

A Game to Level the Playing Field: The case of Community-Company Partnership in Forest Plantations

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EXTENDED ABSTRACT

Cooperation among various stakeholders in forests management is widely accepted as a management strategy. Musi Hutan Persada (MHP), a big forest plantation company in South Sumatra, Indonesia, has established cooperation with local communities since 2000. Initially this cooperation was developed to address the conflict over land uses between the company and local communities. However, interests and expectations can change and differ from company to community. Finding a way to keep the cooperation sustainable becomes an important issue. We ran role-playing game approach using a multi-agent system in order to observe the resilience of the current cooperation. The following steps were taken: a share representation of the cooperation with the stakeholders, a role-playing game and collective assessment of the game. The emergences of new institutions during the role-playing game are among those observed. Scenarios to increase the resilience of the cooperation, which eventually leads to improve both forest attributes and stakeholders' welfare were developed.

The game case diagram we used, is shown in Figure 1. The figure presents a community-company forest plantation partnership within a bounded system. Two categories of actors are involved in the partnership, i.e., communities and the company, in this case MHP.

The role of communities is played by local communities who live in the surrounding of MHP forest plantation. Local communities may participate in the partnership or not through 7 different ways: i) growing small-scale Acacia mangium (out-grower scheme), ii) planting rubber, iii) maintaining old rubber, iv) growing oil

palm, v) providing labor for MHP, vi) growing small-scale mixed-plantation and vii) looking for rent opportunities as in brokerage.

The company manages its big plantation, participate in the partnership and manage its employees.

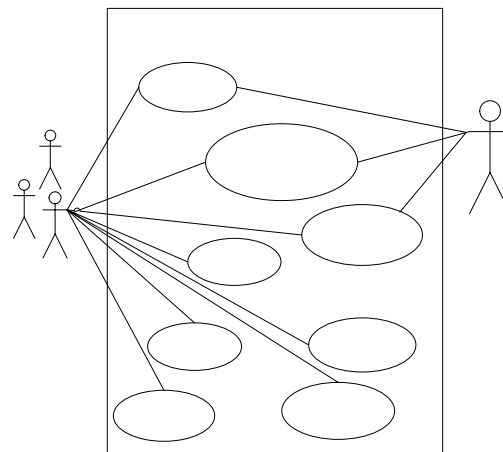


Figure 1. Use Case Diagram of the Game

This role-playing game gave insights to players whose collective investment is necessary to improve their future livelihoods. Learning process took place when the game players discussed, played and analyzed the game.

The game was set to mimics interaction between local communities nearby the forest plantation of MHP. However we simplify a lot the reality so the game may apply to interactions between other local communities and forest plantations.

1. INTRODUCTION

Principle 22 of the 1992 Rio Declaration on Environment and Development highlights the importance of local people and their participation in sustainable development. In forestry, this applies to indigenous people or forest communities living in or nearby forest concession areas. These approaches often involve different ways of empowering local communities by allowing them to be actively involved in planning and decision-making processes.

1.1. Context

Musi Hutan Persada (MHP) is an *Acacia mangium* plantation company located in South Sumatra. MHP is a joint venture company composed of the state own company Inhutani II and private companies: Barito Pacific Timber, Muktilestari Kencana and Marubeni Corporation. MHP runs under the Indonesian Minister of Forestry Decree No. 38/Kpts-II/1996, dated January 29, 1996. The total extent of MHP plantation is 296,400 ha organized in three disjoint forest groups in South Sumatra.

