# Learning Devices and Mediation Tools for Collective Management of Natural Resources: Experiences from Vietnam

Jean-Christophe Castella
IRD, Montpellier, France

## Abstract

In the uplands of northern Vietnam the successive policy reforms that accompanied agricultural de-collectivisation triggered very rapid changes in land use. From a centralised system of natural resource management, a multitude of individual strategies emerged which contributed to new production interactions among farming households, changes in landscape structure, and conflicting strategies among local stakeholders. Within this transitional context, learning devices and mediation tools helped local communities to collectively design their own course of action for developing sustainable natural resource management. This paper describes a collaborative approach combining a number of participatory and geographical representation tools (i.e. participatory 3-D models, spatial graphic models, multi-agent computer models, role-playing games and GIS) in order to analyse and represent the interactions between: i) decision-making processes by individual farmers based on the resource profiles of the farms; ii) the institutions which regulate the access to and use of resources; and iii) the biophysical and socio-economic environment. This methodological pathway can lead to a platform for negotiation on natural resource management. In this paper this methodology is illustrated by a case study in Bac Kan province of Vietnam. Geographic information generated through a participatory process was incorporated into a village level GIS. By then coupling a multi-agent model with this GIS a virtual world was created, accurately reproducing the real world which had been analysed on-site by an interdisciplinary team. This modelling tool facilitated discussions between researchers with different disciplinary backgrounds and led to a common graphic language among scientists and local stakeholders. To take into consideration the extreme diversity and complexity of recent changes in the local situation, increasingly realistic models were developed in association with local stakeholders. These collective learning devices helped create and explore different possible scenarios along which the agricultural and natural environmental could evolve with time. The tools were gradually refined through interaction with different groups of stakeholders and were used for mediation between villagers and district policy makers to formulate natural resource management options compatible with regional development plans. A key lesson learnt from this experience is that the level of realism/abstraction of learning tools used needs to be adapted to each issue raised during the collective negotiation, as well as to the nature of the participants (e.g. farmers or decision makers).

*Keywords: natural resource management, learning devices, participatory GIS, decision support, levels of abstraction, Vietnam.*

## 1. Introduction

In Vietnam, agricultural decollectivisation took place from the early 1980s through to the mid-1990s. In the northern uplands this process led to dramatic changes in household land endowment, which in turn modified the social interactions within the farming community (Rambo et al, 1995; Jamieson et al, 1998). A farming-systems study conducted in Bac Kan province showed that these policy changes contributed to rapid socio-economic differentiation among households (Castella and Dang, 2002). Sadoulet et al. (2002) showed that, under the successive land allocation reforms, family labour force composition influenced individual farm resource endowment. Farmers' production strategies were driven by the changes in land and capital endowments relative to their family labour force and by requirements for rice production needed to secure food self-sufficiency. Individual household strategies also depended on the resource endowments of their village (for example, the quantity of lowlands, forest quality, soil types, and population) which therefore led to highly diverse land-use patterns. In short, a diversity of farm strategies combined with a very heterogeneous environment led to multiple pathways for land-use change at the watershed level. As a consequence, no single policy could tackle the issues related to natural resource management that had arisen during the past decades (Castella et al, 1999). The extreme diversity in local situations resulting from these recent changes was also challenging 'classical' participatory research approaches. To overcome these problems, a new methodology was developed combining role-play and multi-agent models with more classical methods. This methodology is illustrated in this paper by a case study, conducted in Bac Kan province, to investigate the interactions between livestock, crops and forest systems in upland areas. This experience raises new questions about how participatory research can adapt to such dynamic and diverse environments.

## 2. The limits of participatory and non-participatory land-use analysis for collective action

### *2.1 Participatory Rural Appraisal*

Prior to the launch of this research programme, several development projects had been conducted in Bac Kan Province. The main results and achievements of these projects were reviewed in order to build upon their existing successes and pitfalls in supporting collective action in natural resource management. These projects typically started with a one-week participatory rural appraisal (PRA) intended to assess community needs and identify development issues and intervention points, based on local knowledge (Le et al, 1996). The PRA exercise provided a very rapid overview of the history and geography of the commune, based on local knowledge and available statistics. It led to a long list of recommendations. For those proposed activities that were both high priority and feasible, a work plan was designed by the project team and then implemented under the supervision of a project steering committee. The PRA raised the entire community's awareness of local development issues.

