COMPANION MODELLING TO FACILITATE COLLECTIVE LAND MANAGEMENT BY AKHA VILLAGERS IN UPPER NORTHERN THAILAND

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ABSTRACT

In the highlands of northern Thailand, ethnic minorities are accused by lowlanders of aggravating the risk of soil erosion on steep slopes through recent land use changes. Government authorities have threatened to further restrict their access to farm land. But whether this risk is increasing or not, and how to prevent this problem are complex questions. In the recent past, an impressive amount of research efforts to control soil erosion led to limited success and highlighted the need for more integrated approaches to deal with this problem. Soil and water conservation is embedded in complex eco-socio systems, with numerous interacting ecological and social dynamics, and an increasing number of stakeholders with different interests and perceptions. Companion Modelling (ComMod) is an emerging approach designed to facilitate collective learning in such complex systems. By combining tools such as Multi-Agent Systems and Role Playing Games, it aims at developing simulation models integrating different

stakeholders' perceptions to use them within the context of platforms for collective learning. A ComMod process has been tested since 2002 in an Akha village of upper northern Thailand to examine collectively the interactions between soil and water conservation, agricultural diversification, and social equity. The objective of this paper is to present the way a shared representation and understanding of the problem and its key dynamics is achieved, and how it can be used to support collective learning. It describes the concrete use of the ComMod approach with Akha villagers and illustrates how farmers' interest shifts along the learning process from agronomic concerns (soil erosion) to socioeconomic mechanisms (allocation of rural credit to invest in non-erosive perennial crops). The flexibility and adaptive characteristics of the approach are highlighted as they fit with the evolving nature of collective learning processes. The paper ends with suggestions on how to improve the ComMod process by establishing a dialogue with higher levels of organization to sustain the dynamics emerging at the village level.

INTRODUCTION

For the last two decades, the highlands of northern Thailand have been the site of numerous conflicts dealing with natural resource management among an increasing number of stakeholders with different and sometimes contradictory perspectives (Rutherford, 2002). This is due to factors such as development of communication infrastructure, integration to market economy, increasing population density and environmental policies that have led to a relative scarcity of farmland and water resources (Rerkasem and Rerkasem, 1994; Bruneau, 2002; Thomas et al., 2002). Two main types of conflicts dominate in northern Thailand: water-related conflicts between users, and conflicts regarding farmland and forest cover between highland ethnic minorities and the State. A common assumption among lowlanders (Thai citizens living in the plains and the cities) is that highlanders farming practices generate soil erosion on steep slopes provoking flash floods and sedimentation in the lowland irrigation reservoirs. As their actions were considered as harmful to the environment, highlanders have not had much say in the regulation of the conflicts, and the government has highly restricted their access to natural resources. As a result of these decades of highly centralized natural resource management, not only did degradation of environment continue, but many communities dependent on natural resources were impoverished (McKinnon and Vienne, 1989; Suwannarat, 1995).

In the meanwhile, the impressive amount of research carried out to study ways to control soil erosion in the sloping highlands of northern Thailand had limited success. Introduced standard "technological packages", such as grass strips or contour hedgerows systems were not adapted to local farming systems and therefore were not widely adopted (Trebuil et al., 1997). Based on the lessons from these technical experiments, numerous authors called for more integrated approaches for soil and water conservation relying on: (i) an integration of knowledge from different disciplines to take into account the socioeconomic contexts of farming practices, (ii) multiscales methodologies to take into account the interactions among the plot, farm, and watershed scales, and (iii) a genuine involvement of concerned stakeholders, in particular different types of farmers with their various strategies, knowledge and perceptions (Turkelboom and Trebuil, 1998; Sayer and Campbell, 2003). Participatory research has indeed become a buzz word in numerous projects implemented during the last decade. Since 1997, the new Thai Constitution promotes administrative decentralization and public participation in local resource management. This is an important opportunity for village communities to regain control over natural resource management and to increase their influence in public affairs (Neef et al., 2000;

Ganjanapan, 2002). But most projects adopted participation as a mean and not as a goal (Hirsh, 2002; Neef et al., 2003). Therefore much effort is still needed to enable local stakeholders to participate in local renewable resource management, knowing that managed eco-sociosystems are complex and uncertain. In particular, they are characterized by numerous interacting ecological, social and economic dynamics and an increasing diversity of stakeholders with different socioeconomic interests, land use strategies and points of view on the problem to be solved (Trebuil et al., 1997).

There is a need to develop innovative and context-adapted methodologies and tools to enable the local stakeholders to identify and rank their key problems, to exchange their points of view on problems, and to reflect collectively on ecologically adapted and socially acceptable solutions in such agrarian situations. Companion Modelling (ComMod) is an emerging approach designed to facilitate collective learning and action at the community level (Bousquet et al., 1999). It is combining various simulation tools such as Multi-Agent Systems (MAS) and Role-Playing Games (RPG) to facilitate dialogue between various stakeholders concerned by a given local natural resource management issue. The principle of the Companion Modelling approach is to develop simulation models integrating different stakeholders' points of view, and to use them within the context of platforms for collective learning. It has been tested and used in a dozen of case studies in five different Asian countries during the past 4 years, as well as in various institutional and cultural contexts around the world (Bousquet et al., 2005).

