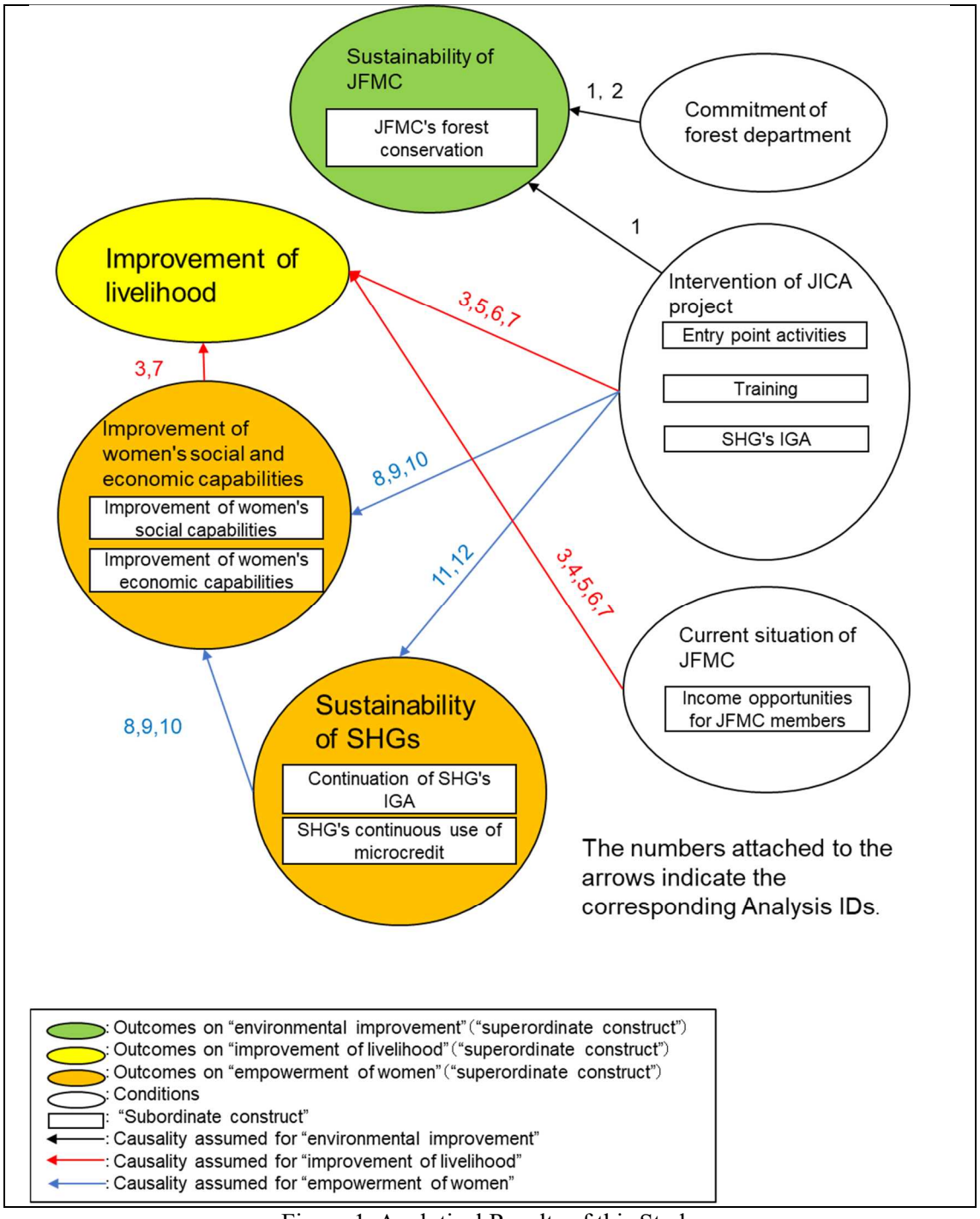


Figure 1: Analytical Results of this Study

Main Topics:

- The construction of community place as an entry point activity[2] is related to an increase in fire prevention activities and the continuation of income generation activities (IGA). The construction of community place implied cooperation within the community, and promoting community collaboration within the project is important.
- The employment by the forest department was a crucial factor influencing the continuation of JFMC's activities. It is inferred that the forest department needs to remain involved in JFMC's activities after the project completion for delivering tangible benefits to JFMCs.
- It was implied that JFMC members having surplus funds led to the increase in grazing animals. As an increase of grazing animals is also a burdening factor on forests, combining project activities with educational activities that promote the meaningful use of the surplus funds is desirable.
- Deriving sufficient conditions for many of the outcomes related to "improvement of women's social and economic capabilities" was difficult. It is inferred that the conditions not addressed in the working framework of this study might contribute to the project effects. For future projects, understanding domestic household factors is considered necessary for establishing appropriate intervention theory. Identifying domestic factors in this study was difficult as it assumed JFMC for the case unit.
- Since QCA case selection is purposeful in that assessment results are applied only to the cases in which the assumed conditions are satisfied, careful attention is required when generalizing the interpretation of results (limitation on interpretation of results).

Keywords: Qualitative Comparative Analysis (QCA), environmental improvement, improvement of livelihood, empowerment of women, participatory afforestation

[2] Based on the plans developed by the JFMCs, the entry point activities provided supports such as: small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

1 Background and Purpose of the Study

1.1 Background of the Study

The factors that lead to effective development projects include both the project environment and the project interventions. Moreover, there is no one-to-one relationship between project effects and factors, but multiple intricately related factors may lead to a specific project effect. In order to identify specific relationships between multiple factors and project effects, quantitative research can assume multiple factors and employ multiple regression analysis to construct a complex model to a certain extent. However, since multiple regression analysis requires a sufficient sample size, the use of multiple regression analysis is often difficult due to the limitations of project nature and data collection. On the other, conventional case studies can present complex causal relationships between project effects and multiple factors. However, case study analysis, in general, lacks the application of standardized research method in a systematic manner.

JICA's forest sector projects in India are distinctive because the projects involved not only afforestation activities but also numerous interventions such as livelihood improvement activities, provision of small-scale infrastructure, and establishment of forest cooperatives. In addition, the environment surrounding the projects was very diverse in terms of climate, nature, social situation, and economic conditions. Therefore, the forest sector in India required an evaluation to cope with the diverse project environment and the numerous project activities.

Qualitative Comparative Analysis (QCA) is a method that can analyze how, based on 10 to 50 cases, an outcome (an element to represent an expected result of an intervention or factor, such as a project effect) of a project is attributed to conditions (interventions or factors assumed to cause incidence of the outcomes). The uniqueness of QCA is to present causal inferences that exist between a single outcome and a combination of conditions. This time, QCA is applied to the analysis on the characteristics of the forest sector projects in India including: multiple interventions, diverse project environments, and numerous combinations of interventions and environments. This report shows the study results of QCA on the ODA loan project in India "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project," out of the participatory afforestation projects (two projects[3]) in the Ex-Post Project Evaluation 2019: Package III-5 (India).

1.2 Purpose of the Study

The purpose of the study is as follows:

(1) Identify interventions and factors that have enabled the occurrence of expected social forestry project effects including "environmental improvement," "improvement of livelihood," and "empowerment of women"
(2) Derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects

The following four objectives were defined as more detailed analytical goals.

a) To identify the interventions and factors that enabled "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project from a perspective that differs from evaluations based on the OECD-DAC evaluation criteria.

b) To present analytical results for each individual project, compare the analytical results of both projects, and provide background context and reasons for similarities and differences between the projects.

[3] "Tripura Forest Environmental Improvement and Poverty Alleviation Project" and "Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project"

c) To conduct an analysis to cover both the projects by using the same variables applied to each project and identify interventions and factors that have enabled the incidence of project effects in participatory afforestation projects in India.

d) Through the above analysis, derive useful recommendations and lessons to be assessed in the formation of new participatory afforestation projects.

2 Research Questions

The research questions of this study include main questions and sub-questions as follows. The main questions are to be answered by the integration of the analytical results from each project or by the QCA analytical results on the integrated data of both projects and the sub-questions are to be answered by the analytical results of QCA for each of the target projects.

(1) Main Question

What interventions and factors, or their combination, have led to "environmental improvement," "improvement of livelihood," and "empowerment of women" in participatory afforestation projects in India?

(2) Sub-questions

What interventions and factors, or their combinations, have resulted in "environmental improvement," "improvement of livelihood," and "empowerment of women" in each project? What are the differences among the projects?

3 Target Project

3.1 Outline of the Project

The project supported social forestry in the Uttar Pradesh state through an ODA loan. To harmonize expansion of a forest area and community development, a Joint Forest Management (JFM) approach, in which the executing agency and the local people undertake joint management of a forest, was adopted. To implement the project, a Joint Forest Management Committee (JFMC) and an Eco-Development Committee (EDC) were established, and Self-Help Groups (SHGs) were also organized for income generation activities under the JFMC and the EDC. The outputs of the target project included afforestation, community development (entry point activities[4]), income generation activities (support to SHGs), and training for the executing agency officers and local people. The following table summarizes the target project:

Table 1 The Outline of the Target Project

Project Name	Project Period	Project Cost	Project Area	Number of Establishments
Uttar Pradesh Participatory Forest Management and Poverty Alleviation Project	March 2008 - December 2017	JPY 9,169 million	14 Districts in the Uttar Pradesh state	JFMC:800 EDC:140 SHG：2,680

Source: Prepared by the author, based on the appraisal report for board members, the project completion report, and the ex-ante project evaluation sheet

3.2 Current Situation of the Forest in the Project Area

Using satellite data, the Forest Survey of India (FSI) continuously measures forest density. FSI classifies forest density as: Very Dense Forest (VDF), Middle Dense Forest (MDF), Open Forest (OF), Scrub, and Non- Forest. The most recent data is provided in the 2017 report, and provides

[4] Based on the plan developed by JFMC, the project provided support including small-scale infrastructure (community places, roads, water supply, etc.) and health care services.

data from October 2015 to February 2016. The data for the period immediately before the commencement of the target project (October 2006 to February 2007) can be found in the 2009 report. The 2009 and 2017 data were compared (see Appendix 1) to show changes before and after the implementation of the project.

The total afforestation area of the target project was 80,695 ha (Project Completion Report, p.iii). The afforestation area of the target project is equivalent to 5.4% of the total forest area in the Uttar Pradesh state in 2017. The project area can be broadly divided into the northern (plain area), the southern (hilly area), and the western (hilly area) parts of the state. The forest cover in the western part of the state is lower than in the other regions. The north has a higher proportion of dense forests while the south has a higher proportion of sparse forests. The forest area in the north and south remained stable between 2009 and 2017, but its density increased. For the same period, forest area, especially sparse forest, increased in the western region.

3.3 Social Situation in the Project Area

The major social condition indicators in the project area are summarized in the attached table (see Appendix 2). The table shows district-wide figures for the literacy rate (overall and by gender), the ratio of scheduled castes, that of scheduled tribes, that of agricultural workers (both landowners and landless), and the population density based on 2011 census data. It is noteworthy that the literacy rate in the Uttar Pradesh state was lower than the average of India (74.0%)[5] for both the entire state and the project area, and that there was a significant gender gap. It is also notable that the scheduled castes accounted for more than 20% of the residents in the project area, and that many of the residents were engaged in agriculture without land ownership.

4 Variables and Working Framework in the Study

4.1 Variables in the Study

The variables of interest in this study are broadly classified into project effects, which in terms of QCA are outcomes, and factors and interventions for each case, which in terms of QCA are conditions. In this study, JFMC is considered a unit to represent a case. The attributes of JFMC, which are background factors, are used in the analysis as conditions if necessary. As much as possible in the selection of the variables, the variables that affect the incidence of outcomes but do not differ among JFMCs are excluded. The list of variables is shown in Appendix 3 to Appendix 11.

4.2 Working Framework

As a result of the field survey, it became clear that among the main project effects, “environmental improvement” and “empowerment of women” had several qualitatively different outcomes. For this reason, these main project effects are divided into two groups. Specifically, “environmental improvement” is divided into two groups: “reforestation” and “sustainability of JFMC,” and “empowerment of women” is divided into two groups: “improvement of women’s social and economic capabilities” and “sustainability of SHG.” In the working framework, “sustainability of JFMC” is the condition for “reforestation” and “sustainability of SHG” is the condition for “improvement of women’s social and economic capabilities.” Since the former outcome takes time to be realized, the latter outcome, which is the preliminary stage of the former outcome, was also used for the analysis.