Thereafter, it became easier to mobilise villagers around activities that benefited the whole community. However, many issues involving coordination among households or community-based management, though ranked as priorities - e.g. upgrading of an irrigation system, alternatives to free-roaming livestock, and the reorganisation of forest protection regulations - were not tackled by the project. There were three main reasons for this. Firstly, the project managers were under pressure to deliver rapid, visible results that could be measured by a project impact monitoring system and within a relatively short period. Secondly, the PRA process raised new issues that could only be addressed satisfactorily by further complementary research (e.g. sustainable cropping systems on the slopes, future market opportunities for different cash crops). Instead of launching specific research, the project gave priority to those problems that already had ready-to-use solutions. Furthermore, the project simply complied with farmers' ideas, which were often influenced by the 'fashion of the moment', as relayed by agricultural extension services: new rice varieties or pig breeds, cinnamon, apricot, *Tephrosia* contour hedgerows, etc. Cash crop selection was not based on preliminary market analysis, and this resulted in a sharp fall in price once the very small market became saturated with the product (especially for apricots and cinnamon). Thirdly, coordination among stakeholders requires complex social learning and consensus building processes. These processes take a long time, and tend to bring to the surface latent tensions or conflicts which disrupt social harmony. As a consequence, the most successful activities were those that could be managed individually and that rapidly improved household well-being (sanitation and clean water supply systems, credit schemes, etc.).

Though interesting discussions on integrated management of natural resources took place among stakeholders during the PRA, these did not lead to collective action. This can be explained by the nature of PRA itself. Although this method is very appropriate for generating agro-ecological and economic information in a very short time, it is not a good tool for analysing social interactions (Mosse, 1998). Local power structures, influence and dependence relationships, and disputes could not be addressed satisfactorily, even though the instigators of the PRA were convinced that an understanding of these social interactions was essential for promoting community-based natural-resource management (Castella et al, 2004). Informed collective action required more refined investigations of the social, agricultural and environmental context of farmers' decisions and interactions.

### 2.2 Monographic studies

At the end of the 1990s, a number of PhD students in anthropology, human geography and political economy did their field research in Bac Kan or neighbouring provinces. They compared their observations of the changes, due to decollectivisation and land reforms, that occurred in several villages with contrasting human and natural environments. The students stayed in the villages for long periods of time and enjoyed regular informal interaction with the local populations, building up reciprocal and trusting relationships. These long-term monographic studies provided precious

empirical evidence concerning the changes that occurred in local management of natural resources and in traditional social networks. However, the students invariably faced a methodological challenge when compiling information collected over long periods of time. In this transitional context, the established rules and norms that governed the local socio-ecological system were not relevant, and farmers could no longer rely on their historically rooted knowledge base or on stable management models. The farmers were faced with a situation of great uncertainty and were forced to constantly adapt to their changing environment. Reconciling information obtained from different sources at different periods into coherent narratives about ongoing changes became a very difficult task. Observed at the landscape-community level, the agricultural system seemed to be merely the sum of the uncoordinated strategies of different stakeholder groups. Observed at the regional level, land-use changes resulted from generalised uncoordinated individual actions, and were therefore highly unpredictable, for example when Tay farmers reclaimed the paddy fields that their ancestors had given to the cooperatives twenty years before. Information assumed to be correct one day was thus questioned the next day, and differed greatly from place to place. Responses obtained to the same question from the same respondent was often different on a monthly basis. This led to doubts as to the reliability of the informants or even the villages under investigation. In-depth research in a limited number of sites was not sufficient to understand the variability in the direction land-use changes were taking at the local scale.

### *2.3 Multi-scale land-use systems analysis*

To reconstruct the whole picture of regional land-use changes, the study began with a fairly conventional analysis consisting of three successive steps conducted by an interdisciplinary team (Castella and Dang, 2002). The agro-ecological zones in the district were classified based on available maps, statistics and stakeholder meetings. Commune-level sites were then selected for more refined studies, based on their representativeness of the district's diversity. The changes in local agricultural systems over the last five decades were studied by open interviews with key local informants (elders, officials, etc). The spatial dynamics in the region were determined by interpretation of aerial photographs (1954, 1977 and 1989) and satellite images (1990, 1995, 1998 and 2001). On-farm surveys were conducted with 300 households, representative of the diversity observed in the previous stages. Semi-structured interviews were used to investigate farmers' decision-making processes and farming system differentiation patterns.