A ComMod process has been tested since 2002 in an Akha village of upper northern Thailand to promote collective watershed management, and more precisely to examine interactions between soil and water conservation, agricultural diversification, and social equity. The objective of this paper is to present the way a shared representation of the problem of land degradation and its key driving forces is achieved, and how it can be used to support collective learning on watershed management. The flexibility and adaptive characteristics of the approach are highlighted as they fit with the evolving nature of coordination processes in adaptive natural resource management. After a presentation of the context of the study, the characteristics of the problem at stake and of the ComMod approach, the paper describes its concrete use with Akha villagers. Finally, preliminary lessons from this ComMod experiment are presented as well as new perspectives for improving this innovative approach in the field of participatory resource management.

THE AGRARIAN SITUATION AND SOIL EROSION IN MAE SALAEP

Located in the northwestern part of Chiang Rai Province, Mae Salaep is a settlement made of two hamlets inhabited by Akha people. The border with Burma is just a one-day walk across the mountains, the village was established in 1907 by a first group of migrants who crossed the frontier. Several other waves of migrations contributed to increase the village population. Since the construction of the all-weather road in 1979 connecting the village to the cities and plains, Mae Salaep small-scale farmers are being integrated into the market economy. As in many other parts of mountain mainland Southeast Asia, the former agrarian system based on shifting cultivation is being replaced by a semi-permanent and cash crop-based agriculture (Trebuil et al., 2000). Since this transition started more than 20 years ago, it has reached a particular advanced stage in this area. Horticultural productions such as ginger, lychee or tea are now playing a key role. Fallow periods are already very short (generally 1 or 2 years long only), and every year more fields become permanently cultivated. As most of the farmers' fields are located on steep

slopes with angles up to 60%, the perceived increase of the risk of land degradation through soil erosion by concentrated runoff is becoming a major issue. Lowlanders accuse highlanders of aggravating the risk of land degradation through recent land use changes and threaten to further restrict their access to farm land. But whether this risk is increasing, as believed by the powerful lowlanders, or not, and how to prevent this problem is a complex issue. There is a need to apprehend the complexity of soil erosion in relation to local farming communities' practices and strategies.

Land degradation is related to agronomic and ecological factors, such as rainfall intensity, vegetative cover during critical climatic periods, or the angle and the length of the slopes (Turkelboom and Trebuil, 1998). But it is also interacting with economic, social, and political driving forces and dynamics (i.e. price fluctuations, land ownership, access to credit, off-farm employment, etc.) that determine the choice and extent of different cropping systems. Moreover, when dealing with such a problem, the diversity of concerned stakeholders must be considered. The households' integration into the market economy has led to an extensive socioeconomic differentiation among farmers having different amounts of productive resources, socioeconomic objectives, and related land use strategies (Trebuil et al., 1997). The local farming community is also interacting with other key stakeholders such as the recently established sub-district administration office, the Royal Forestry Department and other government agencies promoting rural development in the highlands.

When apprehending complex systems, it would be vain to try to analyze exhaustively all the facets of a problem. Instead, we can identify and analyze the key interacting dynamics relevant to it. The initial research question examined by the research team focused on achieving a better understanding of the interaction between diversification into cash cropping and soil erosion by concentrated runoff in this highland Akha community.

COMPANION MODELLING BASED ON MULTI-AGENT SYSTEMS AND ROLE-PLAYING GAMES IN MAE SALAEP

ComMod is a participatory modelling approach alternating field and laboratory activities in an iterative and continuous way (Barreteau et al., 2003). Its objective is to facilitate the adaptive management capacity of local communities through the collective building of a shared representation of the problem at stake, and to stimulate exchanges among stakeholders (including researchers) to identify acceptable solutions and related action plans. In ComMod, models are used in a cyclic process made of three stages which can be repeated as many times as needed: (i) Review of existing knowledge about the problem at stake and gap filling field studies to specify the questions to be examined and to supply information and hypotheses for modelling; (ii) Modelling, i.e. the conversion of current knowledge into a formal tool to be used as a simulator; and (iii) Simulations, conducted according to an experimental protocol, to challenge the initial understanding of the system and raise new questions for new field studies, etc. (Bousquet et al., 2002). This method is flexible and adaptive by its very nature. It should be adapted to each context and to the local stakeholders' suggestions and agenda.

In this experiment, the following simulation tools were closely associated:

(i) Multi-Agent Systems (MAS). They belong to the emergent field of Distributed Artificial Intelligence (Ferber, 1999). They are particularly appropriate to represent and simulate complex agroecosystems to examine natural resource management problems because they focus on interactions among heterogeneous social agents, the agents here are the various users and

resource managers with their own interests and strategies, and between these agents and their common environment such as a cultivated watershed with its own biophysical dynamics (Bousquet et al., 1993; Lansing and Kremer, 1994).

(ii) Role-Playing Games (RPG). To involve local stakeholders in the modelling process, in this experiment, we choose to translate the MAS model built by researchers into a Role-Playing Game (RPG). To play this RPG helps local stakeholders to understand the structure and operation of the computerized MAS model, and gives them a chance to validate, to criticize and to improve it. Such a transformation is possible because MAS have similar features to RPG: agents corresponding to roles, the spatial interface to the gaming board, the time step in a simulation to a game round, etc. (Barreteau et al., 2001).