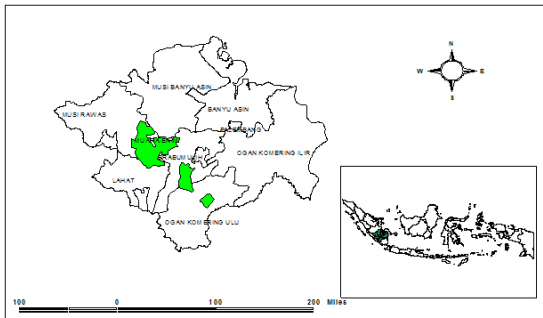


Figure 2. MHP's Forest Plantation concession Located in South Sumatra Province (inset Indonesia)

Communities surrounding MHP are mostly made up of traditional farmers. Other actors are MHP workers, traders and local government officials. The farmers grow rubber plantation, field rice and *Acacia mangium* plantation in collaboration with MHP. The local people were used to organize themselves according to the 'Marga' system. 'Marga' generated rules and norms that applied on resources of a specific territory. 'Marga' is a traditional institution which developed within the communities from generation to generation. However, after 1982 communities were not bounded by Marga rules anymore. It explains why nowadays collective actions for livelihood are rare.

In 1998, Indonesia faced economic, social and political crisis. The crisis influenced all sectors of development including MHP forest plantation which was established two years earlier. Villages surrounding the plantation were asking MHP for more benefits. Then conflicts between villagers and MHP appeared. As a result, MHP offers two cooperation schemes: 'Managing Forest with Community' (MHBM or *Mengelola Hutan Bersama Masyarakat*) and 'People Forest Management' (MHR or *Mengelola Hutan Rakyat*).

MHBM area is currently about 40,000 ha, and involved twelve villages and the MHR area is about 4,000 ha, and involved height villages. MHBM partnership scheme provides fee to communities from the existing plantation of MHP's concession land. The fee amounts to 2,500 rupiahs¹ per cubic meter of log. Although, MHBM is named partnership scheme, it seems to be more a direct aid from MHP to the communities. MHR scheme is closer to partnership spirit with small-holder plantation as out-grower scheme. Individual persons or groups can propose to MHP to plant trees on their own land, regardless the land status. If MHP approves, then MHP will provide all establishment and maintenance costs for small plantations of 2 to 100 hectares. The profit sharing is 60% to MHP, and 40% to the individuals or groups.

1.2. Forest Plantations, Pulp Industries and Land Disputes

Since the late 1980's the Indonesian's pulp & paper have expanded very rapidly. Expansion was temporarily held in 1997 due to the economic crisis. However, by 2000 several pulp mill projects were reinstated and completed. Riau Andalan Pulp & Paper (RAPP) completed their expansion in 2001, while the mill Tanjung Enim Lestari (TEL) that MHP is fully supplying with pulp wood from plantation, was achieved in 2000.

Disputes over lands between local and customary communities and forest companies during Soeharto era (New Order regime, 1966-1998) were very much restricted. Prior 1998, the local army and government could control by force the disputes. Soeharto's resignation in May 1998 was the beginning of the customary community movement to demand the rerun of their customary rights including communal land rights. The conflicts between the local communities and the

¹ 1 US\$ = 10,000 Indonesian Rupiahs (IDR)

companies happened with (1) the land appropriation process; (2) environmental impacts; and (3) recruitment of employees (Sakai 2002).

1.3. Multiagent Simulation and Game

Forestry planners should be able to assess the very long term impacts of their decisions, such as the establishment of plantations or cooperation among various stakeholders. Some major impacts might occur beyond the normal periods of monitoring. Simulation is one way to address this question, and may be the only viable alternative if the system is large or complex. "Simulation" means making a simplified representation of a real-world situation, and animating it so that stakeholders might envision what the future situation might be. Multiagent simulation (MAS) is a promising way to examine natural resource and environmental management issues (Bousquet *et al.* 1999).

Cooperation among agents can only naturally occur when an individual agent cannot pursue its goal on its own. They communicate among themselves to try to seek cooperation to achieve a shared goal (Ossowski 1999, Weiss 1999). Agents may have different economical, social or political interests in establishing cooperation. Cooperation is a dynamic concept; it means once it is established it is just for a limited time. Cooperation will evolve over time. Cooperation may or may not survive in facing the complexity and evolving world. Axelrod and Cohen (1999) revealed the need to have adaptive capacities for each stakeholder involve in the dynamic of the system.