Land-use systems are driven by people's needs and objectives, which in this case were affected by a rapidly evolving socio-economic environment. One important outcome of this research was related to the interactions among livestock-crop-forest systems at the watershed/village level and their impact on agricultural sustainability (Eguienta et al, 2002). Indeed, interactions between livestock management and cropping practices in the uplands illustrated the problems arising from poor coor-

dination between groups of farmers pursuing different strategies. Under the cooperatives, livestock was managed by specialised brigades that closely controlled their movements in the villages. During agricultural decollectivisation, buffalo were distributed to households. This led to dramatic changes in animal husbandry practices. For Tay households, who mainly rely on lowland rice cultivation, mobilising a family member every day of the year to take care of a few buffalo became a real burden. Thus most Tay let their buffalo roam in the uplands, allowing them to graze in pastures and forest during most of the year, when the animals were not needed for ploughing, and checking the status of their herd once every week or two. In contrast, Dao communities, who rely mainly on slope cultivation, generally have their buffalo watched over by a child or an elder almost year-round in order to avoid animal damage to their upland crops. The number of conflicts between Tay and Dao villagers multiplied because of crop damage by roaming animals. The roaming of livestock in the village territory was clearly identified as a constraint to the diffusion of cropping systems as alternatives to slash-and-burn practices. Three management options were possible. The first option was for individual farmers to build fences or dig trenches to exclude livestock from specific land units. The second was to reinstate centralised management of the village livestock herd. The third option, now that the herd had been distributed to a large number of individual households, required collective negotiation of new livestock management rules at the community level.

The three diagnostic methods presented above all showed that the first option was inequitable because richer farmers could more easily enforce the rules they individually imposed over the whole community. This tended to maintain and reproduce pre-existing power relations. The community rapidly reached a consensus against the second option, which reminded them of the cooperative period and poor individual control over decisions made in the name of the collective (Castella et al, 2005c). The third proved the most satisfactory, provided that a consensus could be reached through an open, participatory process. While the three methods used by the team arrived at complementary diagnostic findings - e.g. the history of the problem, the complex mechanisms involved, the diversity of viewpoints and interests, the local power structure and identification of the key players - these did not provide a pathway towards collective action. A rapid, adaptive method was needed to cope with the rapid changes in the socio-ecological environment, while "evading cooption by local politics" (Richards, 1995) so that the local communities were fully in control of the whole negotiation process. These two conditions were essential to the effective implementation of the collectively constructed solution to the common problem.

## 3. Learning devices and mediation tools for collective action

Farming households were under pressure to adapt to rapidly changing production conditions; and research communities also felt constrained to rapidly propose technical and institutional innovations to accompany these on-going changes. A compromise was needed between rapid dissemination of research results and the steps necessary to validate the proposed innovations and avoid unexpected adverse consequences. It was previously shown that a researcher's capacity to respond to farmers' needs and expectations determines the willingness of local populations to further contribute to participatory field activities (Castella et al, 2004). Thus beyond the diagnostic phase it was necessary to engage both researchers and local stakeholders into action-research to rapidly deliver visible and convincing results, i.e. adapted to the local needs and circumstances.

The SAMBA computer model (fully described in Castella et al, 2005a) was designed to mimic individual management of natural resources and the resulting impact at the watershed-village scale on land use and local institutions. This model was parametrized based on data collected during the land use analysis stage and was used to test the main hypotheses derived from field studies. For example, it helped explain that land use in the uplands was affected by the rules used to distribute lowlands to households in the early 1980s. This simulation platform made it possible for a group of scientists from different disciplines and backgrounds to test explanatory hypotheses on poorly documented land-use changes that had occurred in the past. Although it met researchers' expectations, this computer simulation tool had to be made accessible so that local stakeholders could use it to work out their problems, build scenarios, and define pathways towards concrete action. Instead of examining past situations, the tool was modified to explore future scenarios. It became clear that major changes to local institutions and rules would be necessary to induce changes in land-use patterns. A two-way communication network between scientists and local stakeholders could facilitate this collective process towards more sustainable natural resource management. For this, the SAMBA multi-agent model was translated into a role-playing game, prompting and incorporating local knowledge to improve its representation of the most recent changes in land use (Boissau et al, 2004). This role-playing game, using a wooden game board, was designed using the main rules of the initial computer model and was played by ten local farmers selected to represent a diversity of conditions and production strategies. Repeating these participatory simulations at different locations and in different contexts enabled the team to generate decision rules that were further incorporated into a new generic version of the SAMBA model (Boissau and Castella, 2003). It was checked that the resulting model i) correctly simulated the most recent changes in land use after the allocation of forest land to individual farmers, which started in 1993, and ii) could generalise findings from successive participatory simulation sessions to the entire province. The multi-agent model was first validated by comparing simulated and observed land-use maps, and then by submitting its findings (i.e. simulated scenarios of land-use change) to local stakeholders in two communes which had not been previously exposed to the

SAMBA process (Castella et al, 2005b). This participatory assessment was crucial for confirming that the model developed was applicable to the entire province without needing to repeat the intensive data collection effort over a large number of sites.