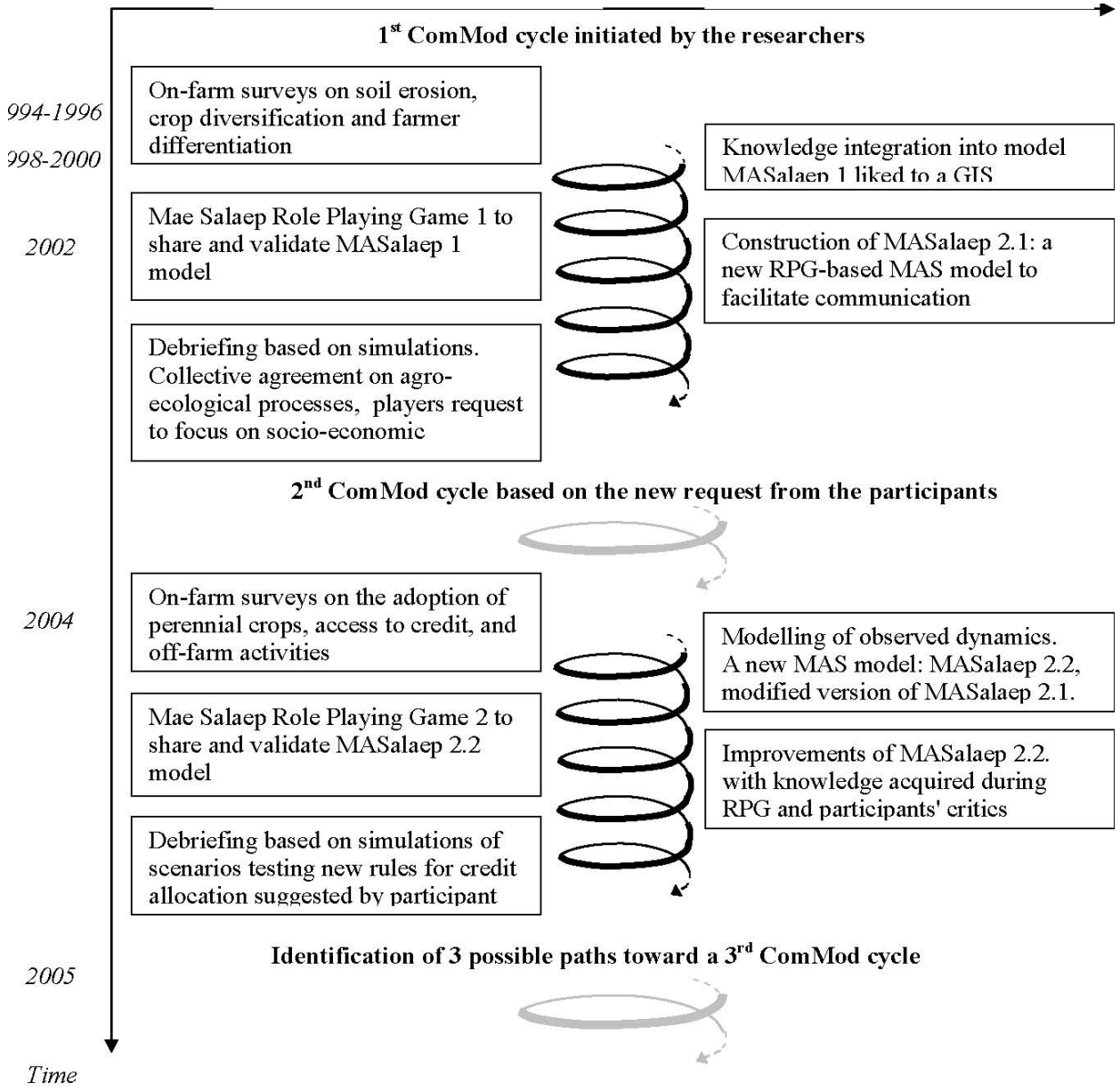

Figure 1. The iterative companion modelling process alternating field and laboratory activities during two cycles carried out in Mae Salaep, Chiang Rai Province, upper northern Thailand.

Figure 1 displays the main methodological phases implemented in this case study. The first participatory modelling cycle carried out during 1999-2002 is described in detail elsewhere (Trebuil et al., 2002). At the end of this first cycle combining the design and use of two MAS models and a RPG, the local stakeholders requested to change several features and rules of the tools to update them and to better represent their new preoccupations. The second ComMod cycle was implemented accordingly with the following steps:

(i) Field survey to collect information about the new problem to be examined,

(ii) MAS modelling of the observed dynamics,

(iii) Conception and implementation of a new RPG associated to this new MAS model.

Two gaming sessions were implemented during the first day of a participatory workshop held in the village in May 2004. The first gaming session was played according to the organizers' representation of the system and was followed by a short collective debriefing. Players were asked to suggest changes to make the RPG more in touch with their representation of reality, or to test a given scenario to solve the problem at stake. The second gaming session was played according to the suggested new features and rules,

(iv) Individual interviews of the players the following day to better understand their behavior during the game, and to evaluate the short-term impact of the game,

(v) Modification of the new MAS model to integrate the participants' suggestions for improvement and new knowledge acquired during the game,

(vi) Plenary session of participatory simulations on the third day using this improved MAS model to support a negotiated agreement on a desired situation among stakeholders, and to explore several scenarios identified by them for reaching this objective,

(vii) Back to the laboratory, more advanced simulations of scenarios were carried out (Barnaud et al. forthcoming),

(viii) More interviews with players were also carried out to assess the impact of this ComMod cycle on their perceptions of the problem and behavior, the usefulness of the process according to them, and their wishes regarding a third ComMod cycle.

