Villagers of Ampel declare they have won the AgriForEst game developed by the CoForTips project to explore forest, land and resources management strategies at the village scale in eastern Cameroon. Photo: CIRAD/Claude Garcia

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CHAPTER 33

Gaming to better manage complex natural resource landscapes

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Highlights

- Successful redesign of complex natural resource landscapes requires active participation of (local) stakeholders.
- Games help identify and clarify stakeholder's views on the issues and potential alternative solutions to complex natural resource management systems.
- Games can support (social) learning and the negotiation of co-investment.

33.1 Introduction

Forested and agroforestry landscapes stand at a crossroads. The combined and interacting effects of land-use change, resource extraction, defaunation and climate change are pushing these ecosystems towards critical points where transitions to altered states will happen. With the livelihoods of millions of mainly smallholder farmers directly depending on these landscapes and at the same time representing large conservation and commercial interests, these landscapes are heavily contested. The large number of conflicting interests and stakeholder perspectives, the interconnections, time lags, uncertainties and non-linearities that characterize these systems make steering them extremely challenging. The future of these landscapes largely depends on our shared capacity to understand and anticipate these transitions. Ecosystem services are part of the language and concepts used to understand the relations between the interests of various stakeholders.[1]

Seen from the perspective of a manager, the Gordian knot of these complex dynamics is the decision-making process of the individuals involved. Two critical factors are at play: (i) the bounded rationality[2] of stakeholders across scales, taking decisions with incomplete or flawed information under situations of high uncertainty, and (ii) stakeholder's behavioural plasticity and the capacity to learn and adapt their strategies to changing environmental and social conditions. These factors are notoriously difficult to assess and incorporate into classical dynamic models. Yet to a large extent, they determine the development of these landscapes as social-ecological systems.[3,4]

An innovative participatory approach to learn about, discuss and explore the complexity of the many dimensions in these contested landscapes is gaming. In recent years, the use of games has become increasingly popular in development as well as research projects. With this increasing popularity, the number of gaming approaches and related concepts also strongly increased. Gaming approaches are now also referred to as 'serious gaming'. 'participatory gaming', or 'role-playing'. What all these approaches share is the process by

which participants use games to explore the system behaviour, to devise strategies and assess their strengths, and to support negotiations for collective and coordinated action. Participants play a game relevant to the question at hand and typically take on the role of a stakeholder in the system, not necessarily the role closest to their day-to-day reality. In addition to letting them identify the potential impacts of their actions, the process can also have a profound impact on their understanding of the system and has the potential to reshape their perception of the problem at hand. The experience plays a central role in the learning process. The approach belongs thus to the field of experiential learning and differs from cognitive learning (emphasizing cognition over affect) and from behavioural learning (which discounts independent activities of the mind).[5]

A particular approach within gaming is Companion Modelling or ComMod[6]. This approach combines role-playing games and simulation models to tackle issues in the fields of renewable resources and environment management. It is particularly suitable for complex problems where a multitude of stakeholders have different and often conflicting views and interests. ComMod promotes dialogue, shared learning and collective decision-making, strengthening the adaptive management capacity of communities facing wicked environmental problems. In the ComMod approach, stakeholders and researchers work together to develop a collective understanding of the social-ecological system and explore the issues at hand.

With the increasing attention and popularity of gaming, the number of questions about the definition, implementation and implications of this relatively new method is also rising. In this chapter, we aim to address the *what*, the *why*, the *how* and the *who* of gaming in complex natural resource landscapes by discussing the four following main questions related to the use of games:

Q1. What are games? (*the What*)

Q2. Why play games? (*the Why*)

- How does in-game behaviour relate to real-life behaviour?

- What is the outcome of gaming for: a) local stakeholders, b) external learning and science?

Q3. How to develop games? (*the How*)

- How realistic do such games need to be?

- Can these games be transposed to other cases?

Q4. Who to get to the table to play? (*the Who*)

Q1. What are games?

Participants enacting stakeholders and negotiating mutual beneficial alternatives. Photo: L Garcia-Barrios

Workshop participants exploring the impact of management on a complex agricultural landscape. Photo: Wageningen University/Erika N Speelman

Smallholder farmers discussing how to meet individual and collective land management goals in the Sierra Springs game. Photo: Wageningen University/Erika N Speelman

Several definitions of games and philosophical discussions on what games actually are can be found in literature. Wittgenstein argued that 'games' cannot be defined[7,8], while Bernard Suits tried to prove him wrong by saying playing a game "is a voluntary attempt to overcome unnecessary obstacles"[9]. From that, it follows that games are "unnecessary obstacles willingly confronted by people." However, Wittgenstein also argued that a specific definition is unnecessary to the act of playing a game.