The world complexity is increasing in parallel with information and communication technology revolution. Most forest stakeholders have better access to information. They view themselves and the others with more variables than before. With better information they may challenge the existing cooperation and institution they set before to improve them. Cooperation should be adaptive to changes but needs also to have some degree of resilience to be effective in a dynamic world. Game is a useful approach to examine this cooperation.

In a general term, a game is an action that triggers a reaction and then this reaction triggers another action. In a specific meaning Huizinga (1951 in Commod 2004) defined a game as (a) a free activity; (b) having imaginative components; (c) without materials that directly involve with its players; (d) bounded by space and time; (e) triggering group discussion; and (d) beside the normal life. Behind a game is a game theory, which is a theory to explain how rational individuals make a decision when they are

mutually interdependent. The basic assumptions of the players in the theory are individualism, rationality and interdependency (Romp 1997).

Role-playing Game (RPG) is a game that is specifically designed for the interaction between players based on the roles they play. Through RPG we can observe the way roles are played and the impacts of the played game on players and environment. During the game, each role player is allowed to do collective action, to contribute to create new institutions or rules among the players or to achieve common goals. When the game is over, each player then can analyze the lesson learnt from the game and compare it to the real world. The realism of the game includes (a) *Explicit reality*: RPG represents the real situation of actors and their resources; (b) *Implicit reality*: RPG represents the simplified situation of actors and their resources; (c) *Virtual world*: RPG is based on an issue, which is not necessary related to specific actor or resource (Commod 2004).

2. Method

The goal of the game is to contribute to improved community livelihood by giving insights to the communities to construct their livelihood strategy. The objectives of the game are (a) to share knowledge with local communities about livelihood strategy; and (b) to help collective decision making on self organization and coordination among the community members to achieve their common goal.

The game modeling follows the steps of (a) representing the MHBM and MHR in game; (b) testing, engaging the stakeholders and refining the model; (c) role-playing game; (d) develop future scenarios; and (e) develop rational collective plan and actions. This process is still continuing and has not been completed yet; the paper only represents the first and a part of second steps only.

This research used 'companion modeling approach' with a modeling tool namely CORMAS (Common Pool Resources and Multi-Agent System). CORMAS is a multiagent simulation platform specifically designed for renewable resource management systems. (CIRAD 2001).

Prior to developing the game we visited the sites and had several discussions with stakeholders to get a first understanding of the context according to their perceptions. This game is to be played at the community level, i.e., community perspective is the central angle. The stakeholders were identified according to the following criteria:

proximity to the forest, legal or traditional rights over the forest and dependency on the forest.

The realism of the game is implicit reality, meaning that the role playing game (RPG) is based on the simplified representation of actors, resources and land management in the case of MHP, which is relevant to the players. The implicit reality in the case of MHP offers more advantages compared to explicit reality in terms of (a) avoiding issues sensitive to some community members, such as the boundary between communities' and MHP's land; (b) providing higher flexibility level in the game.

3. GAME DEVELOPMENT

We identified two typed of stakeholders in the game, which are (a) Communities with land and without land and (b) MHP that own a concession land planted with *Acacia mangium*. At this stage we focused more on the roles of the communities in the partnership rather than MHP.

3.1. Spatial Setting of the Playing Field

Figure 3 describes the spatial setting of the game. The landscape comprises of 25 cells made of 5x5 cells. Each cell represents the area of 10 ha. There are two land categories i.e. company forest plantation of *Acacia* and community's land of small and old rubber plantations, which are unproductive.



Figure 3. Game Spatial Setting with Community's land (bottom) MHP's Forest Concession Land (top)

3.2. Players and Their Decision Spaces

There are two categories of players, which are villagers with or without land. They are all located in the community land. The game is played with six persons of land owners (LO) and four persons of non land owners (NLO). The proportional

numbers of the LO and NLO aims at balancing their power and reflect the reality in the field.