COMMOD IN ACTION: CO-LEARNING AMONG AKHA VILLAGERS

The first researchers' model and the villagers' requests for changes

The research team built a first MAS model to synthesize the existing knowledge about the interactions between crop diversification, soil erosion, and households' economic differentiation. This model was used to conceive a first RPG to confront this research team’s understanding of the situation with that of the local stakeholders'(Trebuil et al., 2002). The knowledge acquired during the game was used to build a second and much simpler MAS model, very similar to the RPG in its rules and features and therefore easier to understand for the participants. This simpler model was used to support discussions and exploration of scenarios with them.

The participants validated the researchers' representation of the agro-ecological aspects of soil erosion, but they requested changes in the model to focus on the expansion of perennial crops in the catchment, as this came out as their preferred way to alleviate the land degradation problem. They requested to integrate more perennial crops and to focus on socioeconomic aspects closely related to the adoption of plantation crops, in particular access to credit, off-farm employment, and price fluctuations (Fig. 2).

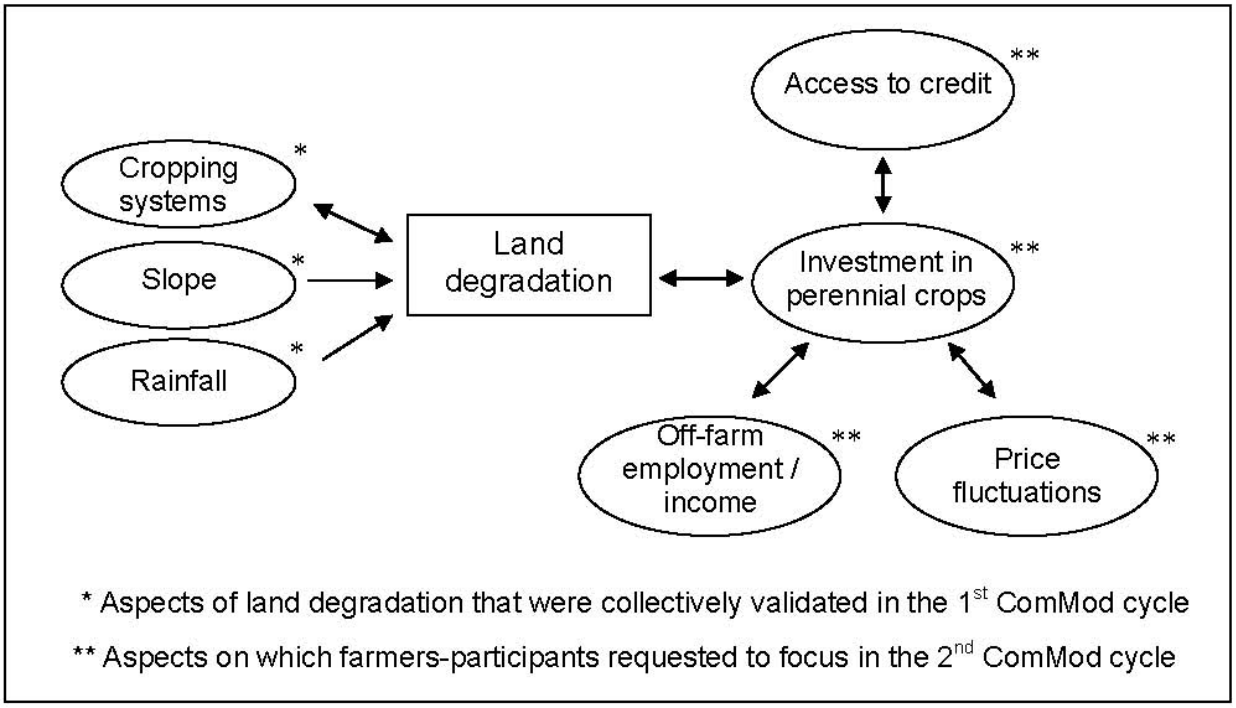

Figure 2. The shift of focus from agro-ecological to socioeconomic aspects of land degradation along the successive ComMod cycles in Mae Salaep, Chiang Rai Province, upper northern Thailand.

Perennial crops are seen by the villagers as a way to alleviate land degradation while providing more stable farmers' incomes. Moreover, as they require less labor than annual crop, they provide more time for off-farm employment. Two perennial crops dominate in the watershed. Lychee was introduced in the early eighties but remained accessible to the wealthiest farmers only. More recently, green tea has been expanding and is accessible to a broader range of farmers because it requires no input, reaches maturity faster, and has a more stable market price than lychee. Farmers call it "the plantation crop of the poor". However even green tea plantations are not accessible to all villagers as a several years long wait is needed before harvesting the first leaves. In fact, the possibility to invest in perennial crops is closely related to access to credit.

Adaptation of the model and the role-playing game to stakeholders' preoccupations

As requested by local stakeholders, the objectives of this 2nd ComMod cycle were as follow:

(i) To better understand the interactions between the adoption of perennial crops by the different types of farmers, access to credit, and off-farm employment.

(ii) To stimulate exchanges about this question between researchers and local stakeholders, and among local stakeholders themselves.

Understanding the local system through an on-farm survey

Two credit systems co-exist in the village: formal and informal credit. Informal credit corresponds to loans arranged among villagers, either without interest within networks of acquaintances, or with high interest rates (more than 5% per month) when loan sharks are

involved. As for formal credit, beside a traditional village fund created 10 years ago, a new government fund was made available in 2002. The older village fund provides small amounts of cash to any household, with interest rates fluctuating between 2 and 5% per month. The new government fund provides larger sums, without interest, but is only accessible to well-off households. This is because only these households can guarantee that they will manage to reimburse the loan. This unequal distribution of the government fund is only partially compensated by its redistribution through informal loans within networks of acquaintances. But as those networks are usually small and quite homogeneous, there is a number of small landholders, acquainted with households as poor as themselves, with no access to this credit.