We define games as models of reality with a model being a simplified representation of reality[10]. In our context, games function as tools to facilitate (social) learning about the functioning and management of complex natural resource landscapes while at the same time soft skills such as discussion and negotiation are practised. Games can have a variety of forms and include amongst others board games, card games, computer games, role-playing games or a combination of any of these forms. Board games are the most common in the context of complex landscapes. They are often supported by (agent-based) computer simulations.

A distinction can be made between games developed for learning by non-stakeholders such as students or researchers, and games to support (social) learning by stakeholders in a specific context. Both types of games enable learning by actively involving participants through discussion and exploration of the behaviour of these complex systems. However, games developed for non-stakeholders tend to focus more on the functioning of landscapes and to a lesser extent on the social dynamics involved, while games to facilitate local learning often concentrate more on social dynamics. In particular, games aiming at local learning often function as boundary objects[11], allowing participants to share and discuss their often-contrasting interests and perspectives of the issues at hand. When thinking of the six-types of knowledge-related human skills, games can be seen as platforms for change (Figure 24.2)[12] which can be used at any of the levels between global to individual incorporating and exploring all six steps in the figure.

Q2. Why play games?

Members of the Interministerial Committee for the Regulation of the Oil Palm Supply Chain negotiate agreements between small oil palm producers and the agro-industry in the CoPalCam game developed by the OPAL project. The game was developed to explore the resilience of the supply chain in Cameroon. Similar models exist for Indonesia and Colombia. Yaounde, 2016. Photo: CIRAD/Claude Garcia

Villagers of Ampel declare they have won the AgriForEst game developed by the CoForTips project to explore forest, land and resources management strategies at the village scale in eastern Cameroon. Ampel, 2016. Photo: CIRAD/Claude Garcia

The next generation of Mexican smallholder farmers discussing how to manage their individual and collective interest. Photo: L Garcia-Barrios

Games are increasingly proving powerful tools for learning and exploring and negotiating alternative management in a large range of systems. These include small coffee farms in Mexico[13], overgrazing in west-African savanna landscapes[14], groundwater management in India[15], and rubber-oil palm landscape transitions in Sumatra[16]. Nonetheless, games still often face a strong dose of prejudice. Many people associate games with leisure rather than serious activity. While this prejudice can be an initial disadvantage, it is at the same time also one of the main strengths of using games. The fact that a game setting is regarded as not so serious and fictional makes it often easier for people to interact, share their perspectives and discuss issues in an open manner. In fact, in questionnaires the game dimension may be underrated, while choices made in games can be more genuine reflections of preferences.

In addition, the 'fun' game zone functions also as a consequence-free zone in which the impact of individual and collective decisions can be explored both at the landscape level as well as on the social level. This fun consequence-free game zone showed in many cases to trigger players to discuss serious real-life issues through the safe 'reality' of the game[17]. One can experience the impact of one's own decisions on the system, and on the decisions and interactions of fellow game participants. Games therefore function as social laboratories in which not only the actual decisions taken in the game, but also the social dynamics can be assessed and analysed.

How does in-game behaviour relate to real-life behaviour?

By real we mean a behaviour that can be observed or described in the landscape. In other words: how much trust can we place on the observations during the game session?

The short answer is none. The longer answer is that we can place equal trust as we place in responses to formal surveys and questionnaires. In-game behaviour is just that, involving wooden tokens and fake bank notes. However, the hypothesis of 'realism' is not a pre-requisite for this kind of work. What matters is the discussion that will be triggered during the debriefing.

However, despite this epistemic boundary, many authors have described the strong relationship between games and participants' real lives[18],[19],[20]. As knowledge of the system increases, the elements weighted by the stakeholders outside the game room will find their way into the game mechanics. When a stakeholder then plays their own role in the game, they will validate the constraints they operate under. The behaviour displayed in response, however, is entirely left to the player, who can decide to explore whatever strategy she or he fancies.

Participants' behaviour during the game sessions can then be assessed in several ways, all of which involve triangulation. A debriefing session after a game is an essential step to discuss the dynamics of the game and how these dynamics relate to real life. Sharing views and experiences from the game and reality participants are able to grasp how plausible their behaviour during the game was. Questions such as "Do you know of anyone who behaves like this?" or "Have you ever done that in reality?" will serve to initiate the discussion. Additional individual interviews after the game session allow in-depth discussion of how game dynamics relate to life.

And all things considered, does it really matter if players act in the game in ways they would never do in the field? This is precisely what we seek to achieve: innovation and the exploration of possible futures beyond what we think may happen. In addition, we gamble on the fact that stakeholders may discover the benefits of innovative behaviour that would warrant its adoption in the field.

What is the outcome of gaming for local stakeholders and science?