The main steps and model formalisms constituting the SAMBA methodology (i.e. narratives, graphics, multi-agent model, role playing game) provided a common frame of reference for all participants in the participatory simulations conducted at different locations. In all versions of the SAMBA model the agents - household, buffalo - and the environment were the same. The colours used to represent different land-use types were similar, and so was the grain (grid cell size) and extent (village) of the simulation interface. The size of the grid cell (1,000 $m^2$) was the unit of area measurement commonly used by upland communities in northern Vietnam. The village was selected as a coherent entity in terms of its biophysical (watershed), social (community) and geographic dimensions. All the technical choices related to the visualisation devices came from regular interaction with local stakeholders (Castella et al, 2005c). The models thus reflected the collective process of knowledge generation by which they were created. Jeantet (1998) suggested that learning devices for collective action should carry out three main functions: translation, mediation and visualisation.

### *3.1 Translation*

This function is particularly important when cultural differences exist between participants. Clarifying, then confronting multiple viewpoints contributes to the construction of a common meaning and mutual understanding among stakeholders. This was the case during the participatory simulations organised with the SAMBA computer model, the role-playing game, and the three-dimensional and graphic models of the villages (Castella et al, 2005c). The participants were researchers of occidental culture, their Kinh Vietnamese colleagues (the dominant ethnic group in Vietnam), and local people belonging to several ethnic minority groups (Tay, Dao and H'Mong), who in fact represent the majority of the population in the mountains. Translation was of course necessary because of linguistic differences, although all participants could understand the Vietnamese language, but also because of cultural differences due to different ethnic, social or professional origins. Oral communication - between players and between players and facilitators - as well as non-oral communication was video recorded, side discussions were reported by an observer who could translate from local languages, and players' actions were registered on a monitoring sheet (e.g. number of buffalo, land use, investments). Each of the five team members reported separately on the course taken and final results of the role play. These findings were then compared during a collective debriefing, which helped assess the broad range of possible interpretations of the same actions. Indeed, the same story could be interpreted differently by each participant depending on his/her personal sensitivity and cultural background. Cultural diversity clearly enriched the collective experiment (Castella et al, 2003; Boissau and Castella, 2003).

### 3.2 Mediation

A learning device is a mediator in the sense that it favours the expression of various sometimes contradictory viewpoints, and that it reinforces their legitimacy in a context of negotiation. Mediation consists of facilitating the debate between stakeholders who are bound by a common problem, the solution of which depends on their capacity to express and exchange their viewpoints to build a shared vision of the problem, to make compromises and to negotiate. The power structure among participants was not ignored but was not, however, examined specifically because this would have required a thorough socio-anthropological study with the risk that the results would already be obsolete by the time they were released. Indeed, it was observed that the power relations among the stakeholders tended to constantly reshape with the rapid socio-economic changes. Situations of change or conflict triggered the emergence of new actors or institutions on the local scene. The model was thus an intermediary object, evolving with the stakeholders themselves according to their inputs into the game (David, 2001; Cardenas and Ostrom, 2004). For example, the environment of the SAMBA role-playing game was quite neutral at first but the players could project their own experience and ideas into the gaming environment. Through their interactions with other players, observers and facilitators, they could reshape the game with their own ideas (Boissau and Castella, 2003).

A few days after each SAMBA role-playing session, participants were systematically and individually interviewed. The interviews investigated the links between how farmers made decisions and behaved during the game and the reality of their own lives. Their lack of experience with the game pushed them to use their own local frame of reference and to make decisions about their virtual actions based on their own experience. For example, during a gaming session a real event that had created severe tensions within the village was spontaneously replayed by the participants. One of the commune officials had taken advantage of his position and good connections with the forestry services to receive some of the best pieces of forest, and areas ten times larger than other members of the village community during land allocation. The other villagers had made complaints against him, but because the land allocation procedure was implemented legally and according to administrative rules, the land was not been redistributed. Unfortunately most of the villagers were not familiar with their local institutions. The game provided an occasion for the participants to publicly express their resentment of this incident and to start a discussion. The individual interviews with the participants provided a framework for analysing the sequence of actions and interactions between players during the gaming session. Prospective scenarios were developed to answer questions such as "what would happen if this or that local rule was modified?" and were then discussed with members of the village community who did not participate in the role play.

### 3.3 Visualisation

The new rules or management principles mediated by the computer model had to be translated into concrete actions. It was important to identify possible winners and losers among the farming households and to define mechanisms for compensation. Experience in Bac Kan that there are successive steps one has to go through between the discussion of a development scenario around a game board and its actual implementation (Castella et al, 2005c). Visualisation tools were very helpful in discussions because as the different scenarios were explored collectively, the participants could see the implications for themselves and for the community (Martin et al, 2004). The devices were adapted to the questions at hand and new representational supports were proposed when limitations were encountered using existing tools (three-dimensional models, graphic models, computer models, game boards, etc).