A new model to represent the observed dynamics

The objective of this new model was to represent the new complex problem under study according to the various stakeholders' perspectives, and to support collective identification and assessment of possible future scenarios.

As two models were already available (a "technical sound" one linked to a GIS, and a more simple one based on the RPG), we did not start from scratch to build this new model. Because the stakeholders were more comfortable with it, we chose to improve the simplified RPG-based MASalaep model to strengthen the appropriation of the modelling process by users. Changes made from this MASalaep model to produce the MASalaep 2 version were needed to fit the evolution of the agrarian situation (introduction of green tea, new access to government fund credit, further differentiation among households) and to tailor it to the shift of focus from agro-ecological to socioeconomic aspects, particularly modelling of decision-making processes regarding investment in perennial crops, formal and informal credit, and off-farm activities. Figure 3 displays the new attributes and methods assigned to the MASalaep 2 model entities (in particular the "Farmer" entity), as well as the new social entities, such as "Credit Sources", added in this new version of the model.

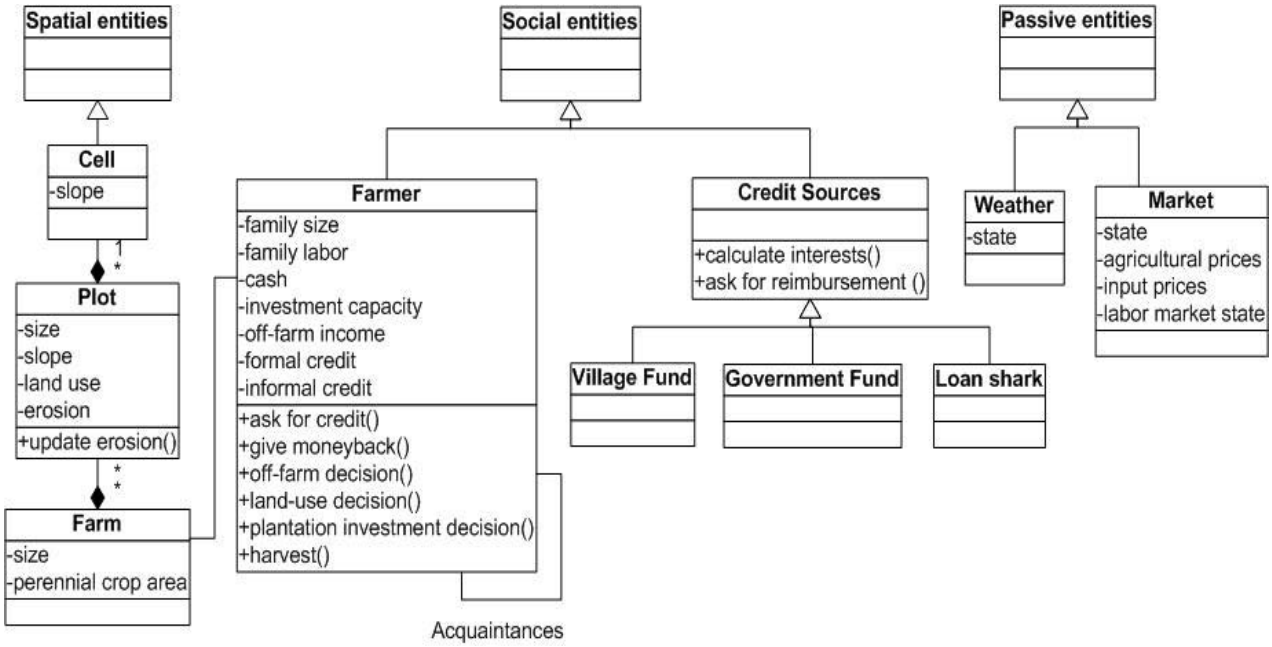

Figure 3. Class diagram of the MASalaep 2 model.

In the model as in the game, there are twelve farmer-agents. The time step is the cropping year. During each simulation, 15 time steps, i.e. 15 successive cropping years, are run. To represent informal credit, each farmer-agent is assigned two acquaintances among the other agents. Each year, if credit is needed, a model agent will try to find the required loan successively with the government fund, his acquaintances, the village fund, and, as a very last resort, through loan sharks. When an agent is indebted with loan sharks, he sends all his family labor to work in off-farm activities. If this does not allow him to raise enough money to reimburse his debts with the loan sharks, this agent disappears as he is forced to sell his land and to leave the village. A labor constraint was also introduced into the model. Each year, the agents decide whether they assign family members to off-farm opportunities or not, knowing that off-farm employment may limit the areas planted to annual crops, and that planting perennial crops might be a strategy to send more family labor off-farm.

Box 1. Presentation of the main rules and features of the second Mae Salaep role-playing game.

Each participant plays the role of a farmer managing a set of fields located on different slopes of a 3D block model representing a catchment. The 12 players-farmers are given various amounts of land, labour and capital according to the actual farming conditions of the three main types of farms present in the village (types A, B and C for small and cash crop-oriented, medium and conservative, and largest and diversified farming households, respectively). There are 3, 6 and 3 players representing type A, B and C respectively, played by farmers who actually belong to these categories. During each gaming round (corresponding to one crop year), the players successively assign a given crop to each of their fields (taking the labor constraint into account), harvest their products, observe cash crop prices conditions, go to the market to sell their products, pay for their annual expenses, draw an "exceptional expense card" which they have to pay for, draw an "off-farm opportunity card" which they can accept or refuse, and finally go to the credit desk to ask and/or reimburse credit if needed. At any time they can exchange money with other players. Each year, the general climatic and market price conditions are determined by drawing a card at random. The annual incomes obtained by players depend on their choice of crops, the level of prices for cash crops, and the two "chance cards". Six cropping years could be played within two half day gaming sessions.