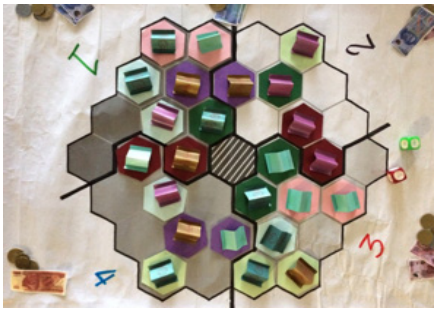
The ultimate goal of participatory gaming is to help people make more informed decisions" is more powerful. To reach this objective, a two-step approach is commonly used. The first step aims at understanding the processes at play, while the second step aims at supporting collective decision-making. No new knowledge will typically be created while the first objective is pursued, but the existing and often fragmented knowledge will be assembled and made explicit. Participatory games commonly show a collective mind map of the issue explored. Such a proposition in itself will already be useful to the stakeholders, as it also is a powerful way to identify knowledge gaps and define avenues for further research.

Defining who gets to participate is key in identifying the impact of games. There are three pathways of change through which impact can be reached. The first involves the participants engaged in the game design process. This is a core group of leaders, agents of change and facilitators that will remain engaged in the process for a prolonged period. The changes in perception will be profound in this group of participants, but this kernel is small: 5 to 10 people. The second pathway of change flows through the learning process of the participants to the game sessions. More games, more players. Learning will happen, but the transformation will be less profound than for those on the first pathway. The third and final pathway is the public, the audience that listens to the narratives we develop about our games. This pathway is virtually global, but has the least transformational capacity. Game behaviour is not actual behaviour and internal validity does not translate into external validity. In addition, as we discussed, the cultural barriers will play here again, creating skepticism when we report findings.

Scientific outcomes from participatory gaming sessions largely fall into the third pathway: learning by the scientific community at large. Until now, studies that use games have mostly reported their games, analysis and findings as stand-alone case studies. In most of these studies, participant numbers are often too low to perform rigorous statistical analysis on the gaming outcomes. However, efforts are made to repeat game sessions to achieve statistically relevant numbers[13,21,22], allowing the complex dynamics of game sessions to be studied through both qualitative and quantitative analysis, which is an important step forward to explore the rigorousness of the game results.

Q3. How to develop games?

The first step of game development: Conceptualising the social-ecological system of the system at play. Photo: Wageningen University/Erika N Speelman



The simple made game board of the RESORTES land use planning game (Speelman EN, García-Barrios LE 2010). Photo: L. Ditzler

The first step of game development: Conceptualising the social-ecological system of the system at play. CIRAD/Claude Garcia

Every game developer wants to design a game that engages its players, stimulates them to actively participate and learn from the dynamics of the game and the interaction with fellow players. While this task can seem daunting at the start, several methods are available to guide one through this process.[23,24,25]

When designing a game, it is important to start with setting up a broad transdisciplinary team to grasp the width of the landscape you are taking into account. Next, through initial stakeholder analysis, principal stakeholders—i.e. those most impacted by the system and those with the power to change the system—can be identified and included in the game development team. Responses from participants in early try-out games can point to aspects of the local system not yet understood by external observers.

The first step of the actual game development involves identifying the main actors, the system boundaries and the main elements of the system. It is important to be aware of the many distinct perspectives on these factors. A good guide to phase is the ARDI approach[26]. This approach identifies Actors, Resources, Dynamics and Interactions within the system as a way to build a collective mental model of the system. Intense interactions with stakeholders are essential to discuss and reflect on the developed mental model.

Once the collective mental model is developed and the main issues at stake have been identified, the development team needs to get creative in constructing a game setting that will bring about the discussion and behaviour of interest. This is not always an easy task and requires several cycles of testing and fine tuning.

While implementing the game itself, it is key to develop alongside a good and smooth observation and analysis scheme for exploring your results and drawing conclusions. Especially for research this is essential for finding interesting results and being able to draw solid conclusions.

How realistic should games be?

The question of realism in modelling is not new and was already discussed in Levin's seminal paper about the strategy of model building[27]. When discussing a model's 'realism', we need to clarify if we mean that the model describes with accuracy the causal links between system components, or if we mean the outputs of the model accurately describe real-life outcomes[28]. In the second case, games are not realistic. The landscapes we create in the game, the gamescapes, are only allegories of the real landscapes. However, in the first meaning, a match between the causal structure of the world and that of the model means, according to the statements of the participants themselves, that "all interactions in the game we see also in real life".[29]

Realism seems a desirable attribute for any model designed to help with decision making. However, the major difficulty when dealing with wicked problems lies not in understanding the bio-physical processes involved, but rather the values held by the various stakeholders, their segmented perception of the system, and their agendas that at times appear to conflict and at other times genuinely do so[30]. Thus, what matters with our games is to represent the stakeholders and their power and knowledge asymmetries. Precisely because a game session involves people, two major components of decision making are constitutive to the model: 1. bounded rationality, i.e. the fact that a human is not a rational *Homo economicus* and 2. behavioural plasticity, i.e. the fact that we learn, cope and adapt when receiving feedback. The term *Homo ludens* seems appropriate[31,32]. Our games thus offer a realistic representation of the social component of any natural-resources management problem. One that is notoriously difficult to capture in a classical model with standard approaches.