LO may manage their land, participate in MHBM and work for the company or become company's labors. These three options are not mutually exclusive. It means they may choose more than one option at the same time. The first option, managing the land, comprises three sub-options i.e. keeping the old rubber trees, selling the land or converting into *Acacia mangium*, oil palm, and new variety of rubber or mixed plantation.

For NLO, the options are not as many as LO. NLO may participate in MHBM or be company's labor. Both LO and NLO may also become free riders or rent seeker in this game, or in the local dialect it is called 'preman'. This man or woman take or steal fee from other community works. They do nothing, except brokering the relation between community and company in a negative way. Table 1 shows investment (I) and return (R) from managing the land. I, and R are shared out for 20 years.

Table 1. Investment (I) and return (R) in millions Indonesian Rupiahs

Year	MHB M		MHR		Old Rubber		New Rubber		Oil Palm		Mix plantation	
	I	R	I	R	I	R	I	R	I	R	I	R
1	0	0	2	0	0	0	60	0	90	0	20	0
2	0	0	0	0	0	0	0	0	0	0	2	0
3	0	0	0	0	0	0	0	0	0	0	2	0
4	0	0	0	0	0	0	0	0	0	0	2	0
5	0	0	0	0	0	0	0	0	0	0	2	0
6	0	0	0	0	0	0	0	60	0	90	2	0
7	0	0	0	0	0	0	0	60	0	90	2	0
8	0	5	0	80	0	0	0	60	0	90	2	0
9	0	0	2	0	0	0	0	60	0	90	2	0
10	0	0	0	0	0	0	0	60	0	90	2	0
11	0	0	0	0	0	0	0	60	0	90	2	0
12	0	0	0	0	0	0	0	48	0	72	2	0
13	0	0	0	0	0	0	0	48	0	72	2	0
14	0	0	0	0	0	0	0	48	0	72	2	0
15	0	0	0	0	0	0	0	48	0	72	2	0
16	0	5	0	80	0	0	0	48	0	72	2	0
17	0	0	0	0	0	0	0	48	0	72	2	0
18	0	0	0	0	0	0	0	36	0	54	2	0
19	0	0	0	0	0	0	0	36	0	54	2	0
20	0	0	0	0	0	0	0	36	0	54	20	600

Figure 4. The Class Diagram of the Game

3.3. Playing the Game

In the initial stage each player has 10 million rupiahs as their first liquid resources. As soon as the game is starting the LO has a cell to decide. NLO has to decide whether they participate or not to MHRM. Then LO has to choose what kind of land management option is going to take. As describe in Table 1, each option has consequences in terms of investment and return.

The game is designed to be played following the sequence A, B and C. The general challenge for the players is to maximize their total returns in twenty time steps. The Scenario A is designed with no communication among the players. In scenario B, players are divided into two groups (NLO and LO) each group is organized into communication and collaboration sub-groups. With scenario C, all players are in the same group with communication and perhaps collaboration.

The company can afford that only four players participate to MHR scheme during the game. If there are more than 4 players, the company will take randomly those involved into MHR.

Landscape diversity is calculated by the cell average diversity. The cell diversity is calculated from the number of neighbors with same land uses. The cell diversity determines the fire likelihood in the area. If a cell has low cell diversity and it is planted with *Acacia* then the probability of fire is high. The fire spread out through the *Acacia* plantation with edge connected.

During and after the game, the game facilitator observes the return to the players, land diversity and the emerging institutions in A, B and C game scenarios. The facilitator and the players can discuss the institutions that emerge if any during the game.

4. RESULTS AND DISCUSSION

At this stage the game was tried out by ten voluntary students of Bogor Agricultural University, Bogor. To simplify the analysis, the players considers only management of land as the solely source of income. We also did not involve the cost of money e.g. commercial (bank) and non-commercial rates.