One of the main lessons that could be drawn from the combined use of various visualisation devices is that their degree of realism (or level of abstraction) must be adapted to the precise situation and to the stakeholders involved in the collective process. For example, simple wooden cubes representing a landscape on a game board meant that the behaviour of villagers during land allocation could be explored without inhibitions, thus overcoming a number of taboos and conflicting issues that constrained open discussions on this topic. The participants could express the general principles and beliefs underlying their decision making process more openly than they would have done with more realistic supports such as aerial photographs or a three-dimensional model of the village. Indeed, when the simulation environment closely resembled reality, so that participants could precisely locate their own or a neighbour's field on the visualisation support, then emotional aspects associated with the interactions came to the fore. Discussions then became location specific and were thus distracted from the initial purpose of determining general rules and "common higher principles" which transcend individuals and bring them together as a community (Boltanski and Thevenot, 1991). An even higher level of abstraction was used in an experimental economy to study the emergence of collective rules or institutions. A simple grid representing the presence/absence of a resource at a given location, or gain/loss based on game theory, can serve as a support to explore the relations between the individuals and the collective (Boissau, 2005; Ostrom, 2006). However, when the discussions turn back to concrete action, the mediation devices need to be anchored in much more realistic representations, making it possible for each participant to evaluate the consequences of his/her own individual decisions (Castella et al, 2005c).

It can be concluded that the developed learning devices fulfilled all three functions of translation, mediation, and visualisation. They provided a concrete, visible link between two processes: collective action and knowledge generation, which are inseparable outcomes of action-research.

## 4. Communication platforms and social learning for adaptive management of natural resources

For the researchers, the scientific soundness of the knowledge generated through action-research is guaranteed by the quality of the collective process that leads to co-construction of the problem. For the stakeholders, the quality of the process determines the relevance of decisions or actions that are the eventual outcomes of the learning process. Consequently, an important question is how to rigorously assess the quality of a learning process. What are the criteria or evaluation methods that can be used to judge the success or failure of a collective learning process (Funtowicz and Ravetz, 1993)? In agriculture and natural resource management, evaluation procedures are far from standardised (Röling and Wagemakers, 1998; LEARN Group, 2000; Ramirez, 2001; Meinzen-Dick et al, 2004), as this research domain emerged empirically from field experiments conducted by various teams. A first attempt to unify these contrasted research practices was made by Fazey et al. (2005), who compared them to the more theoretical perspective of collective action. This implies first analysing the learning devices by considering them as traces of stakeholder interactions and then studying the "human devices" or socio-technical networks that supported these interactions (Sebillotte, 2002; Hubert, 2005). Like the learning devices, the "human devices" are both the means and product of a collective learning process (Brossier and Benoit, 2005).

Usually, researchers engage in action-research because they are asked to tackle social problems which require scientific knowledge but also have a political dimension. Their scientific knowledge undoubtedly gives legitimacy in inviting the other stakeholders to the negotiating table. The discussion that follows aims at i) enlarging the list of participants so as to take into account the various aspects of the problem; ii) facilitating the emergence of new actors and leaders, as the problems are worked out; and finally, iii) empowering the participants to secure their ownership of the collective process. Röling (1994) proposed that this social learning process should be organised within platforms of communication consisting of groups of stakeholders who share a common problem which can then be solved collectively by dialogue and negotiation. Researchers are initially involved in the platform to instigate the phenomena/events which they then analyse. As the participants gain skills, the platform gradually leads to the formation of structures/institutions within the communities for managing common resources, and these then earn local legitimacy with respect to other groups of stakeholders located at either the same or higher hierarchical levels (Steins and Edwards, 1999). This legitimacy rests directly on the quality of the dialogue, which must be characterised by transparency, authentic engagement, impartiality and the competence of the participants (Van de Kerkhof and Wieczoreck, 2005).

The team has now revisited its experience in Vietnam by conducting a sociological analysis of the events that took place during the communication platforms it initiated (Boissau, 2005). Individual and collective behaviour was analysed before, during and after the phases of interactions between actors.

### 4.1 Before

The communication platform was set up following one year of research, which included multi-scale land-use systems analysis (as described above) and field experiments with local farmers through long stays in the villages. This preliminary work gave a legitimacy to the research team vis-à-vis local populations and facilitated discussion of issues related to natural resource management. This work had led to a farming systems classification, which was used to select participants/farmers in the communication platform who represented the diversity of farming practices in the study area. Preliminary knowledge of the village history and power structures within the communities and between communities also guided the choice of the participants. For organisational reasons the number of players was limited to ten, which sometimes made the selection difficult. To overcome this constraint, some people were invited to participate as observers who could have discussions with the players and contribute to debriefing sessions. The discussions were made easier by the fact that all the players were farmers and thus belonged to the same socio-professional group.