A new role-playing game to share the model with stakeholders

The objectives of this new RPG were as follows:

(i) To stimulate exchanges between researchers and stakeholders, i.e. to “open the black box of the model” (Barreteau et al., 2001) and give them a chance to validate, criticize or improve it,

(ii) To stimulate exchanges among the farmers-participants with various interests, land use strategies, and perspectives on the problem.

To facilitate the model sharing, its associated RPG displays very similar features and mode of operation. Consequently the changes made in Mae Salaep RPG 1 to conceive this second RPG were almost the same as the modifications made in the MASalaep model to build its second version. Because a gaming session should not be too long and must remain lively, we could not

add more features and rules linked to socioeconomic processes without simplifying some agro-ecological features related to soil erosion. The main principles and rules of this new game are presented in Box 1.

Gaming sessions, discussions and collective exploration of possible future scenarios

What happened during the game?

Box 2 and the related photographs provide an example of the dynamics generated by the RPG.

Box 2. Dynamics observed during two gaming sessions of the Mae Salaep second role-playing game on 26 May 2004 in Mae Salaep village of Chiang Rai Province.

During the first gaming session, medium-sized and large landholders (type B and C) invested massively in tea and lychee plantations and made extensive use of both formal and informal credit. The small landholders (type A) chose much less risky strategies by "growing" mainly low input annual crops. Because everybody needed cash, the players were eager to draw off-farm opportunity cards. Off-farm income was a main source of cash and this kind of revenue was extensively redistributed among players through numerous informal exchanges.

This first gaming session was followed by a short collective debriefing. The participants noticed that type A smallholders were the only ones who did not invest in plantation crops because they lacked access to credit. An old participant suggested to solve the problem with informal credit: "It is not possible to change the rules of formal credit. Informal credit is more efficient. They should ask me, I would agree to lend them money without interest." On the other hand, some younger participants suggested changes in the formal credit: they proposed to try a 3-year grace period for smallholders under the government fund. Type A farmers said that to be able to reimburse their loans, they should be allowed to send all their family workers to off-farm employers until the plantations reach maturity.

This new rule was tested in the second gaming session: all the smallholders invested in small tea and lychee plantations and succeeded in reimbursing their loans.

Exchanges stimulated by the game

The first gaming session revealed the social inequity regarding investments in plantation crops because of unequal access to credit. All the participants accepted that this situation represented the real circumstances and constituted a problem. This collective agreement stimulated discussions among them. Questions were raised such as: how could they change the rules of formal and informal credit so that smallholders (type A) have a better access to credit? Is it possible to change those rules? Would the smallholders benefit from such a change or would they face a too high risk of bankruptcy? What would be the consequence of such changes for the medium-sized and larger landholders (types B and C)? They exchanged their views on these topics and proposed possible solutions, one regarding changes in informal credit, the other one dealing with new rules for formal credit (See Box 2).

Photo 1. Explanation in Akha language of the features and rules of the game.

Photo 2. Discussion about credit between two players in front of the "credit desk"

Scenarios identified, selected, and simulated

The game succeeded in stimulating discussions and suggestions of scenarios by the stakeholders, but only one new scenario could be played within the afternoon. To remove this time constraint and be able to test more scenarios, simulations could be run by using the MASalaep 2 model with the participants. During the participatory simulation sessions, they could understand the functioning and the limits of the model. It was legitimized in their eyes as they participated in the modelling process through validation and suggestions of improvements.

The two tested variables in the simulations were the rules for informal credit (the shape of networks of acquaintances, Fig. 4), and the rules for formal credit (duration and allocation of the government fund).

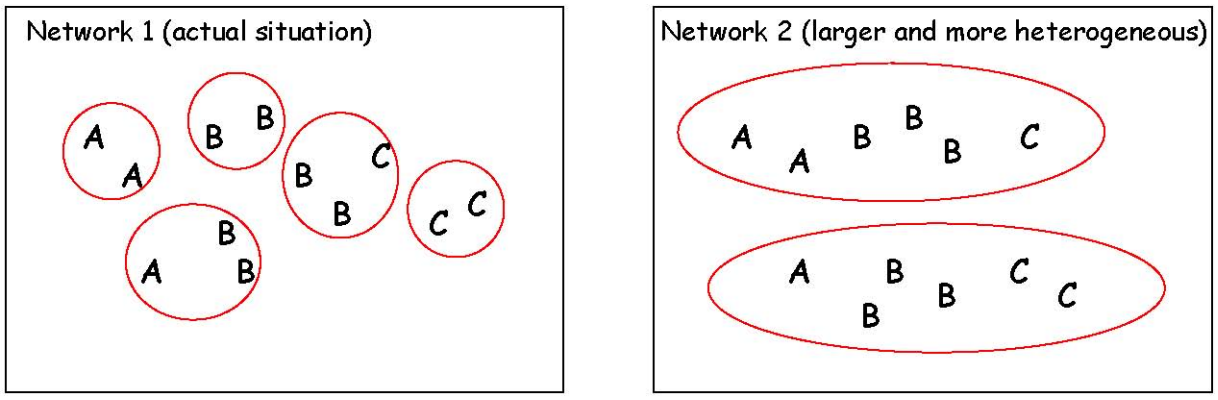

Figure 4. Different social networks among three (A, B, C) types of farms to regulate the distribution of informal credit in the simulations.