The working framework was formulated to provide an overall picture of this study, and to illustrate the causal relationships assumed for the variables (see Appendix 12). In the working framework, “superordinate constructs” and “subordinate constructs” were established for precise grouping of the variables. The “superordinate constructs” group qualitatively similar variables and are used to show the working framework in a simplified manner. The “subordinate constructs” are subgroups within the “superordinate constructs.” The variables within the same category of

[5] Census of India 2011

"subordinate construct" can be treated as qualitatively consistent (i.e., variables can be synthesized), and the "subordinate constructs" are used for the analysis using the QCA software (see "6.1 Analytical Method" for more information on the software). When all variables in the "superordinate constructs" are considered qualitatively consistent, the "superordinate constructs" and the "subordinate constructs" are considered the same, and therefore these "subordinate constructs" are not shown in the figure.

5 Case Selection

5.1 Number of Cases

As mentioned above, QCA requires approximately 10 to 50 cases. The questionnaire survey was conducted from April 12 to July 3, 2021, in four forest divisions of the Uttar Pradesh state: North Kheri, Mirzapur, Renukoot, and Obra. While North Kheri is located in the northern part of the state, Mirzapur, Renukoot and Obra are located in the southern part of the state. The forest divisions for this study were selected according to the procedure described in the next section. Within the above questionnaire period, data were collected in 16 JFMCs. See Appendix 13 and Appendix 14 for JFMCs that were surveyed.

5.2 Procedure for Case Selection

The target project supported the establishment and management of more than 900 cooperatives in the Uttar Pradesh state. The procedure to select cases from among a large number of possible cooperatives included the following considerations:

- Variation in the variables is essential in the analysis but the cases themselves should be comparable. For this reason, EDC is not included as a case of this study, and JFMCs are used as a case unit.
- In order to have variation of the variables among cases, in addition to the characteristics that cannot be controlled by the project and the requirements related to the feasibility of the survey, the continuation and activity of JFMC were reflected in the case selection. Specifically, the activity status of JFMCs and SHGs, which are intermediate outcomes, were included as case selection conditions. Also t it was taken into account that the variables directly related to reforestation and empowerment of women may not differ among JFMCs since only a few years have passed after the completion of the project.
- The specific procedure for case selection was as follows.

STEP 1: Precipitation: Districts with annual precipitation of 700 mm or more (5-year average for 2014 - 2018) were selected. In the Uttar Pradesh state, eight districts were selected.

STEP 2: Number of JFMCs: Forest divisions with less than 10 JFMCs were excluded. The reason for exclusion was that fewer JFMCs could be compared and selected in the same division.

STEP 3: The state forest department confirmed whether a JFMC met the following criteria. JFMCs that met these criteria were defined as an Active JFMC.

- There was at least one meeting listed in the meeting register for the past one year.
- There was a member who was employed by the forest department in the past year.

STEP 4: The forest department selected 15 JFMCs from JFMCs that met the requirements of STEP 3, where the activities for livelihood improvement of JFMCs and SHGs continued to be active. About 15 JFMCs that had not organized meetings frequently/had stopped meeting and had stopped using facilities and equipment for entry point activities were selected from the same division. JFMC that satisfied these criteria were defined as a Non-active JFMC.

STEP5: Whether or not the selected JFMC satisfied the following criteria was confirmed. If the criteria were not confirmed, a new JFMC that met the criteria was selected.

- Access: Within a day trip distance from the district HQ.
- Agriculture Dependency: According to the district census, more than 30% of the working population in the revenue village was engaged in agriculture.
- Women SHGs: At least one SHG for which the majority of SHG members were women.

STEP 6: From the selected 30 JFMCs (15 Active, 15 Non-active), the questionnaire survey was planned to be conducted in JFMCs that could be accessed within the survey period. Eventually, the survey covered 16 JFMCs (8 Active, 8 Non-active).

5.3 Study Targets in a Case

Due to the wide variety of variables to be used, if the number of respondents were limited to one person for each village, it was likely that the respondent would not have the necessary information. Therefore, in each JFMC, one person from the forest department, one person from JFMC, and one person from SHG were chosen for the survey. The questionnaire was also divided into three parts: one section for a forest department officer, one for a JFMC member, and one for a SHG member.

6 Analysis Results

6.1 Analytical Method

This study used fsQCA (version 3.1b), a software for QCA, to conduct the analysis using crisp set QCA. Crisp set QCA is a method that uses binary data for outcomes and conditions. The interpretation of the analytical results using binary data becomes easier given that outcomes and causal conditions are binary numbers with qualitatively different meanings. The analysis excluded the variables with skewed distributions in the questionnaire responses because QCA could not analyze them. As a result, among the "subordinate constructs" all variables in the outcome *continuous use of revolving fund* and the conditions *agroforestry* and *JFMC's income* had skewed distributions. Therefore, these "subordinate constructs" were excluded from the analysis. The variables in the analysis are summarized in Appendix 15. On the conditions used in QCA, the necessary conditions between an outcome and conditions were calculated, and three to five variables with the highest consistency and a certain level of coverage (0.3 or higher) were selected[6]. In the preparation of the truth table, a row with a raw consistency of less than 0.8 was deleted. Parsimonious solutions, which were easy to interpret, were chosen out of the output solutions. When the solution coverage was low (below 0.7), it was concluded that the derived sufficient conditions could not adequately explain the outcome.

6.2 Constraints during the Evaluation

For interpretation of QCA analytical results, this study had assumed two field trips. The second trip was expected to conduct interviews with project stakeholders and beneficiaries; however, due to the spread of the novel coronavirus, only one trip was conducted in March 2020. The field study assistants conducted the tasks planned for the second trip on a limited basis. An authentic approach for a case study is to extract cases for which sufficient conditions were applied and then re-examine the reasons and background of each case individually for further consideration of the analytical results. However, for the reasons mentioned above, the availability of qualitative information was limited. As a result, the interpretation of the QCA analytical results is mainly based on the limited knowledge obtained in the short period of the first field survey. In particular, establishing causal relationships solely based on the analytical results of QCA was difficult, and supplementing the results of this study with additional information would be desirable.

[6] Referred to Daisuke Mori (2017) "How to use software for qualitative comparative analysis (QCA) : fs/QCA and R(1)", Kumamoto law review (140)

6.3 Analysis Results

6.3.1 Overall

A summary table for the derived sufficient conditions based on "6.1 Analytical Method" can be found in Appendix 16. The "superordinate constructs" and the "subordinate constructs" contained in the outcomes and the conditions of the derived sufficient conditions can be found in the table in Appendix 17. In addition, the derived sufficient conditions by themselves are illustrated in the figure in Appendix 18. It should be noted that the figure is extremely simplified as the figure does not show the combinations of conditions in detail.

6.3.2 Environmental Improvement

(1) Reforestation

Overall subordinate construct: The sufficient conditions for all the outcome variables (*barren land after project completion, forest density after project completion,* and *current survival rate*) and the synthesized outcome variable (*reforestation after project completion*) have low solution coverage of 0.2-0.4. It was difficult to sufficiently explain the outcome with the derived sufficient conditions.

(2) Sustainability of JFMC (JFMC's Forest Conservation)

Overall subordinate construct: Among the outcomes, the sufficient conditions for *fire prevention after project completion* and *JFMC official meeting* have high solution coverage. On the other hand, the sufficient condition for *monitoring after project completion* has low solution coverage.

Fire prevention after project completion (Analysis ID 1): *Fire prevention after project completion* was divided into two categories on a four-point scale: the first level (increased) and the second to fourth levels (almost no change). JFMCs that increased fire prevention activities after the project completion were: (a) those that chose the community place as the entry point activity or (b) those that had training only for afforestation and that were visited frequently by forest department staff. The one-to-one cross-tabulation for this outcome is shown in Appendix 19.

JFMC's official meeting (Analysis ID 2): *JFMC's official meeting* was divided into two categories on a five-point scale: the first to fourth levels (meeting in the past year) and the fifth level (no meeting in the past year). The JFMC that had formal meetings at least once a year after the project completion were: (a) JFMC members that were employed by the forest department during the past three years. Since both solution consistency and solution coverage ratio is 1, the employment by the forest department is considered a necessary and sufficient condition for JFMC's official meeting. The one-to-one cross-tabulation for this outcome is shown in Appendix 20.

6.3.3 Improvement of Livelihood

(1) Improvement of Livelihood

Overall subordinate construct: For *JFMC members' livestock after project (grazing animal)*, *JFMC members' livestock after project (other), JFMC members' expenditure after project (education), JFMC members' expenditure after project (house), JFMC members' employment opportunities after project,* sufficient conditions with high solution coverage were found. On the other hand, it is difficult to interpret solutions for *JFMC members' household income after project*. The solution coverage for *JFMC members' saving after project* and JFMC members' household expenditure after project is low.

JFMC members' livestock after project (grazing animal) (Analysis ID 3): *JFMC members' livestock after project (grazing animal)* was divided into two categories based on a four-point scale: the first to third levels (increased) and the fourth level (no change). Three terms were derived as sufficient conditions for the increase in JFMC members' grazing animals after project.

Two of the terms were not important because their raw coverages were low. The term with high raw coverage was (a) there was income from sources other than agriculture and animal husbandry, and the income of SHG members under the JFMC increased, which was included in the sufficient condition. The one-to-one cross-tabulation for this outcome is shown in Appendix 21.

JFMC members' livestock after project (other) (Analysis ID 4): *JFMC members' livestock after project (other)* was divided into two categories in the four-point scale: the first to third levels (increase) and the fourth level (no change). The sufficient conditions for the increase in JFMC members' other livestock after project were (a) JFMC members who were employed by the forest department within the past three years and had income sources other than agriculture and animal husbandry. The one-to-one cross-tabulation for this outcome is shown in Appendix 22.

JFMC members' expenditure after project (education) (Analysis ID 5): *JFMC members' expenditure after project (education)* was divided into two categories on a four-point scale: the first to third levels (increased) and the fourth level (no change). The sufficient conditions for the increase in the expenditure on education of JFMC members were: (a) JFMC members employed by the forest department within the past three years, or (b) training in both afforestation and livelihood improvement and income sources other than agriculture and animal husbandry. The one-to-one cross-tabulation for this outcome is shown in Appendix 23.

JFMC members' expenditure after project (house) (Analysis ID 6): *JFMC members' expenditure after project (house)* was divided into two categories on a four-point scale: the first to third levels (increase) and the fourth level (no change). The sufficient conditions for the increase in expenditure on house repair and improvement by JFMC members were: (a) JFMC members employed by the forest department within the past three years, or (b) income sources other than agriculture and animal husbandry and training in both afforestation and livelihood improvement. The one-to-one cross-tabulation for this outcome is shown in Appendix 24.

JFMC members' employment opportunities after project (Analysis ID 7): *JFMC members' employment opportunities after project* was divided into two categories on a four-point scale: the first to third levels (may have increased) and the fourth level (has not increased). The sufficient condition for the increase in the employment opportunities for JFMC members was (a) income from the skills learned in training, (b) income sources other than agriculture and animal husbandry, or (c) the increase in the income of SHG members under the JFMC. The one-to-one cross-tabulation for this outcome is shown in Appendix 25.

6.3.4 Empowerment of Women

(1) Improvement of Women's Social and Economic Capabilities (Improvement of Women's Social Capabilities)

Overall subordinate construct: Only for *time for SHG activities*, it was possible to derive the sufficient condition, and the solution coverage was relatively high. From the other outcomes (*women's confidence in household decisions, change in outreach of female SHG members Female SHG members' influence on household expenditure*), sufficient conditions could not be derived because the truth table could not be formulated.

Time for SHG activities (Analysis ID 8): *Time for SHG activities* was divided into two categories: one hour or more per week and less than one hour per week. In order for SHG activities to exceed one hour per week, a sufficient condition was (a) more than 20% of the total members continue to engage in IGA, and SHG members can use training knowledge. The one-to-one cross-tabulation for this outcome is shown in Appendix 26.