### 4.2 During

During the role play, each player drew a card introducing the main characteristics of his/her virtual family. After having described their real families the players were then asked to introduce their virtual family to the other participants. By playing with a virtual family, the participants were spared the emotional load related to playing their true life in front of other farmers whom they know well. Their behaviour was monitored during the game (e.g. aspects such as their imitation of other players, logic of innovation through trial and error, installation in a routine as soon as their financial situation was stabilised) to assess the individual and relational cognitive schemes they applied during the innovation process. The results of the participatory learning process were then confirmed during the collective debriefing meeting or through individual interviews that were conducted over the following days. This anthropological study showed that the players played their own lives during the game based on their personal experience, especially during the initial learning phase. However, their behaviour throughout the game was also highly influenced by local history, culture and internalised power struggles and collective issues. The interactions between players revealed the social structures of the village community.

### 4.3 After

The individual and collective surveys carried out after the participatory simulation sessions confirmed that in unknown situations farmers make decisions based on their local, historically constructed frame of reference (Boissau and Castella, 2003). Due to the preliminary research into local circumstances, the team was able to achieve the objective of capturing local knowledge by placing the participants in conditions favourable to communication, focusing on relatively homogeneous player groups, and ensuring the absence of conflict in the topics under discussion. However, the surveys conducted a few months later in the same villages showed that some objectives had not been

achieved. Participants confirmed that they had learned a lot from the communication platform, especially about the impact of their individual decisions on the village landscape. They had also discovered how their neighbours make decisions, something that they had never had the chance to observe before. Nevertheless, while interesting discussions between participants followed, exchanges about this collective experiment were more difficult with people who had not taken part in it. The participants did not feel sufficiently qualified or motivated to transmit knowledge obtained via the platform or to continue the collective process that was initially mediated by the researchers. These mitigated results led the research team to question the stability and continuity of the human devices which supported collective action. How could a sufficient level of commitment be maintained among the participants in the long term?

Local people were initially curious about the research carried out in their village and their interest was boosted by the novelty of the devices used (e.g. computer model, role-playing game, three-dimensional model) and the perspective of learning something from interaction with the other participants. Finally, their motivation peaked when they realised how they could benefit, individually and collectively, by maintaining the dialogue. Besides their initial interest in improved cooperation, they also thought that the collective learning process had been useful in implementing concrete actions. The participants were more interested in exploring future scenarios than analysing past changes. While the researchers learned much, analysis of past change, although participatory, contributed relatively little to the questions of the local communities. On the other hand, prospective evaluations of new practices based on simulation devices renewed their interest in the communication platform beyond the phase of discovery. In a context of uncertainty, simulations were particularly valued because they created situations that were not practical using real experiments. Participants recognised the connections between individual behaviour and collective management, and also the immediate future and the long term. During the computer simulations they insisted on running the model over longer periods. They were interested in and constantly surprised by the dynamic landscape, which evolved at each time step and changed with individual management rules. Thus, in line with Olsson et al. (2006), windows of opportunity for collective action to meet stakeholders' expectations at local and regional levels (e.g. changes in the local rules for livestock management) were identified through the participatory simulations.

## 5. Conclusions

Combining various learning devices allowed the research team to tackle multiple issues at complementary scales. The tools and methods were gradually developed during the process because the participants invested time and energy in adapting them to their own interests until, ideally, a shared representation of the problem was achieved. This shared representation was thus the outcome of a collaborative platform. Rather than providing a ready-made solution, the platform supported the

emergence of a new perspective on the problem and also helped explore various problem-solving pathways. The shift from strategic management (technology transfer) to dialogue-based management (problem solving) dramatically changed the role played by researchers in generating information. Instead of remaining external observers, they joined the other stakeholder groups (farmers, local administrations, planners and policy makers) as partners in a problem-solving process and acquired legitimacy through their involvement in concrete actions. Scientific knowledge was then viewed on equal terms with layman/indigenous knowledge. This shift to trans-disciplinary research changed the learning perspective from an accumulation of scientific data to an intimate understanding of the processes at work. During transition periods, when former frames of reference are no longer valid, action-research can still tackle complex problems by exploring potential development pathways. Learning devices and mediation tools involved in communication platforms facilitate these social experiments and collaborative explorations.

## References

Boissau, S. and Castella, J.C. 2003. "Constructing a common representation of local institutions and land use systems through simulation-gaming and multi-agents modeling in rural areas of Northern Vietnam: the SAMBA-Week methodology". *Simulations & Gaming*. 34: 342-347.

Boissau, S., Hoang, L.A. and Castella, J.C. 2004. "The SAMBA role play game in northern Vietnam. An innovative approach to participatory natural resource management". *Mountain Research and Development*. 24: 101-105.