Can games be transposed to other cases?

Typically, games get developed in a certain context, with efforts to reflect the local environment, social dynamics and current issues. If it appears to connect participants to a virtual reality they recognize and meets the objectives of the game designers, it is normal that the same game is replicated in situations that appear to be similar. Or, some simple modifications make it more relevant for a setting that is recognized as similar, but not identical. How do we know that a locally adapted version of a common game has the same validity across multiple settings? Is there a danger of adapting too much if we want to compare some of the game outcomes?

In fact there is a considerable spectrum of games in this respect. The behavioural economics games that test basic human tendencies to trust, share, cheat or maximize individual gains may require only the adoption of a local currency in otherwise standardized rules for interaction. Landscape games, on the other side of the spectrum will need to reflect local land use and its issues[11]. Two concepts may help in judging what level of game adaptation is needed: theory of place (or the identification of similarity domains, as in stages of forest transition[33], and issue cycle (or the progression of questions asked after new issues emerge in a multi-stakeholder environment[34,35]). In the end, transposing games to other settings will remain largely a trial-and-error process that requires critical self-reflection from those involved. Where local learning is the primary objective of the game, participant responses are a good guide and can help in fine-tuning games to each setting. If the game operators also want to learn from the choices participants make in the game, in-depth discussion with participants after a game can give qualitative clues on how it was perceived, but it remains a judgement call whether or not results of multiple, locally adapted games in various settings can be jointly analysed for valid conclusions.

Q4. Who to get to the table?

Local farmers discussing land planning strategies during a game session of RESORTES. The game was developed to facilitate discussion and negotiation on territorial planning in the south of Mexico. Wageningen University/Erika N Speelman

Participants share their insights during the debriefing after a game session of the ReHab game (Le Page et al 2016). Photo: CIRAD/Claude Garcia

Members of the FSC Congo Basin Regional Working Group on High Conservation Values use the MineSet game developed by the CoForSet project to define new management rules for FSC concessions and the integration of the Intact Forest Landscapes in the standards. Brazzaville, August 2017. Photo: CIRAD/Claude Garcia

Deciding whom to work with, whom to play with and whom to talk to are the three most critical questions to address when aiming to bring change in a system. These questions reflect the level of desired transdisciplinarity in the team, engagement and monitoring needs. For the selection of players, it is important to develop a clear overview of the stakeholders involved and where they can be placed on the scales of 'power to change the issue' and 'level of impact experienced'. Developing a game with a group of key stakeholders who have leading roles in their communities or associations (those with power to change the issue) will facilitate and strengthen the belief in the new method; including stakeholders who are most impacted will strengthen the understanding of the issues at hand and the potential acceptance of the alternatives explored.

In addition, the social network among the group of players has shown to influence the willingness to participate and the level of active participation in game sessions[11]. However, difficulties of getting stakeholders to participate in game sessions have nonetheless been encountered and described by several authors[11,36,37,38]. As with many new methods and approaches, people need to be convinced that the new approach renders better results than the more conventional methods. Therefore, in addition to starting with a group of influential stakeholders, we recommend using the (i) snowballing method to decrease levels of absenteeism among invited participants and increase active participation during the game, or (ii) an open informal invitation to all members of the community[39]. In both cases, participants who actually show up can be grouped randomly, by ages, by roles or any other reasonable schemes required by the hypothesis to be tested. Whether gender-specific sessions are relevant will depend on local context and norms of behaviour.

33.2 Next steps

In this chapter, we sought to introduce games as innovative tools to assist learning by discussing the *what*, the *why*, the *how* and the *who* of gaming while focusing on games in the context of complex natural resource landscapes.

We found that games create an atmosphere in which participants willingly engage in open collective discussions about how to manage complex landscapes. Social learning occurs in these sessions amongst others through the active participation of participants and the experimental consequence-free zone of the game session. When aiming for local learning to reach more informed decisions, it is essential to get the people around the table that have the power to impact the issues at stake as well as those most affected by the system. Having a firm base of participants can strengthen the credibility and hence the impact of this tool still often viewed with skepticism.

With increasing numbers of convincing stories being published on the 'magic' of games, it is time to move beyond individual case studies and to develop more rigorous game set-ups, develop standardized assessment tools and general guidelines that will strengthen our field of study and aid practitioners in the field. This will result in the wider use of games in the field of research and development, allowing more people to learn and games improve individual decision making - and can involve collective action or not.

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