(2) Improvement of Women's Social and Economic Capabilities (Improvement of Women's Economic Capabilities)

Overall subordinate construct: *SHG members' expenditure after project (ornament)* and *SHG members' saving after project* could derive sufficient conditions with high solution coverage. For *Female SHG members' income after project, Female SHG members' expenditure after project,* and *SHG members' expenditure after project(education),* it was possible to derive the sufficient conditions with low solution coverage. It was difficult to interpret the sufficient conditions of *SHG members' livestock after project (grazing animal)* and *SHG members' expenditure after project (cosmetics)*. *Female SHG members' influence on household expenditure* was not able to derive a sufficient condition because a truth table could not be formulated.

SHG members' expenditure after project (ornament) (Analysis ID 9): *SHG members' expenditure after project (ornament)* was divided into two categories on a four-point scale: the first to third levels (increased) and the fourth level (no change). Two terms were derived as sufficient conditions for the increase in SHG members' spending on ornament, one of which is not important due to low solution coverage. The sufficient condition for the term with high raw coverage was that (a) more than 20% of the total members continue to engage in IGA and SHG members use their training knowledge. The one-to-one cross-tabulation for this outcome is shown in Appendix 27.

SHG members' saving after project (Analysis ID 10): *SHG members' saving after project* was divided into two categories on a four-point scale: the first to third levels (increased) and the fourth level (no change). In order for SHG members' savings to increase, the sufficient conditions were (a) SHG members received training in both management of SHG and livelihood improvement, and (b) SHG held official meetings at least once a year. The one-to-one cross-tabulation for this outcome is shown in Appendix 28.

(3) Sustainability of SHG (Continuation of SHG's IGA)
Overall subordinate construct: The outcome variable is only *female members continuing IGA*, and the sufficient condition with high solution coverage was derived for this outcome.

Female members continuing IGA (Analysis ID 11): *Female members continuing IGA* was divided into two categories: more than 20% of SHG members and less than 20% of SHG members. In order for SHG to have more than 20% of the total members continuing to engage in IGA, there were two sufficient conditions: (a) a community place was not selected for the entry point activity and SHG members used the training knowledge, or (b) a community place was selected for the entry point activity and SHG members are engaged in husbandry of grazing animals as IGA but they did not use the training knowledge. The one-to-one cross-tabulation for this outcome is shown in Appendix 29.

(4) Sustainability of SHG (SHG's Continuous Use of Microcredit)
Overall subordinate construct: Out of the outcomes, *SHG's official meeting* were able to derive sufficient conditions with a relatively high solution coverage. On the other hand, *SHG's loans* was not able to derive sufficient conditions because the truth table could not be formulated.

SHG's official meeting (Analysis ID 12): *SHG's official meeting* was divided into two categories on a six-point scale: the first to fifth levels (meetings in the past year) and the sixth level (no meetings in the past year). In order for SHGs to hold official meetings at least once a year, a sufficient condition was (a) SHG members use training knowledge (*use of training knowledge for SHG activities*). The one-to-one cross-tabulation for this outcome is shown in Appendix 30.

6.4 Considerations

The considerations of the analytical results for "subordinate constructs" are as follows:

Reforestation: Deriving sufficient conditions with high solution coverage by QCA was difficult. On forest density and on reduction of barren land, the questionnaire responses were skewed to the direction to show reforestation, and the variables had to be binary between "change significantly" and "change modestly." Considering both; the long period it takes for the factors such as suitability of JFMC to show a clear qualitative difference in reforestation, and that there is no clear difference between the two values, this result would suggest that the questions and choices need to be modified to draw a clear difference.

Sustainability of JFMC (JFMC's forest conservation): For the activation of fire prevention, the construction of a community place in the entry point activities is a sufficient condition. It is considered that the community that selected the community place established a cooperative relationship, and that, once established, the community place further promotes cooperation within the community. The other variable (training only in afforestation activities, frequent visits by the forest department staff) indicates that both the forest department and the community are proactive in reforestation. The sufficient condition for JFMC official meetings is JFMC members employed by the forest department in the past three years, and the two binominal variables have the same distribution. It is evident that the forest department's involvement contributes to the continuation of the JFMC activities that bring about tangible benefits for the JFMCs.

Improvement of livelihood: The increase of grazing animals is contingent on the availability of non-agriculture income and the increase in income of SHG members. The sufficient conditions for an increase in other livestock are both; employment by the forest department and non-agriculture income. Since animal husbandry is considered a type of investment, it is considered that the investment is made with extra resources from outside of the regular income. The employment by the forest department and the combination of livelihood training and non-agriculture income contribute to the expenditures on education and repair/improvement of houses. The expenditure on education and better housing may be funded from sources other than regular income. A variety of channels contributed to the employment creation as the sufficient conditions for the increase of employment opportunities comprised a wide range of multiple terms: income from training knowledge, an increase of non-agriculture income, and an increase in SHG members' income. The created jobs included sales and production of bidi (leaf-rolled tobacco), opening of general stores, and employment by the forest department.

Improvement of women's social and economic capabilities (Improvement of women's social capabilities): The possibility for women to spend time on SHG activities requires both a certain number of female members engaged in livelihood activities (at least three in each SHG, or 20%) and the utilization of training knowledge. These conditions suggest a situation that several members led SHG activities, and that training knowledge could be effectively used for SHG activities. A few SHGs had the outcomes: women's confidence in household-related decisions and the range of their travel. On the other hand, many SHGs had the outcome "the percentage of income that women can decide usage," but a truth table could not be created. This suggests the existence of conditions that were not assumed in the working framework.

Improvement of women's social and economic capabilities (Improvement of women's economic capabilities): SHG members' expenditure on ornament was conditional on a certain number of female members continuing IGA. It was found that continuous IGA leads to purchase of relatively more expensive items. For SHGs, in which members' savings are increasing, either training in

both SHG management and IGA, or holding official meetings on a regular basis, are applicable. The acquisition of extensive knowledge through comprehensive training may be a factor to encourage savings. Learning about SHGs' financial management, use of microfinance, and planning for IGA through comprehensive training may enhance awareness for saving. The regular official meetings would also suggest continuous activities in SHG and motivate members to save more for these activities. For the outcome on the improvement of women's economic capabilities, there were many variables which had sufficient conditions with low solution coverage or those for which sufficient conditions could not be derived. This may suggest that there were conditions that were not assumed in the working framework.

Sustainability of SHG (continuation of SHG's IGA): SHGs with more than 20% of members continuing IGA have either of the two conditions and these conditions differ in: the construction community place and the use of training knowledge. In the first condition, the community place is not built, but the training knowledge is used. In this condition, it is assumed that SHG obtained very valuable training knowledge that can be directly used for IGA. In the second condition, a community place was constructed, and training knowledge was not used, but husbandry of grazing animals was selected as an IGA. As women are often engaged in husbandry of grazing animals in the project area, it is inferred that IGA can be continued without the use of training knowledge if the community is strongly united.

Sustainability of SHG (SHG's continuous use of microcredit): Since new loans are often decided in official meetings, "formal meetings" is considered as a variable that leads to the use of microcredit in the future. In SHGs for which official meetings are held regularly: training knowledge is used. The use of training knowledge indicates that an IGA is active, and this suggests that training alone is not sufficient to sustain SHG activities. As for the number of loans provided by SHGs, only a few SHGs have been providing loans on a continuous basis.

7 Limitations and Issues in the Future

QCA methodology in regards to target selection and comparability, and in regards to the interpretation of results encountered limitations and restrictions. For future reference, this section mentions some specific limitations that arose in this research and assessment.

Issues related to robustness of results

As the analysis was based on a single question to determine 0 or 1 for an outcome or a condition, this resulted in a situation that robustness of construct validity could not be ensured. Since each question was regarded as a single condition, various analyses, depending on several conditions, could find a variety of results. In such cases, formulating a synthetic variable with multiple conditions, in line with the design of the survey questionnaire, is possible. Specifically, it is possible to take measures such as organizing and integrating outcomes and conditions from multiple questions along with a certain "superordinate construct" for comprehensive determination of 0 or 1. However, as this analysis performed an integration of conditions, consideration needs to be taken into account when interpreting individual results.

Issues related to interpretation (setting a coverage at 0.7 or higher)

Although determining whether the consistency exceeds a threshold is necessary, causal inference is possible even if a coverage is low. In general, causality is inferred when a coverage is low but consistency is 1 or very close to 1 (0.9 or higher) because this suggests that there is a 90% chance or higher that the outcome will be 1. Although sufficient conditions with a coverage of 0.7 or higher were selected for this study, the coverage can only indicate what percentage of cases with an outcome of 1 can be explained by the condition. It should be noted that, because multiple conditions can be assumed to lead to the same outcome, interpretive limitations exist when

explaining more than 70% of the cases with outcome of 1 by a single sufficient condition. QCA could not confirm the assumption that "sustainability of JFMC" is a condition of "reforestation." This issue presumably affects the above result.

8 Conclusion

Based on the factors and interventions related to the incidence of the main project effects, the conclusions of this report are presented below.

(1) Results of Analysis

It is inferred that the conditions in "intervention of JICA project" are related to all of the main project effects: environmental improvement, improvement of livelihood, and empowerment of women. This result suggests that the improvement of project interventions contributes to the improvement of the above project effects. Next, the construction of community place in the entry point activity was found to be associated with the increase of fire prevention activities and continuity of IGAs. The construction of community place implies collaboration within the community. In addition, the employment by the forest department was found to be an important factor for the continuation of JFMC activities. It is also suggested that the surplus funds generated by JFMC members through the various activities of this project would be expended on better living environment, an increase of livestock, and education. Finally, it was difficult to derive sufficient conditions for many of the outcomes related to "improvement of women's social and economic capabilities." The conditions (e.g., factors within the household) which are not addressed in the working framework of this study may have contributed to the difficulty.

(2) Recommendations

Involvement of the forest department: As mentioned above, the employment by the forest department was found to be an important factor for the continuation of JFMC activities. For tangible benefits, the involvement of the forest department is essential to JFMC activities even after the project completion. Since the number of JFMCs that can participate in various programs offered by the forest department is limited, establishing an ongoing collaboration scheme with other departments and NGOs is necessary to support many JFMCs. Employing JFMC members in activities of other departments and NGOs such as afforestation, bush clearing, and development of nursery is particularly desirable.

(3) Lessons Learned

Efforts to promote community collaboration: The construction of community place implies collaboration within the community and highlights the importance of promoting community collaboration within the project. For enhancement of community collaboration, the inclusion of team-building training in the training provided by a social forestry project is worth further consideration. A team-building training includes the preparation of team rules, role-playing (e.g., experiencing a leadership position), and a short-term collaborative work.

Utilization of surplus funds: It is suggested that the surplus funds generated by JFMC members through this project would be expended on better living environment, an increase of livestock, and education. On the other hand, the increase in the number of grazing animals would worsen the burden on the forest. Therefore, combining social forestry with various educational activities to promote the meaningful use of surplus funds is desirable. Specifically encouraging hygiene education for the construction and maintenance of toilets and other facilities in houses, and promoting the use of surplus funds for activities other than the purchase of grazing animals.

Assessment of intervention theory: It was difficult to derive sufficient conditions for many of the outcome variables related to the improvement of women's social and economic capabilities. The

paths from social forestry to the improvement of women's social and economic capabilities were not established. Examining the intervention theory at the time of project formulation and clarifying the paths leading to the project effects would be desirable to plan a project for promoting women's empowerment through social forestry. In addition, in the several outcomes from which the sufficient conditions were derived, the use of training knowledge is a condition related to the improvement of women's social and economic capabilities. Therefore, analyzing the situations for increasing usage of training knowledge would be meaningful.