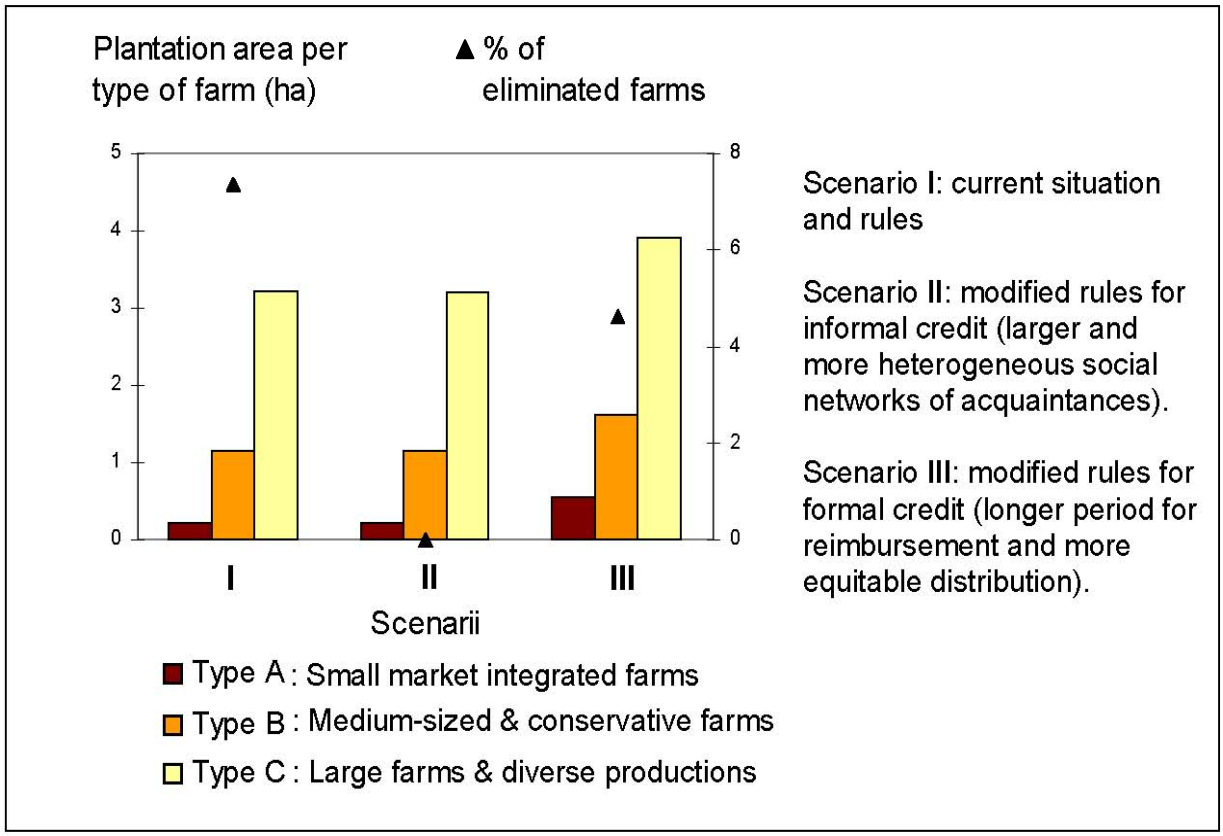

Figure 5. Results of simulations exploring the effects of various rules for the allocation of formal and informal credit on the adoption of perennial crops and farmer's differentiation.

Three scenarios were tested collectively (Fig. 5):

(i) The first scenario corresponds to the current situation; rules for the operation of formal and informal credit are similar to actual ones: one year long loans from the government fund distributing 0, 10, and 20 thousands Bahts to type A, B, and C farms, respectively.

(ii) The second scenario tests new rules for the operation of informal credit corresponding to the suggestion of an old player: the lack of access to credit of type A smallholders should be solved through informal credit. This is translated into a scenario with larger and more heterogeneous social networks allocating informal credit. This scenario is very efficient to reduce the number of bankrupt smallholders but does not allow them to increase their investments in plantation crops. This is because they borrow money from their acquaintances only for urgent needs, not for investment. Moreover, this scenario is very hypothetic because there is no explicit rule in the current functioning of informal credit.

(iii) The third scenario is implemented with a new set of rules for formal credit: 3-year-long loans of 12, 24, and 54 thousand baths to type A, B, and C farms, respectively. This option enables the three types of farmers to invest significantly more in plantation crops. If the loan is rather small, smallholders manage to reimburse it. They face less risk of bankruptcy than in the current situation thanks to the incomes from their plantations. However, this solution is less efficient than the previous scenario (type A villagers acquainted with Type B and C villagers) to reduce their risk of bankruptcy.

Photo 3. Plenary session of scenario simulations with MASalaep 2.2 model.

Photo 4. Divergence of opinions and debate about allocation of credit.

LESSONS FROM THIS COMMOD EXPERIMENT

Usefulness of the ComMod process for the researchers: a better understanding of local stakeholders' perspectives on the system

The game associated to the model efficiently triggered an interactive exchange of perspectives between researchers and local stakeholders. In the first ComMod cycle, the latter were invited to react on the representation of the land degradation process as seen by the research team through the game. They could express their own perspectives on the problem and suggest their preferred way to alleviate it, i.e. to reflect on the expansion of perennial crops in the catchment and the socioeconomic constraints preventing smallholders from investing in these crops. The process enabled the research team to better understand local farmers' preoccupations and to adapt their tools accordingly. The simulations with the new model integrating villagers' perceptions allowed the researchers to elucidate the specific and complementary roles played by formal and informal credit in the dynamic process of expansion of perennial crops. Formal credit is potentially more efficient than informal credit to stimulate investment in perennial crops, whereas informal credit is potentially more efficient than formal credit to reduce the risk of bankruptcy among small and resource-poor farmers.

The game and the discussions it stimulated enabled the research team to better elucidate tacit knowledge about the distribution of power among villagers related to the decision-making process dealing with the allocation of formal credit. Such tacit knowledge explains the difference between the way people say they behave (this corresponds to the limited knowledge acquired from previous interviews) and their actual behavior (which could be observed during the gaming sessions).

Usefulness of the ComMod process for the villagers: a better understanding of each other's perspectives on the system

The first element emerging from interviews with participants was the fact that the experiment allowed them to better understand each other's situations and points of views by providing a platform for communication. In particular, most of the medium-sized and large farm owners said that they had the opportunity to think about the situation faced by smallholders. The

game triggered an initial phase in which local stakeholders exchanged their views on a problem and discussed together to set a goal and to define a desired situation. One of the village leader declared that "in every day life, everybody has his own problems, people do not have the opportunity to think about others' situations. There is no place where we can think all together".

The second element of learning by local stakeholders deals with their improved understanding of the complexity of the system, thanks to experimentation in the game and exploration of scenarios to reach the desired situation. As this village leader said: "The players can try how to plan to invest in plantations themselves. It is more efficient than speaking." According to another player, the game "helps to think in advance" because during a gaming session, players could observe six cropping seasons and assess the effects of their choices. "In every day life we do not have the opportunity to think in advance. We can only think to grow maize each year to buy and eat rice", he added.

A major part of the success of this learning process could be due to the fact that the model has become "theirs", corresponding to their representation of the system in a process examining the very questions they raised in succession. This required very flexible simulation and gaming tools to ensure an easy and rapid adaptation to the context and to the continuous learning process, and the availability of model developers who genuinely want to understand the rationality of the local stakeholders.

Is ComMod providing a democratic platform?

A player said that the game was a kind of democratic process where all voices could be expressed. It would be ideal, but is it really the case? And if yes, could they all be heard?

The first risk is that the players do not dare to emit any criticism in the presence of Thai or western researchers, or government officers. This is especially true in the context of northern Thailand where ethnic minorities are used to more top-down kinds of interventions. The second risk is that people of little influence do not express themselves in the group, in particular Akha women who are rarely able to speak Thai because they are less involved than men in off-farm activities. "In Akha communities, women work, men speak", said a female participant. Still, their voice is essential as they are the most active actual users of natural resources.

Individual interviews as well as the ice-braking playful mood of the game were two key solutions to reduce these risks and to ensure that all voices could be expressed. But whether they were all heard and taken into account is another matter.

According to Van der Veen (2000), in a communicative learning process, the phase during which participants synthesize the diverse expressed facts and arguments to formulate a "collective" solution is determining. It is at this stage that the most influential or intelligent participants risk to impose (consciously or not) their point of view. Therefore there is a need to draw a special attention to the composition of the group of participants. Researchers and participatory workshop organizers should be aware of the status and social role of the participants in the community to be able to interpret correctly the collective discussions and agreements stimulated by ComMod process. In our case, one of the two participants who formulated the suggestion for changes in the rules of formal credit allocation is the leader of the catholic community in the village. He does not express himself very easily in groups; he is not a well-off farmer, but is an innovative farmer other villagers observe and imitate "because he is clever and always make good choices," in the words of one of them. Such leaders are essential to trigger processes of collective learning and action at the village level, but facilitators should be aware of the risk that these leaders' suggestions might not reflect all villagers' interests.

CONCLUSIONS AND PERSPECTIVES

This ComMod experiment succeeded in facilitating a learning process with and among Mae Salaep farmers, but it has not yet clearly led to a concrete impact in their community. A major explanation for this major limitation could be the lack of institutional support. People, rules and practices are embodied in an institutional context. If within a community people want to change things, they need the support of higher level institutions. There is a need to facilitate dialogue between these two levels and to reinforce institutional linkages in a bottom-up way to increase the impact to this ComMod process. Official representatives of institutions were neither integrated into the model nor invited to the participatory workshops so far because we believed that their presence could have intimidated villagers and brought the collective discussions to a standstill. But it seems that, now, the participants feel confident enough and even willing to integrate them in the collective learning process. When they were asked what other stakeholders should be invited to take part in a future gaming session, they answered that the Tambon Administrative Organization (sub-district level) officers should be in their own role in the game, "so that they know what is happening in the village".

The 1997 so-called “People Constitution” and the re-establishment of Tambon Administrative Organization at the sub-district level constitute important opportunities to remodel the traditional centralized institutional framework that favors dialogue and a balance between local communities and the bureaucracy. Such a dialogue is particularly necessary in the context of mountain mainland Southeast Asia because institutions have long been biased against ethnic minority groups often accused of damaging the environment. A dialogue favoring a better mutual understanding and listening of local farming communities voices is needed to counter a common prejudice against poor people in this region.

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