Boissau, S. 2005. "Co-evolution of a research question and methodological development: an example of companion modeling in northern Vietnam". In: Bousquet, F., Trébuil, G. and Hardy, B. (eds.). *Companion modeling and multi-agents systems for integrated natural resource management in Asia*. Los Baños: International Rice Research Institute.

Boltanski, L. and Thévenot, L. 1991. *De la Justification: Les Economies de la Grandeur*. Paris: Gallimard.

Brossier, J. and Benoît, M. 2005. "Modéliser et agir dans des systèmes complexes : la question des dispositifs humains. Une illustration avec la gestion de l'eau dans les territoires ruraux". In: *Colloque de Cerisy 2005: Intelligence de la Complexité: Epistémologie et Pragmatique*. Paris: Association Européenne du Programme Modélisation de la Complexité and Association pour la Pensée complexe.

Cardenas, J.C. and Ostrom, E., 2004. "What do people bring into the game? Experiments in the field about cooperation in the commons". *Agricultural Systems*. 82: 307-326.

Castella, J.C., Husson, O., Le, Q.D. and Ha, D.T. 1999. "Implementing the ecoregional approach in the Red River Basin uplands, Vietnam". In: Nguyen, N.K. et al. (eds.). *Towards an Ecoregional Approach for Natural Resource Management in the Red River Basin of Vietnam*. Hanoi: The Agricultural Publishing House.

Castella, J.C. and Dang, D.Q. (eds.). 2002. *Doi Moi in the Mountains. Land Use Changes and Farmers'*

*Livelihood Strategies in Bac Kan Province, Vietnam*. Hanoi: The Agricultural Publishing House.

Castella, J.C., Boissau, S. and Hoang, L.A. 2003. "Enhancing communities' adaptability to a rapidly changing environment in Vietnam uplands: the SAMBA role-play". In: Serrano, R.C. and Aggangan, R.T. (eds.). *Sustaining Upland Development in Southeast Asia: Issues, Tools and Institutions for Local Natural Resource Management*. Los Baños: PCARRD.

Castella, J.C., Dang, D.Q. and Thévenot, P. 2004. "Toward new modes of governance of the research-development continuum to facilitate the dissemination of agricultural innovations in a mountainous province of northern Vietnam". *International Journal of Agricultural Resources, Governance and Ecology*. 3(1/2): 77-94.

Castella, J.C., Boissau, S., Tran, N.T. and Dang, D.Q. 2005a. "Agrarian transition and lowland-upland interactions in mountain areas in northern Vietnam: Application of a multi-agents simulation model". *Agricultural Systems*. 86: 312-332.

Castella, J.C., Tran, N.T. and Boissau, S. 2005b. "Participatory simulation of land-use changes in the northern mountains of Vietnam: The combined use of an agent-based model, a role-playing game, and a geographic information system". *Ecology and Society*. 10(1): 27.

Castella, J.C., Tran, T.H. and Eguienta, Y.K. 2005c. "Participatory landscape analysis for community-based livestock management in Vietnam". *Participatory Learning and Action*. 51: 82-89.

David, A. 2001. "Models implementation: A state of the art." *European Journal of Operational Research*. 134: 459-480.

Eguienta, Y.K., Martin, C., Lecomte, P., Husson, O. and Castella, J.C. 2002. "Crop-livestock interactions in northern VietNam: Issues, diversity of farmers' responses, and alternatives for sustainable integration of animals in upland agricultural systems". In: Castella, J.C. and Dang, D.Q. (eds.). *Doi Moi in the Mountains. Land Use Changes and Farmers' Livelihood Strategies in Bac Kan Province, Viet Nam*. Hanoi: The Agricultural Publishing House.

Fazey, I., Fazey, J.A. and Fazey, D.M.A. 2005. "Learning more effectively from experience". *Ecology and Society*. 10(2): 4.

Funtowicz, S.O. and Ravetz, J.R. 1993. "Science for the post-normal age". *Futures*. 25: 739-755.

Hubert, B. 2005. "Dispositifs, connaissances et apprentissages pour l'agir ensemble : les enjeux environnementaux au secours de la pensée technique". In: Colloque de Cerisy 2005: *Intelligence de la Complexité: Epistémologie et Pragmatique*. Paris: Association Européenne du Programme Modélisation de la Complexité and Association pour la Pensée complexe.

Jamieson, N. L., Le, T.C. and Rambo, A. T. 1998. *The Development Crisis in Vietnam's Mountains*. Honolulu: East West Center.

Jeantet, A. 1998. "Les objets intermédiaires dans la conception. Eléments pour une sociologie des processus de conception". *Sociologie du Travail*. 3: 291-316.