Appendix 1: Forest Area in the Uttar Pradesh state

		Geo-area km2	2009 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total		240,928	1,626	4,563	8,152	14,341	5.95	745
Project target area		60,354	1,315	3,167	4,590	9,062	15.01	436
North	Pilibhit	3,499	340	158	200	698	19.95	0
	Kheri	7,680	409	485	436	1,320	17.19	1
	Bahraich & Shravasti	6,878	290	315	243	848	12.33	4
	Balrampur	2,981	225	188	116	529	17.75	3
West	Lalitpur	5,039	0	128	442	570	11.31	41
	Jhansi	5,024	0	33	167	200	3.98	121
	Mahoba	2,884	0	22	73	95	3.29	96
	Hamirpur	4,282	0	66	108	174	4.06	39
South	Chitrakoot	3,092	0	358	203	561	18.14	15
	Allahabad	5,137	0	27	68	95	1.85	23
	Mirzapur	4,521	0	323	543	866	19.16	44
	Sonbhadra	6,788	45	870	1,626	2,541	37.43	38
	Chandauli	2,549	6	194	365	565	22.17	11

		Geo-area km2	2017 assessment VDF km2	MDF km2	OF km2	Total km2	%	Scrub km2
State Total		240,928	2,617	4,069	7,993	14,679	6.09	551
Project target area		61,399	2,179	2,705	4,345	9,229	15.03	323
North	Pilibhit	3,686	471	86	131	688	18.67	2
	Kheri	7,680	805	158	311	1,274	16.59	4
	Bahraich	5,267	240	156	153	549	10.48	9
	Shravasti	1,640	152	85	48	285	17.38	0
	Balrampur	3,349	279	154	91	524	15.65	3
West	Lalitpur	5,039	0	129	458	587	11.65	31
	Jhansi	5,024	0	42	261	303	6.03	40
	Mahoba	3,144	0	21	149	170	5.41	62
	Hamirpur	4,021	0	80	147	227	5.65	14
South	Chtrakoot	3,216	81	319	186	586	18.22	37
	Allahabad	5,482	6	26	95	127	2.32	36
	Mirzapur	4,405	8	290	507	805	18.27	47
	Sonbhadra	6,905	130	967	1,442	2,539	36.77	28
	Chandauli	2,541	7	192	366	565	22.24	10

		2009/2017 Changes (%) VDF km2	MDF km2	OF km2	Total km2	Scrub km2
State Total		61%	-11%	-2%	2%	-26%
Project target area		66%	-15%	-5%	2%	-26%
North	Pilibhit	39%	-46%	-35%	-1%	NA
	Kheri	97%	-67%	-29%	-3%	300%
	Bahraich Shravasti	35%	-23%	-17%	-2%	125%
	Balrampur	24%	-18%	-22%	-1%	0%
West	Lalitpur	NA	1%	4%	3%	-24%
	Jhansi	NA	27%	56%	52%	-67%
	Mahoba	NA	-5%	104%	79%	-35%
	Hamirpur	NA	21%	36%	30%	-64%
South	Chtrakoot	NA	-11%	-8%	4%	147%
	Allahabad	NA	-4%	40%	34%	57%
	Mirzapur	NA	-10%	-7%	-7%	7%
	Sonbhadra	189%	11%	-11%	0%	-26%
	Chandauli	17%	-1%	0%	0%	-9%

Source: Forest Survey of India “STATE OF FOREST REPORT 2009”, Forest Survey of India “STATE OF FOREST REPORT 2017”

Appendix 2: Social Situation in the Project Area

		Literartes			Scheduled	Scheduled		Agri.	Popolation
		Total	Male	Female	Castes	Tribes	Cultivators	Labourers	Density
		%	%	%	%	%	%	%	Person/Km2
Uttar Pradesh State		67.68	77.28	57.18	20.70	0.57	28.96	30.30	829
Project target area (avg)		64.02	74.47	52.32	22.19	2.54	32.22	36.86	507
North	Pilibhit	61.47	71.70	50.00	16.42	0.08	34.99	36.24	551
	Kheri	60.56	69.57	50.42	26.40	1.33	41.85	33.38	524
	Shravasti	46.74	57.16	34.78	16.94	0.50	40.48	40.90	681
	Balrampur	49.51	59.73	38.43	12.90	1.16	36.38	43.24	642
West	Lalitpur	63.52	74.98	50.84	19.69	5.86	53.16	26.10	242
	Jhansi	75.05	85.38	63.49	28.14	0.19	28.09	30.44	398
	Mahoba	65.27	75.83	53.22	25.22	0.07	32.67	37.30	279
	Hamirpur	68.77	79.76	55.95	21.84	0.04	29.37	40.9	275
South	Chitrakoot	65.05	75.80	52.74	26.89	0.04	40.61	38.23	308
	Allahabad	72.32	82.55	60.97	22.00	0.13	22.46	25.62	1086
	Mirzapur	68.48	78.97	56.86	26.48	0.81	20.20	37.91	567
	Sonbhadra	64.03	74.92	52.14	22.64	20.67	19.31	50.83	270
	Chandauli	71.48	81.72	60.35	22.88	2.14	19.31	38.11	769

Source: Directorate od Census Operations Uttar Pradesh " Census of India 2011 Uttar Pradesh"

Appendix 3: Main Project Effect “Environmental Improvement” (Reforestation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Reforestation	Reforestation	Barren land after project completion	Did barren land in the forest area afforested by this Project increase after the project completion?	Ⅰ25
			Forest density after project completion	How is the forest density of the forest area afforested by this Project after the project completion?	Ⅰ24
			Current survival rate	How much is the survival rate for the afforestation of this Project today?	Ⅰ14
Conditions (Factors /Interventions)	Reduction of burden on forest	Reduction of burden on forest	Compliance with grazing rules	Did JFMC members stop animal grazing in the forest area planted by this Project? Does the JFMC members comply with the rules of animal grazing?	Ⅰ19 II22
			Use of LPG	What percentage does households have an LPG gas connection in this JFMC?	Ⅱ23
			Control of logging	Is tree-cutting without an official permission stopped in the forest area?	Ⅱ24
	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after this Project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last three years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Programs other than afforestation	Programs other than afforestation	(Reference) Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	II25
	Improvement of livelihood	Improvement of livelihood	JFMC members’ income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ33 Ⅱ34
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ37 Ⅱ38
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ45
	Sustainability of JFMC	JFMC’S forest conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after this project completion? What is the reason for the above answer?	Ⅰ20 Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
		Continuous use of revolving fund	Deposit to JFMC’s account *Source to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account *Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32

Appendix 4: Main Project Effect ”Environmental Improvement” (JFMC’s Forest Conservation)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	JFMC’s Forest Conservation	Fire prevention after project completion	Did the JFMC conduct prevention activities for forest fire more frequently after the project completion? What is the reason for the above answer?	Ⅰ20, Ⅰ21
			Monitoring after project completion	Did the JFMC conduct monitoring activities for illegal logging more frequently after the project completion? What is the reason for the above answer?	Ⅰ22 Ⅰ23
			JFMC’s official meeting	How frequent is JFMC’s executive meeting?	Ⅱ11
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 5: Main Project Effect “Environmental Improvement” (Continuous Use of Revolving Fund)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Sustainability of JFMC	Continuous use of revolving fund	Deposit to JFMC’s account *Source of payment to be checked	How many times does JFMC have deposits in its bank account?	Ⅱ31
			Withdrawal from JFMC’s account*Use to be checked	How many times does JFMC have withdrawals in its bank account?	Ⅱ32
Conditions (Factors /Interventions)	Commitment of forest department	Commitment of forest department	New afforestation project	Was any afforestation project implemented in the forest area after the project completion?	Ⅰ18
			Replantation for the last 3 years	How many hectares is the replanted area in the forest area afforested by this Project for last three years?	Ⅰ11
			Visits by forest department staff	How many times does an officer of the Forest Department come to this JFMC for a month?	Ⅱ20
			Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ21
	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ15
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ6
	Current situation of JFMC	JFMC’s income	JFMC’s timber income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s NTFP income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30
			JFMC’s other income	How much was JFMC’s revenue of the following items in 2019? (Timber, Non-timber, Others)	Ⅱ30

Appendix 6: Main Project Effect “Improvement of Livelihood” (Improvement of Livelihood)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of livelihood	Improvement of livelihood	JFMC members’ household income after project	Is the household income increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 33 Ⅱ 34
			JFMC members’ non-agricultural income after project	Is the non-agriculture household income increased in this JFMC due to this Project?	Ⅱ 35
			JFMC members’ minor produce sales after project	Is the sales of minor produce increased in this JFMC due to this Project? (Fodder, leaf, medicinal herbs, etc.)	Ⅱ 36
			JFMC members’ saving after project	Does JFMC members increase saving due to this Project?	Ⅱ 42
			JFMC members’ livestock after project (grazing animals, others)	Do the JFMC members increase the number of grazing animals (buffalo/cow/goats/sheep) due to this Project? Do the JFMC members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅱ 43 Ⅱ 44
			JFMC members’ household expenditure after project	Is the household expenditure increased in this JFMC due to this Project? What is the reason for the above answer?	Ⅱ 37 Ⅱ 38
			JFMC members’ expenditure (education, mobile phone, house)	Does JFMC members increase the expenses for education due to this Project? Does JFMC members purchase mobile phones due to this Project? Does JFMC members increase the expenses for construction or improvement of house due to this Project?	Ⅱ 39 Ⅱ 41 Ⅱ 40
			JFMC members’ employment opportunities after project *Type of job to be checked	Does JFMC members find more employment opportunity due to this Project?	Ⅱ 45
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ 12
			(Reference)Use of facilities/equipment for IGA	Do JFMC members earn income by using the facilities and equipment provided by this Project? How JFMC members use the facilities and equipment for earning the income?	Ⅱ 13 Ⅱ 14
		Training	Type of training for JFMC members	What kind of skill training did this Project provide to JFMC members? (Be specific)	Ⅱ 15
			(Reference) Use of training knowledge for IGA	Do JFMC members earn income by using the skill learned from the training provided by this Project? How JFMC members use the skill for earning the income?	Ⅱ 16 Ⅱ 17
			(Reference) Matching of training with facilities/equipment	Does the skill training match the facilities/equipment by this Project? What is the reason for the above answer?	Ⅱ 18 Ⅱ 19
		Tree species	Tree species	What was the variety of trees planted by this Project?	Ⅰ 12
		Nursery	JFMC’s Nursery	Did JFMC have a decentralized people’s nursery at the project implementation phase?	Ⅰ 13
		Agroforestry	Agroforestry *Area and crop to be checked	Does the JFMC have agroforestry?	Ⅰ 15
			Harvest of agroforestry	Does the JFMC have harvest from agroforestry?	Ⅰ 16
		Planning	(Reference) Participation in micro plan development	How many households participated in the preparation of the micro plan?	Ⅱ 6
	Current situation of JFMC	Income opportunities for JFMC members	Employment by forest department	How many JFMC members did the forest department hire for protection of forest, check dam maintenance, and other related activities for the last two years?	Ⅱ 21
			Allocation from revolving fund	Does the JFMC distribute benefits, which is from a revolving fund, to JFMC members?	Ⅱ 27
			Income other than agriculture and animal husbandry	Do the JFMC members have income except the income of agriculture and animal husbandry?	Ⅱ 26

	Programs other than afforestation	Programs other than afforestation	Livelihood program after project completion	Is there other support program for income generation of JFMC members other than this Project?	Ⅱ 25
	Improvement of women's social and economic capabilities	Improvement of women's economic capabilities	Female SHG members' income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer?	Ⅲ21 Ⅲ22

Appendix 7: Main Project Effect “Empowerment of Women” (Improvement of Women’s Social Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s social capabilities	Change in outreach of female SHG members	How far did you go alone in the last year? How far did you go alone before this Project?	Ⅲ18 Ⅲ19
			Percentage of income decided by female SHG members	How much percent can female members of this SHG decide freely on her personal income today? How much percent could female members of this SHG decide freely on her personal income before this Project? What is the reason for the change of the percentage?	Ⅲ31 Ⅲ32 Ⅲ33
			Time for SHG activities	How many hours does a SHG member spend for SHG activities for a week now? (average of SHG members, 1 day = 8hours)	Ⅲ15
			Women’s confidence in household decisions	Do you feel more confident in your decision on family matters due to this Project?	Ⅲ20
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Sustainability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of micro credit	SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 8: Main Project Effect “Empowerment of Women” (Improvement of Women’s Economic Capabilities)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Improvement of women’s social and economic capabilities	Improvement of women’s economic capabilities	Female SHG members’ income after project	Was the income of female members of this SHG increased due to this Project? What is the reason for the above answer？	Ⅲ21 Ⅲ22
			Female SHG members’ expenditure after project	Was the personal expenditure of female members of this SHG increased due to this Project?	Ⅲ26
			SHG members’ expenditure after project (education, ornaments, cosmetics, cloth)	Do SHG members increase the expenses for education due to this Project? Do SHG members increase the expenses for ornaments due to this Project? Do SHG members increase the expenses for cosmetics due to this Project? Do SHG members increase the expenses for clothes due to this Project?	Ⅲ27 Ⅲ28 Ⅲ29 Ⅲ30
			SHG members’ saving after project	Do the SHG members increase saving due to this Project?	Ⅲ23
			SHG members’ livestock after project (grazing animals, others)	Do the SHG members increase the number of grazing animals (buffalo /cow/goats/sheep) due to this Project? Do SHG members increase the number of other domestic animals (pig, poultry, etc.) due to this Project?	Ⅲ24 Ⅲ25
			Female SHG members’ influence on household expenditure	Is your opinion on household spending accepted more due to this Project?	Ⅲ34
Conditions (Factors /Interventions)	Intervention of JICA Project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅱ18
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17
	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
		SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14

Appendix 9: Main Project Effect “Empowerment of Women” (Continuation of SHG’s IGA)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	Suitability of SHG	Continuation of SHG’s IGA	Female members continuing IGA	How many female SHG members continue income generation activities supported by SHG?	Ⅲ11
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference)Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference)Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

Appendix 10: Main Project Effect “Empowerment of Women” (SHG’s Continuous Use of Microcredit)

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Outcomes (Project effects)	SHG’s continuous use of microcredit	SHG’s continuous use of microcredit	SHG’s loans	How many loans SHG provide to SHG members for the last year?	Ⅲ16
			SHG’s official meeting	How frequent is SHG’s meeting?	Ⅲ14
Conditions (Factors /Interventions)	Intervention of JICA project	Entry point activities	Type of entry point activity	What was the entry point activity of this JFMC?	Ⅱ12
		Training	Type of training for SHG members	What kind of skill training did this Project provide to SHG members? (Be specific)	Ⅲ12
			(Reference) Use of training knowledge for SHG activities	Do SHG members use the skill learning from the training provided by this Project?	Ⅲ13
		SHG’s IGA	Husbandry of cattle/goats/sheep by SHG	What were SHG activities?	Ⅲ10
			Husbandry of other animals by SHG	What were SHG activities?	Ⅲ10
			Agriculture by SHG	What were SHG activities?	Ⅲ10
			Fish farming by SHG	What were SHG activities?	Ⅲ10
			Handicraft making by SHG	What were SHG activities?	Ⅲ10
			Other activities by SHG	What were SHG activities?	Ⅲ10
			(Reference) Matching of training and SHG activities	Do SHG members use the skill learning from the training provided by this project?	Ⅲ13
	Influence of women	Influence of women	Female panchayat head	Is the head of the panchayat female?	Ⅲ9
			JFMC’s female executive after project completion	How many executive members does this JFMC have? How many female executive members does this JFMC have? Is the number of JFMC female executive member increased after the project completion?	Ⅱ8 Ⅱ9 Ⅱ10
			Female SHG head	Is the head of this SHG female?	Ⅲ8
	Programs other than afforestation	Programs other than afforestation	Support to SHG after project completion	Is there other support program for income generation of women other than this Project?	Ⅲ17

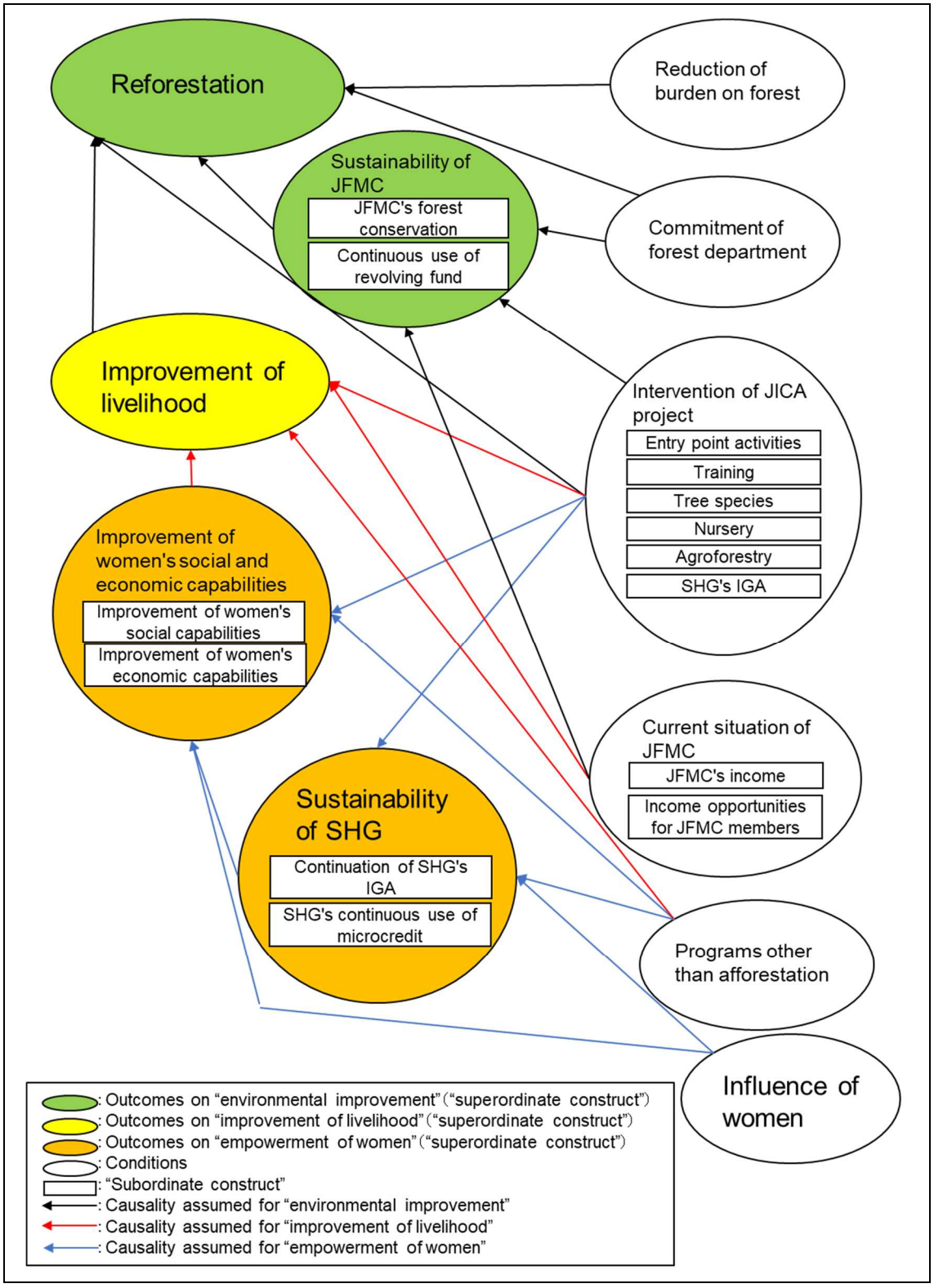
Appendix 11: Attributes

Type of variables	Superordinate construct	Subordinate construct	Variables	Questions	Questionnaire
Attribute	Attributes of JFMC	Area of forest land	Area of forest land	How many hectares is the area planted by this Project?	Ⅰ10
		Number of households	Households in JFMC at project implementation	How many households was in the JFMC during the project implementation phase?	Ⅱ5
		Literacy rate	Literacy rate	Census Data	
		Fish farming	Fish farming	Does the JFMC conduct fish farming in a check dam made by this Project?	Ⅰ17
		Market for products	Market where products are sold	Is there a market which the JFMC can sell products?	Ⅱ29
		Distance to market	Distance to market (km)	Where is the market which JFMC members can sell their products?	Ⅱ28
		Gender of SHG members	Gender of SHG members	How many members does the SHG have? (number of male, number of female)	Ⅲ6
		Female members	Number of female SHG members (fSHG)	How many female members does the SHG have?	Ⅲ6
		Percentage of women in households of JFMC	Percentage of women in households of JFMC (ratio of fJFMC)	What is the proportion of women in the households joining the JFMC?	Ⅱ7
		Female literacy rate	(Reference) Female literacy rate	Census Data	

Note:

- Outcomes in project evaluation are described as “Main project effects” for distinguishing them from the technical term in QCA (Outcomes),
- “Superordinate construct” and “Subordinate construct” are the same across the tables but the variables under “Subordinate construct” are changed in each table.
- The variables with (Reference) are ones to be unused in the analysis in principle. They are used as conditions in the analysis if it is appropriate.
- In the “Questionnaire” column, questionnaire numbers are shown. The questions with I for forest department officers, those with II for JFMC members, and those with III for SHG members.

Appendix 12: Working Framework of the Study



Appendix 13: JFMC in the Study

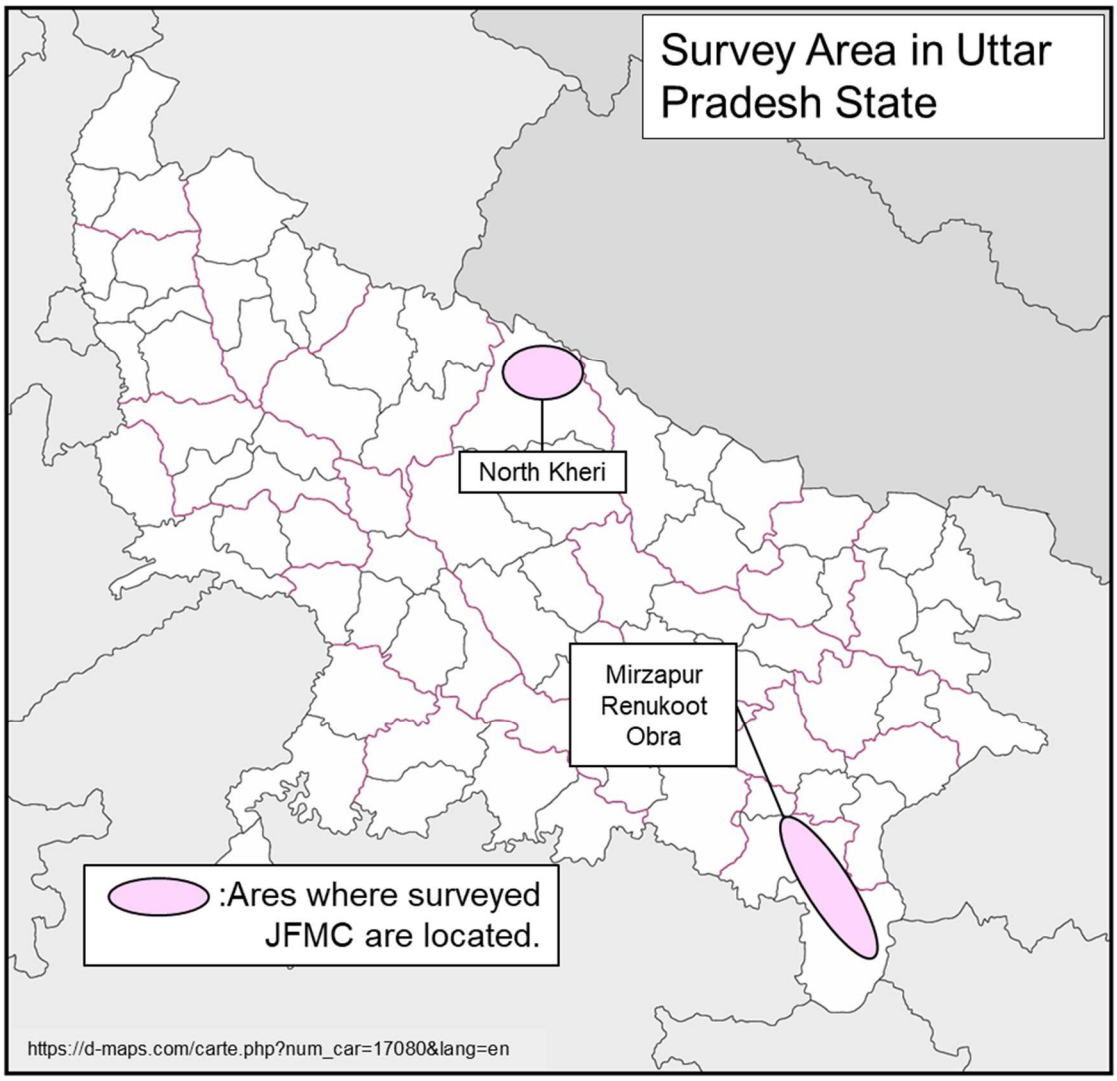
North Kheri (Active 1 & non-active 1) = 2				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	North Nighasan	Latthauha	Active	Guru Govind Singh SHG
2	North Nighasan	Murtiha	Non-Active	Veer Baba SHG

Mirzapur (Active 4 & non-active 4) = 8				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Shukrit	Lohra	Active	Jai Bharti SHG
2	Madihan	Dhekwah	Active	Saraswati SHG
3	Lalganj	Vijaypur	Active	Garib Nawaz SHG
4	Dramandganj	Naugawan	Non-Active	Jai Hanuman SHG
5	Mirzapur	Dhanwal	Non-Active	Hari om SHG
6	Chunaar	Ballipur	Non-Active	Jai Maa Durga SHG
7	Wyndham Falls	Siddhi	Active	Baba Ravidas SHG
8	Patehra	Gorthara	Non-Active	Lakshmi SHG

Renukoot (Active 2 & non-active 2) = 4				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Jarha	Injani	Non-Active	Lakshmi SHG
2	Dudhi	Majhauli	Active	Bhole Nath SHG
3	Dudhi	Rajkhar	Active	Maa Durge SHG
4	Vendhamganj	Gulariya	Non-Active	Saraswati SHG

Obra (Active 1 & non-active 1) = 2				
Sr. No	**Range**	**JFMC**	**Type**	**Female SHG**
1	Jugail	Beejaura	Active	Chirag SHG
2	Dala	Panari	Non-Active	Rang Basia SHG

Appendix 14: Survey Area



Appendix 15: Variables Used in the Analysis

Questionnaire	V. name	Variables	Classification
I-14	survive	Current survival rate (High, Low)	1: 50%-100%, 0: 0%-25%
I-19	FD_grazing	Compliance with grazing rules (Yes, No)	1: Complied completely, 0: Some don't
I-20	fire	Fire prevention after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-22	monitoring	Monitoring after project completion (Increased, Almost same)	1: Increased, 0: Almost same
I-24	forest_dens	Forest density after project completion (Increased significantly, Increased moderately)	1: Increased significantly, 0:Increased moderately
I-25	forest_barr	Barren land after project completion (Decreased moderately , Almost same)	1: Decreased moderately, 0: Almost same
I-24&25	forest_recov	Reforestation after project completion (Significant recovery, Other)	1: Singificant recoverry in density and barren land, 0: Other
II-5	HH_number	Households in JFMC at project implementation(Many, Few)	1: More than 100 households, 0: 100 households or less
II-9	JF_female	JFMC's female executive after project completion (Many, Few)	1: Three or more, 0: Two (smallest under rule)
II-11	JF_meeting	JFMC's official meeting (Yes, No)	1: Yes for the past year, 0: No for the past year
II-12	Entry1	Type of entry point activity 1 (Basic infrastructure, Other)	1: Road&Water supply, 0: Other
II-12	Entry2	Type of entry point activity 2 (Community place, Other)	1: Community place, 0: Other
II-13	Income_P	Use of facilities/equipment for IGA (Yes, No)	1: Yes, 0: No
II-15	training	Type of training (Both, Other)	1: Plantaion&IGA, 0: Other
II-16	JF_knowledge	(Reference)Use of training knowledge for IGA (Yes, No)	1: Yes, 0: No
II-18	train_equip	(Reference)Matching of training with facilities/equipment (Yes, No)	1: Yes, 0: No
II-20	FD_visits	Visits by forest department staff (Many, Few)	1: Many (five or more), 0: Few (fewer tha five)
II-21	FD_employ	Employment by forest department (Yes, No)	1: Yes, 0: No
II-22	JF_grazing	Compliance with grazing rules (Yes, No)	1: Complied completely, 0: Some don't
II-23	LPG	Use of LPG (High, Low)	1: 60% or more, 0:Less than 60%
II-24	cutting	Control of logging (Controlled, Not controlled)	1: Complied completely, 0: Some don't
II-25	IGA_other	(Reference) Livelihood program after project completion(Yes, No)	1: Yes, 0: No
II-26	other_income	Income other than agriculture and animal husbandry (Yes, No)	1: Yes, 0: No
II-33	JF_income	JFMC members' household income after project (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
II-35	JF_otherinc	JFMC members' non-agricultural income after project (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
II-37	JF_expense	JFMC members' household expenditure after project (Increased moderately , Almost same)	1: Increased, 0: Almost same
II-39	JF_education	JFMC members' expenditure after project (education) (Increased, Same)	1: Increased, 0: Same
II-40	JF_house	JFMC members' expenditure after project (house) (Increased, Same)	1: Increased, 0: Same
II-42	JF_saving	JFMC members' saving after project (Increased, Same)	1: Increased, 0: Same
II-43	JF_granimal	JFMC members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
II-44	JF_othanimal	JFMC members' livestock after project (other) (Increased, Same)	1: Increased, 0: Same
II-45	JF_employ	JFMC members' employment opportunities after project (Increased probably, No increase)	1: Increased probably, 0: No increased
III-9	vill_female	Female panchayat head (Yes, No)	1: Yes, 0: No
III-10	SHG_actgrani	SHG activities 1 (Husbandry of grazing animal, Other)	1: Husbandry of grazing animal, 0: Other
III-10	SHG_actagri	SHG activities 2 (Agriculture, Other)	1: Agriculture, 0: Other
III-11	IGA_cont	Female members continuing IGA (20% or more, Less than 20%)	1: 20% or more, 0:Less than 20%
III-12	SHG_training	Type of training for SHG (Both, Other)	1: SHG Admin&IGA, 0: Other
III-13	SHG_know	(Reference)Use of training knowledge for SHG activities (Yes, No)	1: Yes, 0: No
III-14	SHG_meeting	SHG's official meeting (Yes, No)	1: Yes for the past year, 0: No for the past year
III-15	SHG_hours	Time for SHG activities (Yes, No)	1: One hour or more, 0: Less than One hour
III-16	SHG_loans	SHG's loans (Yes, No)	1: Yes, 0: No
III-17	SHG_supports	Support to SHG after project completion (Yes, No)	1: Yes, 0: No
III-18	goout_after	Current outreach of female SHG members (Long, Short)	1: Outside of panchayat, 0: Within panchayat
III-19	goout_before	Pre-project outreach of female SHG members (Long, Short)	1: Outside of panchayat, 0: Within panchayat
Ⅲ18&19	goout	Change in outreach of female SHG members (Longer, Other)	1: Longer, 2: Other
III-20	decision	Women's confidence in household decisions (Increased significantly, Other)	1: Increased significantly, 0: Other
III-21	SHG_income	Female SHG members' income after project (Increased moderately , Almost same)	1: Increased, 0: Almost same
III-23	SHG_saving	SHG members' saving after project (Increased, Same)	1: Increased, 0: Same
III-24	SHG_granimal	SHG members' livestock after project (grazing animal) (Increased, Same)	1: Increased, 0: Same
III-25	SHG_othanimal	SHG members' livestock after project (other) (Increased, Same)	1: Increased, 0: Same
III-26	SHG_expense	Female SHG members' expenditure after project (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-27	SHG_education	SHG members' expenditure after project(education) (Increased, Same)	1: Increased, 0: Same
III-28	SHG_ornament	SHG members' expenditure after project (ornament) (Increased, Same)	1: Increased, 0: Same
III-29	SHG_cosme	SHG members' expenditure after project (cosmetics) (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-30	SHG_cloth	SHG members' expenditure after project (cloth) (Increased moderately , Almost same)	1: Increased moderately , 0: Almost same
III-31	decide_after	Percentage of income decided by female SHG members (Much, Moderate)	1: 80% or more, 0: Less than 80%
III-32	decide_before	Percentage of income decided by female SHG members (Much, Moderate)	1: 80% or more, 0: Less than 80%
III-31&32	decide	Percentage of income decided by female SHG members (Increased significantly, Increased)	1: Increased by 50% or more, 0: Increased by less than 50%
III-34	effect_income	Female SHG members' influence on household expenditure (Agreed, Other)	1: Agreed, 0: Other

Appendix 16: Summary Table for Analytical Results (No.1)

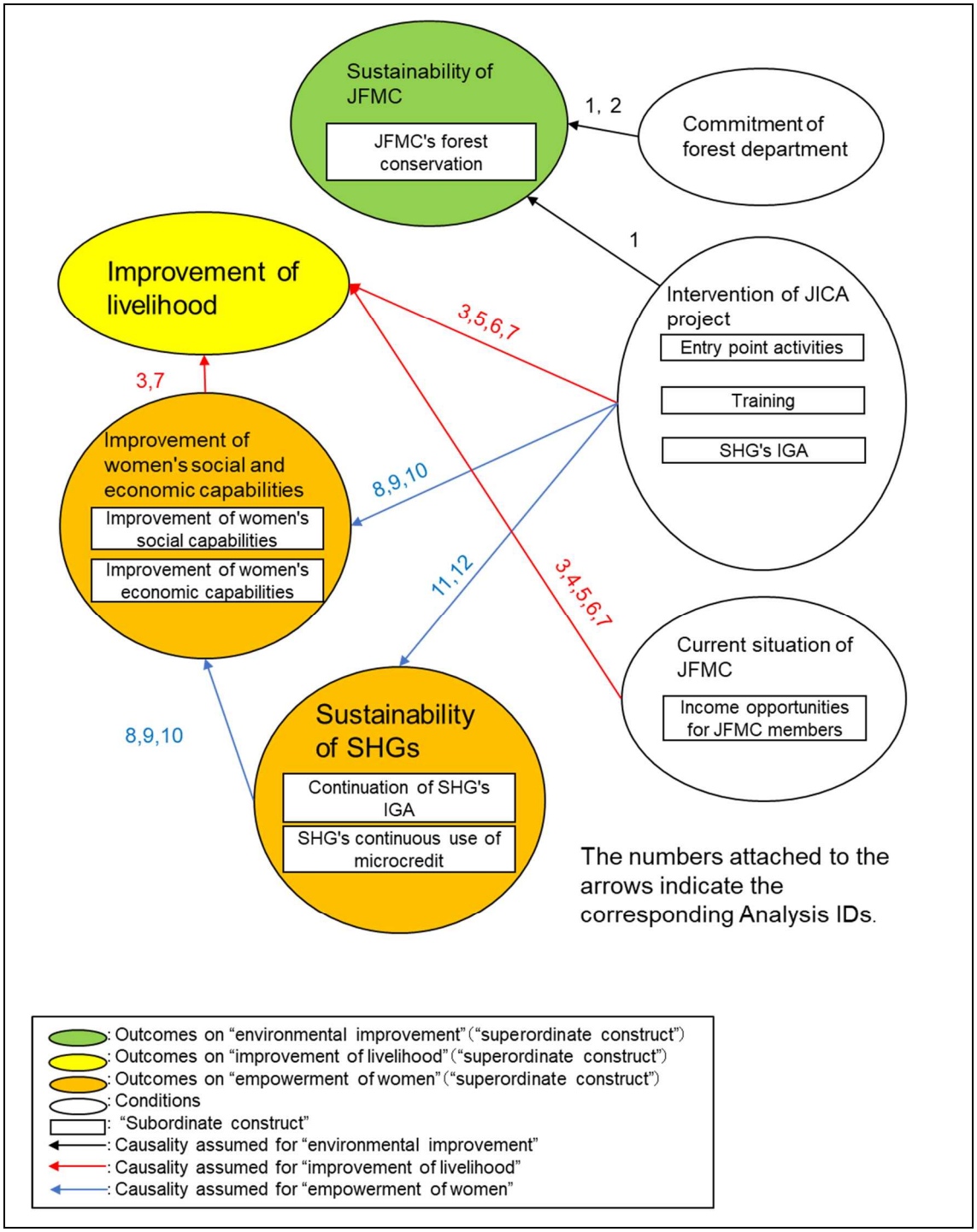
		Necessary conditions *			Parsimonious solution					
Analysis id	Model formula	Condition	Consistency	Coverage	Consistency cutoff	Solution	Raw coverage	Unique coverage	Consistency	Solution Coverage	Solution Consistency
1	fire = f(Entry2, training, FD_visits, FD_employ)	FD_visits	0.833333	0.909091	1	Entry2	0.583333	0.416667	1	0.75	1
						~training*FD_visits	0.333333	0.166667	1		
2	JF_meeting = f(FD_visits, FD_employ, training)	FD_visits	1	0.727273	1	FD_employ	1	1	1	1	1
		FD_employ	1	1							
3	JF_granimal = f(training, other_income, SHG_income)	other_income	0.75	0.818182	1	training*~other_income	0.0833333	0.0833333	1	0.833333	1
						~training*other_income	0.25	0.166667	1		
						other_income*SHG_income	0.583333	0.5	1		
4	JF_othanimal = f(FD_employ, other_income, SHG_income)	training	0.714286	0.555556	0.8	FD_employ*other_income	0.714286	0.714286	0.833333	0.714286	0.833333
		FD_employ	0.714286	0.625							
		other_income	1	0.636364							
		SHG_income	0.714286	0.625							
5	JF_education = f(JF_knowledge, FD_employ, training, other_income)	other_income	0.769231	0.909091	1	FD_employ	0.615385	0.230769	1	0.846154	1
						training*other_income	0.615385	0.230769	1		
6	JF_house = f(training, FD_employ, other_income)	other_income	0.833333	0.909091	1	FD_employ	0.666667	0.25	1	0.916667	1
						training*other_income	0.666667	0.25	1		
7	JF_employ = f(training, JF_knowledge, other_income, SHG_income)	other_income	0.833333	0.909091	1	JF_knowledge	0.571429	0.0714285	1	0.928571	1
						other_income	0.785714	0.214286	1		
						SHG_income	0.571429	0.0714285	1		
8	SHG_hours = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	IGA_cont	0.875	0.875	1	IGA_cont*SHG_know	0.75	0.75	1	0.75	1
		SHG_training	1	0.666667							
		SHG_know	0.875	0.875							
		SHG_meeting	1	0.727273							
9	SHG_ornament = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	IGA_cont	0.875	0.875	1	IGA_cont*~SHG_meeting	0.125	0.125	1	0.875	1
		SHG_training	1	0.666667		IGA_cont*SHG_know	0.75	0.75	1		
		SHG_know	0.875	0.875							
		SHG_meeting	0.875	0.636364							
10	SHG_saving = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	SHG_training	0.857143	1	1	SHG_training	0.857143	0.214286	1	1	1
		SHG_meeting	0.785714	1		SHG_meeting	0.785714	0.142857	1		
11	IGA_cont = f(Entry2, SHG_training, SHG_actgrani, SHG_know)	SHG_training	1	0.666667	1	~Entry2*SHG_know	0.5	0.5	1	0.75	1
		SHG_know	0.75	0.75		Entry2*SHG_actgrani*~SHG_know	0.25	0.25	1		
12	SHG_meeting = f(SHG_training, SHG_know, SHG_actgrani)	SHG_training	0.818182	0.75	1	SHG_know	0.727273	0.727273	1	0.727273	1
		SHG_know	0.727273	1							

*Conditions with consistancy 0.7 or more are shown.

Appendix 17: Summary Table for Analytical Results (No.2)

		Parsimonious solution	Outcome		Condition 1		Condition 2		Condition 3	
Analysis id	Model formula	Solution	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct	Superordinate construct	Subordinate costruct
1	fire = f(Entry2, training, FD_visits, FD_employ)	Entry2	sustainability of JFMC	JFMC's forest conservation	intervention of JICA project	entry point activities				
		~training*FD_visits			intervention of JICA project	training	commitment of forest department	commitment of forest department		
2	JF_meeting = f(FD_visits, FD_employ, training)	FD_employ	sustainability of JFMC	JFMC's forest conservation	commitment of forest department	commitment of forest department				
3	JF_granimal = f(training, other_income, SHG_income)	training*~other_income	improvement of livelihood	improvement of livelihood	intervention of JICA project	training	current situation of JFMC	income opportunities for JFMC members		
		~training*other_income			intervention of JICA project	training	current situation of JFMC	income opportunities for JFMC members		
		other_income*SHG_income			current situation of JFMC	income opportunities for JFMC members	improvement of women's social and economic capabilities	improvement of women's economic capabilities		
4	JF_othanimal = f(FD_employ, other_income, SHG_income)	FD_employ*other_income	improvement of livelihood	improvement of livelihood	current situation of JFMC	income opportunities for JFMC members	current situation of JFMC	income opportunities for JFMC members		
5	JF_education = f(JF_knowledge, FD_employ, training, other_income)	FD_employ	improvement of livelihood	improvement of livelihood	current situation of JFMC	income opportunities for JFMC members				
		training*other_income			intervention of JICA project	training	current situation of JFMC	income opportunities for JFMC members		
6	JF_house = f(training, FD_employ, other_income)	FD_employ	improvement of livelihood	improvement of livelihood	current situation of JFMC	income opportunities for JFMC members				
		training*other_income			intervention of JICA project	training	current situation of JFMC	income opportunities for JFMC members		
7	JF_employ = f(training, JF_knowledge, other_income, SHG_income)	JF_knowledge	improvement of livelihood	improvement of livelihood	intervention of JICA project	training				
		other_income			current situation of JFMC	income opportunities for JFMC members				
		SHG_income			improvement of women's social and economic capabilities	improvement of women's economic capabilities				
8	SHG_hours = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	IGA_cont*SHG_know	improvement of women's social and economic capabilities	improvement of women's social capabilities	sustainability of SHG	continuation of SHG's IGA	intervention of JICA project	training		
9	SHG_ornament = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	IGA_cont*~SHG_meeting	improvement of women's social and economic capabilities	improvement of women's economic capabilities	sustainability of SHG	continuation of SHG's IGA	sustainability of SHG	SHG's continuous use of microcredit		
		IGA_cont*SHG_know			sustainability of SHG	continuation of SHG's IGA	intervention of JICA project	training		
10	SHG_saving = f(IGA_cont, SHG_training, SHG_know, SHG_meeting)	SHG_training	improvement of women's social and economic capabilities	improvement of women's economic capabilities	intervention of JICA project	training				
		SHG_meeting			sustainability of SHG	SHG's continuous use of microcredit				
11	IGA_cont = f(Entry2, SHG_training, SHG_actgrani, SHG_know)	~Entry2*SHG_know	sustainability of SHG	continuation of SHG's IGA	intervention of JICA project	entry point activities	intervention of JICA project	training		
		Entry2*SHG_actgrani*~SHG_know			intervention of JICA project	entry point activities	intervention of JICA project	SHG's IGA	intervention of JICA project	training
12	SHG_meeting = f(SHG_training, SHG_know, SHG_actgrani)	SHG_know	sustainability of SHG	SHG's continuous use of microcredit	intervention of JICA project	training				

Appendix 18: Analytical Results of the Study



Appendix 19: Cross-Tabulation Fire Prevention after Project Completion

nursery	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	9	12	25.0%	75.0%
= 1	1	3	4	coverage	coverage
Total	4	12	16	75.0%	25.0%
Entry1	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	11	13	8.3%	33.3%
= 1	2	1	3	coverage	coverage
Total	4	12	16	33.3%	8.3%
Entry2	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	5	9	58.3%	100.0%
= 1	0	7	7	coverage	coverage
Total	4	12	16	100.0%	58.3%
training	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	58.3%	77.8%
= 1	2	7	9	coverage	coverage
Total	4	12	16	77.8%	58.3%
FD_visits	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	83.3%	90.9%
= 1	1	10	11	coverage	coverage
Total	4	12	16	90.9%	83.3%
FD_employ	fire		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	58.3%	87.5%
= 1	1	7	8	coverage	coverage
Total	4	12	16	87.5%	58.3%

*necessary condition
**sufficient condition

Appendix 20: Cross-Tabulation JFMC's Official Meeting

nursery	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	6	12	25.0%	50.0%
= 1	2	2	4	coverage	coverage
Total	8	8	16	50.0%	25.0%
Entry1	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	12.5%	33.3%
= 1	2	1	3	coverage	coverage
Total	8	8	16	33.3%	12.5%
Entry2	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	50.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	8	8	16	57.1%	50.0%
training	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	3	7	62.5%	55.6%
= 1	4	5	9	coverage	coverage
Total	8	8	16	55.6%	62.5%
FD_visits	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	0	5	100.0%	72.7%
= 1	3	8	11	coverage	coverage
Total	8	8	16	72.7%	100.0%
FD_employ	JF_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	0	8	100.0%	100.0%
= 1	0	8	8	coverage	coverage
Total	8	8	16	100.0%	100.0%

*necessary condition
**sufficient condition

Appendix 21: Cross-Tabulation　JFMC Members' Livestock after Project (Grazing Animal)

nursery	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	8	12	33.3%	100.0%
= 1	0	4	4	coverage	coverage
Total	4	12	16	100.0%	33.3%
Entry1	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	9	13	25.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	12	16	100.0%	25.0%
Entry2	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	50.0%	85.7%
= 1	1	6	7	coverage	coverage
Total	4	12	16	85.7%	50.0%
Income_P	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	10	14	16.7%	100.0%
= 1	0	2	2	coverage	coverage
Total	4	12	16	100.0%	16.7%
training	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	58.3%	77.8%
= 1	2	7	9	coverage	coverage
Total	4	12	16	77.8%	58.3%
JF_knowledge	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	58.3%	87.5%
= 1	1	7	8	coverage	coverage
Total	4	12	16	87.5%	58.3%
train_equip	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	9	13	25.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	12	16	100.0%	25.0%
FD_employ	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	50.0%	75.0%
= 1	2	6	8	coverage	coverage
Total	4	12	16	75.0%	50.0%
IGA_other	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	10	12	16.7%	50.0%
= 1	2	2	4	coverage	coverage
Total	4	12	16	50.0%	16.7%
other_income	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	75.0%	81.8%
= 1	2	9	11	coverage	coverage
Total	4	12	16	81.8%	75.0%
SHG_income	JF_granimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	58.3%	87.5%
= 1	1	7	8	coverage	coverage
Total	4	12	16	87.5%	58.3%

*necessary condition
**sufficient condition

Appendix 22: Cross-Tabulation　JFMC members' Livestock after Project (Other)

nursery	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	28.6%	50.0%
= 1	2	2	4	coverage	coverage
Total	9	7	16	50.0%	28.6%
Entry1	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	6	13	14.3%	33.3%
= 1	2	1	3	coverage	coverage
Total	9	7	16	33.3%	14.3%
Entry2	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	42.9%	42.9%
= 1	4	3	7	coverage	coverage
Total	9	7	16	42.9%	42.9%
Income_P	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	9	5	14	28.6%	100.0%
= 1	0	2	2	coverage	coverage
Total	9	7	16	100.0%	28.6%
training	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	2	7	71.4%	55.6%
= 1	4	5	9	coverage	coverage
Total	9	7	16	55.6%	71.4%
JF_knowledge	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	71.4%	62.5%
= 1	3	5	8	coverage	coverage
Total	9	7	16	62.5%	71.4%
train_equip	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	5	13	28.6%	66.7%
= 1	1	2	3	coverage	coverage
Total	9	7	16	66.7%	28.6%
FD_employ	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	71.4%	62.5%
= 1	3	5	8	coverage	coverage
Total	9	7	16	62.5%	71.4%
IGA_other	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	28.6%	50.0%
= 1	2	2	4	coverage	coverage
Total	9	7	16	50.0%	28.6%
other_income	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	0	5	100.0%	63.6%
= 1	4	7	11	coverage	coverage
Total	9	7	16	63.6%	100.0%
SHG_income	JF_othanimal		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	71.4%	62.5%
= 1	3	5	8	coverage	coverage
Total	9	7	16	62.5%	71.4%

Appendix 23: Cross-Tabulation　JFMC Members' Expenditure after Project (Education)

nursery	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	10	12	23.1%	75.0%
= 1	1	3	4	coverage	coverage
Total	3	13	16	75.0%	23.1%

Entry1	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	12	13	7.7%	33.3%
= 1	2	1	3	coverage	coverage
Total	3	13	16	33.3%	7.7%

Entry2	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	53.8%	100.0%
= 1	0	7	7	coverage	coverage
Total	3	13	16	100.0%	53.8%

Income_P	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	11	14	15.4%	100.0%
= 1	0	2	2	coverage	coverage
Total	3	13	16	100.0%	15.4%

training	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	61.5%	88.9%
= 1	1	8	9	coverage	coverage
Total	3	13	16	88.9%	61.5%

JF_knowledge	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	61.5%	100.0%
= 1	0	8	8	coverage	coverage
Total	3	13	16	100.0%	61.5%

train_equip	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	10	13	23.1%	100.0%
= 1	0	3	3	coverage	coverage
Total	3	13	16	100.0%	23.1%

FD_employ	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	61.5%	100.0%
= 1	0	8	8	coverage	coverage
Total	3	13	16	100.0%	61.5%

IGA_other	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	9	12	30.8%	100.0%
= 1	0	4	4	coverage	coverage
Total	3	13	16	100.0%	30.8%

other_income	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	76.9%	90.9%
= 1	1	10	11	coverage	coverage
Total	3	13	16	90.9%	76.9%

SHG_income	JF_education		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	61.5%	100.0%
= 1	0	8	8	coverage	coverage
Total	3	13	16	100.0%	61.5%

*necessary condition
**sufficient condition

Appendix 24: Cross-Tabulation　JFMC Members' Expenditure after Project (House)

nursery	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	9	12	25.0%	75.0%
= 1	1	3	4	coverage	coverage
Total	4	12	16	75.0%	25.0%
Entry1	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	11	13	8.3%	33.3%
= 1	2	1	3	coverage	coverage
Total	4	12	16	33.3%	8.3%
Entry2	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	5	9	58.3%	100.0%
= 1	0	7	7	coverage	coverage
Total	4	12	16	100.0%	58.3%
Income_P	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	10	14	16.7%	100.0%
= 1	0	2	2	coverage	coverage
Total	4	12	16	100.0%	16.7%
training	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	4	7	66.7%	88.9%
= 1	1	8	9	coverage	coverage
Total	4	12	16	88.9%	66.7%
JF_knowledge	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	4	8	66.7%	100.0%
= 1	0	8	8	coverage	coverage
Total	4	12	16	100.0%	66.7%
train_equip	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	9	13	25.0%	100.0%
= 1	0	3	3	coverage	coverage
Total	4	12	16	100.0%	25.0%
FD_employ	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	4	8	66.7%	100.0%
= 1	0	8	8	coverage	coverage
Total	4	12	16	100.0%	66.7%
IGA_other	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	8	12	33.3%	100.0%
= 1	0	4	4	coverage	coverage
Total	4	12	16	100.0%	33.3%
other_income	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	2	5	83.3%	90.9%
= 1	1	10	11	coverage	coverage
Total	4	12	16	90.9%	83.3%
SHG_income	JF_house		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	5	8	58.3%	87.5%
= 1	1	7	8	coverage	coverage
Total	4	12	16	87.5%	58.3%

*necessary condition
**sufficient condition

Appendix 25: Cross-Tabulation　JFMC Members' Employment Opportunities after Project

nursery	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	11	12	21.4%	75.0%
= 1	1	3	4	coverage	coverage
Total	2	14	16	75.0%	21.4%

Entry1	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	12	13	14.3%	66.7%
= 1	1	2	3	coverage	coverage
Total	2	14	16	66.7%	14.3%

Entry2	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	7	9	50.0%	100.0%
= 1	0	7	7	coverage	coverage
Total	2	14	16	100.0%	50.0%

Income_P	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	12	14	14.3%	100.0%
= 1	0	2	2	coverage	coverage
Total	2	14	16	100.0%	14.3%

training	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	6	7	57.1%	88.9%
= 1	1	8	9	coverage	coverage
Total	2	14	16	88.9%	57.1%

JF_knowledge	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	2	14	16	100.0%	57.1%

train_equip	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	11	13	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	2	14	16	100.0%	21.4%

FD_employ	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	2	14	16	100.0%	57.1%

IGA_other	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	10	12	28.6%	100.0%
= 1	0	4	4	coverage	coverage
Total	2	14	16	100.0%	28.6%

other_income	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	78.6%	100.0%
= 1	0	11	11	coverage	coverage
Total	2	14	16	100.0%	78.6%

SHG_income	JF_employ		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	2	14	16	100.0%	57.1%

*necessary condition
**sufficient condition

Appendix 26: Cross-Tabulation　Time for SHG Activities

JF_female	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	6	11	25.0%	50.0%
= 1	2	2	4	coverage	coverage
Total	7	8	15	50.0%	25.0%
Entry1	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	12.5%	33.3%
= 1	2	1	3	coverage	coverage
Total	8	8	16	33.3%	12.5%
Entry2	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	50.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	8	8	16	57.1%	50.0%
vill_female	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	6	13	25.0%	66.7%
= 1	1	2	3	coverage	coverage
Total	8	8	16	66.7%	25.0%
SHG_actgrani	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	37.5%	33.3%
= 1	6	3	9	coverage	coverage
Total	8	8	16	33.3%	37.5%
SHG_actagri	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	37.5%	75.0%
= 1	1	3	4	coverage	coverage
Total	8	8	16	75.0%	37.5%
IGA_cont	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	87.5%	87.5%
= 1	1	7	8	coverage	coverage
Total	8	8	16	87.5%	87.5%
SHG_training	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	66.7%
= 1	4	8	12	coverage	coverage
Total	8	8	16	66.7%	100.0%
SHG_know	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	87.5%	87.5%
= 1	1	7	8	coverage	coverage
Total	8	8	16	87.5%	87.5%
SHG_meeting	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	0	5	100.0%	72.7%
= 1	3	8	11	coverage	coverage
Total	8	8	16	72.7%	100.0%
SHG_supports	SHG_hours		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	8	6	14	25.0%	100.0%
= 1	0	2	2	coverage	coverage
Total	8	8	16	100.0%	25.0%

*necessary condition
**sufficient condition

Appendix 27: Cross-Tabulation　SHG Members' Expenditure after Project (Ornament)

JF_female	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	6	11	25.0%	40.0%
= 1	3	2	5	coverage	coverage
Total	8	8	16	40.0%	25.0%
Entry1	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	12.5%	33.3%
= 1	2	1	3	coverage	coverage
Total	8	8	16	33.3%	12.5%
Entry2	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	50.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	8	8	16	57.1%	50.0%
vill_female	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	12.5%	33.3%
= 1	2	1	3	coverage	coverage
Total	8	8	16	33.3%	12.5%
SHG_actgrani	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	37.5%	33.3%
= 1	6	3	9	coverage	coverage
Total	8	8	16	33.3%	37.5%
SHG_actagri	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	5	12	37.5%	75.0%
= 1	1	3	4	coverage	coverage
Total	8	8	16	75.0%	37.5%
IGA_cont	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	87.5%	87.5%
= 1	1	7	8	coverage	coverage
Total	8	8	16	87.5%	87.5%
SHG_training	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	66.7%
= 1	4	8	12	coverage	coverage
Total	8	8	16	66.7%	100.0%
SHG_know	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	1	8	87.5%	87.5%
= 1	1	7	8	coverage	coverage
Total	8	8	16	87.5%	87.5%
SHG_meeting	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	1	5	87.5%	63.6%
= 1	4	7	11	coverage	coverage
Total	8	8	16	63.6%	87.5%
SHG_supports	SHG_ornament		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	12.5%	50.0%
= 1	1	1	2	coverage	coverage
Total	8	8	16	50.0%	12.5%

*necessary condition
**sufficient condition

Appendix 28: Cross-Tabulation　SHG Members' Saving after Project

JF_female	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	10	11	28.6%	80.0%
= 1	1	4	5	coverage	coverage
Total	2	14	16	80.0%	28.6%
Entry1	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	12	13	14.3%	66.7%
= 1	1	2	3	coverage	coverage
Total	2	14	16	66.7%	14.3%
Entry2	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	7	9	50.0%	100.0%
= 1	0	7	7	coverage	coverage
Total	2	14	16	100.0%	50.0%
vill_female	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	11	13	21.4%	100.0%
= 1	0	3	3	coverage	coverage
Total	2	14	16	100.0%	21.4%
SHG_actgrani	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	1	6	7	57.1%	88.9%
= 1	1	8	9	coverage	coverage
Total	2	14	16	88.9%	57.1%
SHG_actagri	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	10	12	28.6%	100.0%
= 1	0	4	4	coverage	coverage
Total	2	14	16	100.0%	28.6%
IGA_cont	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	2	14	16	100.0%	57.1%
SHG_training	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	85.7%	100.0%
= 1	0	12	12	coverage	coverage
Total	2	14	16	100.0%	85.7%
SHG_know	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	6	8	57.1%	100.0%
= 1	0	8	8	coverage	coverage
Total	2	14	16	100.0%	57.1%
SHG_meeting	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	3	5	78.6%	100.0%
= 1	0	11	11	coverage	coverage
Total	2	14	16	100.0%	78.6%
SHG_supports	SHG_saving		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	12	14	14.3%	100.0%
= 1	0	2	2	coverage	coverage
Total	2	14	16	100.0%	14.3%

*necessary condition
**sufficient condition

Appendix 29: Cross-Tabulation　Female Members Continuing IGA

JF_female	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	5	11	37.5%	60.0%
= 1	2	3	5	coverage	coverage
Total	8	8	16	60.0%	37.5%
Entry1	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	7	13	12.5%	33.3%
= 1	2	1	3	coverage	coverage
Total	8	8	16	33.3%	12.5%
Entry2	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	4	9	50.0%	57.1%
= 1	3	4	7	coverage	coverage
Total	8	8	16	57.1%	50.0%
vill_female	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	6	13	25.0%	66.7%
= 1	1	2	3	coverage	coverage
Total	8	8	16	66.7%	25.0%
SHG_actgrani	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	4	7	50.0%	44.4%
= 1	5	4	9	coverage	coverage
Total	8	8	16	44.4%	50.0%
SHG_actagri	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	6	12	25.0%	50.0%
= 1	2	2	4	coverage	coverage
Total	8	8	16	50.0%	25.0%
SHG_training	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	0	4	100.0%	66.7%
= 1	4	8	12	coverage	coverage
Total	8	8	16	66.7%	100.0%
SHG_know	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	6	2	8	75.0%	75.0%
= 1	2	6	8	coverage	coverage
Total	8	8	16	75.0%	75.0%
SHG_supports	IGA_cont		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	7	7	14	12.5%	50.0%
= 1	1	1	2	coverage	coverage
Total	8	8	16	50.0%	12.5%

*necessary condition
**sufficient condition

Appendix 30: Cross-Tabulation SHG's Official Meeting

JF_female	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	8	11	27.3%	60.0%
= 1	2	3	5	coverage	coverage
Total	5	11	16	60.0%	27.3%
Entry1	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	9	13	18.2%	66.7%
= 1	1	2	3	coverage	coverage
Total	5	11	16	66.7%	18.2%
Entry2	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	3	6	9	45.5%	71.4%
= 1	2	5	7	coverage	coverage
Total	5	11	16	71.4%	45.5%
vill_female	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	8	13	27.3%	100.0%
= 1	0	3	3	coverage	coverage
Total	5	11	16	100.0%	27.3%
SHG_actgrani	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	5	7	54.5%	66.7%
= 1	3	6	9	coverage	coverage
Total	5	11	16	66.7%	54.5%
SHG_actagri	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	4	8	12	27.3%	75.0%
= 1	1	3	4	coverage	coverage
Total	5	11	16	75.0%	27.3%
SHG_training	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	2	2	4	81.8%	75.0%
= 1	3	9	12	coverage	coverage
Total	5	11	16	75.0%	81.8%
SHG_know	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	3	8	72.7%	100.0%
= 1	0	8	8	coverage	coverage
Total	5	11	16	100.0%	72.7%
SHG_supports	SHG_meeting		Total	NC*	SC**
	= 0	= 1		consistency	consistency
= 0	5	9	14	18.2%	100.0%
= 1	0	2	2	coverage	coverage
Total	5	11	16	100.0%	18.2%

*necessary condition

**sufficient condition