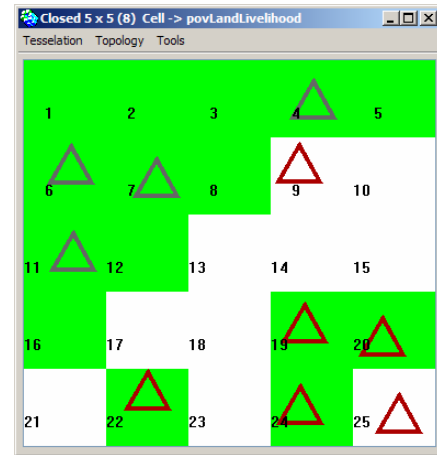


Figure 5. Scenario A: four players participate in MHRM scheme and the other four players participate in MHR scheme.

4.1. Scenario A: No communication among the game players

The players who take roles as communities do not have enough capital to invest into their land. As a result six players tried to grow *Acacia* in MHR scheme, but only four were accepted by MHP (Figure 5). Four players located in the concession land follow MHRM scheme. The total net revenue for 20 year amounts to less than 800 million rupiahs for ten players (see Figure 6 Scenario A). It means each player got per year 4 million rupiahs or US\$ 400.

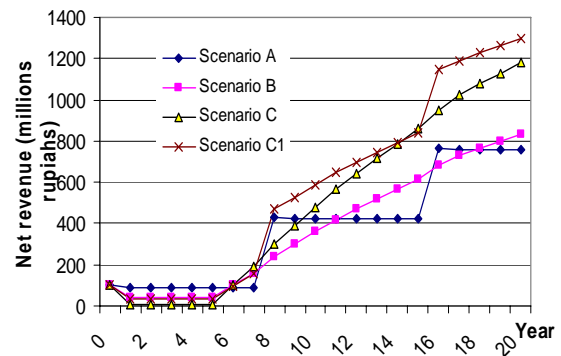


Figure 6. The Total Net Revenue Collected by 10 player during 20 years (in million Rupiahs) for Scenario A, B, C and C1.

We choose for marker the total net revenue as a first approach to compare the scenarios. In reality we observed a lot of disparities amongst the community itself, it would be pertinent later to add some markers of revenue disparity within the community.

4.2. Scenario B: Communication and collaboration within each group of players

In Scenario B, the players landless or with land could communicate and collaborate within their groups. After discussion, they came up with two kinds of strategies. The communities without land stay in the MHBM scheme. The communities with land agree to invest all their money into rubber plantation (Figure 7 cell 23). Establishing rubber plantation needs 60 million rupiahs investment, and it could be obtained through pooling money from the six players. At the end, after 20 years their net return was better than what they would get by investing in MHR (Figure 6 Scenario B).

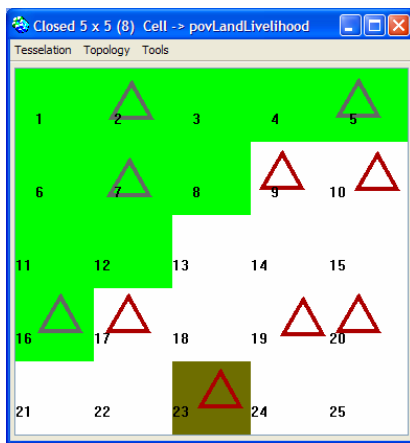


Figure 7. Scenario B: six players with land pool their money to invest in rubber plantation.

4.3. Scenario C: Communication and collaboration among all players

In this scenario, all ten players, could communicate and collaborate. They discussed the strategy to play. Finally, they came up with strategy to collect the 10 players' money to invest into oil palm, which need 90 millions rupiahs. After 20 year they obtained about 1,200 millions rupiahs (Figure 6 Scenario C).

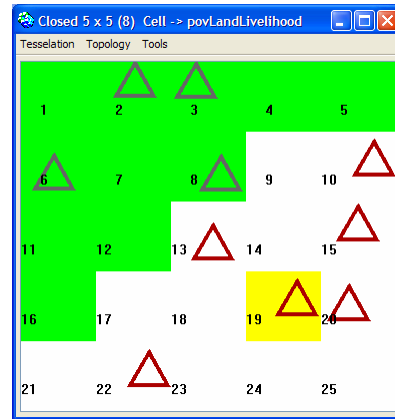


Figure 8. Scenario C; nine players pool their money to invest in oil palm plantation.

The game was iterated twice. In the second replication the players had different ideas on the Scenario C, but not on A and B. Instead of investing all their money in oil palm, they decided to have two kinds of investments i.e. rubber plantation and MHR (Figure 9). As a result, after 20 year, their net revenue was higher than in previous scenarios (Figure 6 Scenario C1).

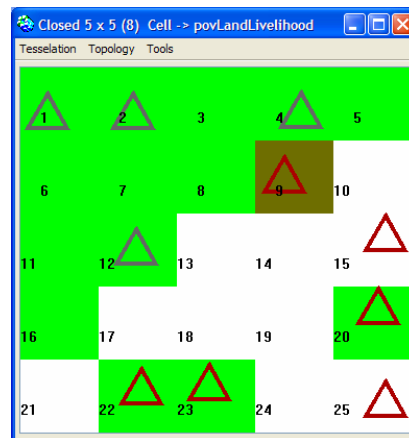


Figure 9. Scenario C1: six players invest in rubber plantation, and the other four players invest in MHR.

The land diversity of scenario A, B, C and C1 was respectively 40.8, 27.9, 27.6 and 34.9. We assumed that land outside MHP forest is homogeneous, and that even though planted with *Acacia* (Scenario A) it would increase the diversity. However, the probability of not getting fire during the period of community investment is higher on Scenario B and C as the landscape diversity is higher than in scenario A. If fire would burn some MHP's plantation plots then it would also burn all the MHR plots connected by edge to fire. During the game fire did not happen in the area.

The game shows that the communication and collaboration among the players, which represented the community members, could produce more options for the communities. They can share their resources to improve their livelihood. Through this collaboration, a collective investment can emerge. It is easy to see that rubber plantation is more profitable than MHR scheme; however, currently people in South Sumatra can not renew their small rubber plantation due to a lack of capital of 6 millions per hectare. If they can anticipate the net return of collective investment they may realize that they have actually some possibility to renew their old and small rubber plantation.

If this collective action widens to community without land who are currently working for MHRM scheme, their net return will be even higher. In the first game iteration they collaboratively planted oil palm, but in the second game iteration they modified into planting rubber and participating in MHR scheme in parallel. So we can see the learning process through playing the game. We cannot tell that if they collaborate then automatically an optimum solution will emerge. But through time the optimum solution will be approached. Outcomes of the game may suggest to the community members some ideas of institutional arrangement to facilitate maintain and enforce collective actions.

5. CONCLUSION AND FUTURE WORKS

This work is in progress and needs to be revised in the future. However, it shows a method which allowed an exploration of community-company partnerships over a long period of time by the stakeholders themselves. We expect that this method will contribute to make these partnerships more transparent for all stakeholders and by the way more viable. From this work we can already conclude (a) CORMAS is a useful platform to develop this simple spatial explicit role-playing game (RPG); (b) Collaboration and communication can facilitate future community livelihood improvement, (c) Best solutions need to be learned through time. (d) This RPG can help the players to anticipate potential future outcomes of their own decisions. The future steps of this work are the following activities: (a) To facilitate the company to anticipate possible issues as for example the situation in which community members would not be interested to grow *Acacia* under MHR scheme,; (b) To play the game with the real stakeholders i.e. the communities and MHP.

6. ACKNOWLEDGMENTS

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