Le, N.H., Vu, C.N., Nguyen, T.N. and Le, H.D. 1996. "Participatory rural appraisal training workshop. Field report and recommendations to the pilot participatory development project in Ngoc Phai commune, Cho Don district, Bac Thai province, Vietnam". UNDP Highland People's Programme Report No. 3. Hanoi.

LEARN Group (eds.). 2000. *Cow Up a Tree. Knowing and Learning for Change in Agriculture. Case Studies from Industrialised Countries.* Paris: INRA Editions.

Martin, C., Castella, J.C., Hoang, L.A., Eguienta, Y.K. and Tran, T.H. 2004. "A participatory simulation to facilitate farmers' adoption of livestock feeding systems based on conservation agriculture in the Vietnam uplands." *International Journal of Agricultural Sustainability.* 2: 118-132.

Meinzen-Dick, R., DiGregorio, M. and McCarthy, N. 2004. "Methods for studying collective action in rural development". *Agricultural Systems.* 82: 197-214.

Mosse, D. 1998. "Process-oriented approaches to development practice and social research". In: Mosse, D., Farrington, J. and Rew, A. (eds.). *Development as Process. Concepts and Methods for Working with Complexity.* London and New York: Routledge.

Olsson, P., Gunderson, L.H., Carpenter, S.R., Ryan, P., Lebel, L., Folke, C. and Holling, C.S. 2006. "Shooting the rapids: Navigating transitions to adaptive governance of socio-ecological systems." *Ecology and Society.* 11(1): 18.

Ostrom, E. 2006. "The value-added of laboratory experiments for the study of institutions and common-pool resources" *Journal of Economic Behavior & Organization.* 61: 149-163.

Richards, P. 1995. "Participatory rural appraisal: a quick and dirty critique". PLA Notes. 24: 13-16.

Rambo, A.T., Reed, R R., Le, T.C. and DiGregorio, M.R. 1995. *The Challenges of Highland Development in Vietnam.* Honolulu: East-West Center.

Ramirez, R. 2001. "Understanding the approaches for accommodating multiple stakeholders' interests". *International Journal of Agricultural Resources, Governance and Ecology.* 1: 264-285.

Röling, N. 1994. "Platforms for decision-making about ecosystems". In: Fresco, L.O., Stroosnijder, L., Bouma, J. and Van Keulen, H. (eds.). *The Future of the Land: Mobilising and Integrating Knowledge for Land Use Options.* Chichester: John Wiley.

Röling, N.G. and Wagemakers, M.A.E. (eds.). 1998. *Facilitating Sustainable Agriculture: Participatory Learning and Adaptive Management in Times of Environmental Uncertainty.* Cambridge University Press.

Sadoulet, D., Castella, J.C., Vu, H.N. and Dang, D.Q. 2002. "A short history of land use changes and farming system differentiation in Xuat Hoa Commune, Bac Kan Province, Viet Nam". In: Castella, J.C. and Dang, D.Q. (eds.). *Doi Moi in the Mountains. Land Use Changes and Farmers' Livelihood Strategies in Bac Kan Province, Viet Nam.* Hanoi: The Agricultural Publishing House.

Sebillotte, M. 2002. "Logiques de l'agir et construction d'objets de connaissance. L'invention de nouveaux dispositifs de recherche". In: Gaudin, T. and Hatchuel, A. (eds.). *Les Nouvelles Raisons de Savoir, Colloque de Cerisy.* La Tour d'Aigues: Editions de l'Aube.

Steins, N.A. and Edwards, V.M. 1999. "Synthesis: Platforms for collective action in multiple-use common-pool resources". *Agriculture and Human Values.* 16: 309-315.

Van de Kerkhof, M. and Wieczorek, A., 2005. "Learning and stakeholder participation in transition processes towards sustainability: Methodological considerations". *Technological Forecasting & Social Change.* 72: 733-747.

NAFRI
National Agriculture and Forestry Research Institute

Proceedings of the 2nd International Conference on

# Sustainable Sloping Lands and Watershed Management:

# linking research to strengthen upland policies and practices

December 12-15, 2006

Luang Prabang, Lao PDR


## Proceedings of the International Conference on

# Sustainable Sloping Lands and Watershed Management: linking research to strengthen upland policies and practices

**December 12-15, 2006**

**Luang Prabang, Lao PDR**

Correct citation for this work:

Gebbie, L., Glendinning, A., Lefroy-Braun, R. and Victor, M. (editors). 2007. *Proceedings of the International Conference on Sustainable Sloping Lands and Watershed Management: linking research to strengthen upland policies and practices.* Vientiane: NAFRI.



*Cover photo credits: top left (Peter Jones), top right (Blesilda Calub), bottom left (Bruce Linquist), bottom right (Khanhkham Ouanoudom)*

Organised with support from: