

Devices based on models to accompany stakeholders in enhancing collective learning and action on livestock farming systems

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Abstract: *A methodological framework and a participatory device to better coordinate the different actors concerned with the management of a shared resource is proposed. The approach is based on co-constructing a shared representation of action processes, debating on evolution scenarios and immersing stakeholders in situated actions by means of role-playing games. It makes easier generating and sharing knowledge on complex interactions between livestock farming practices and environmental stakes.*

Keywords: *participatory modelling, collective learning, livestock farming systems, environment*

The main goal of this paper is to propose and discuss a methodological framework and a participatory procedure to better coordinate the different actors concerned with the management of a shared resource. Our approach aims at facilitating changes in livestock farming practices allowing a better adjustment to new expectancies from local societies toward their environment. Our research deals with land use dynamics and marketing of farm products. It is based on participatory processes where researchers are associated with farmers and other stakeholders to tackle collectively a shared question on agriculture and environment. It will be illustrated through two questions related to goat milk production and processing systems and to sheep grazing territories at a regional scale:

- how to enhance farming systems organisation in the framework of milk supply to dairy cooperatives?
- how to improve the management of livestock farming systems by better accounting for their interaction with landscape dynamics?

The global framework deals with organisation problems where different stakeholders take decisions and develop actions modifying the properties and behaviour of a system they share one with the other. The approach is focused on the interactions between stakeholders, and modelling is considered as an effective tool to help stakeholders in sharing contrasting points of view. Interactions take place mainly at three stages of the modelling approach: during the co-construction of a common representation of the current situation, during the analysis of changes in their farming systems according to development scenarios collectively designed and simulated, or during role-playing games. This approach makes easier back-loop learning processes by modifying know-how and their attached values (Argyris et Schön, 1996).

Co-constructing models with stakeholders on action processes

The goal is to support different stakeholders in co-constructing a shared representation of a specific question on a defined situation, and then to formalize it. The process always involves periods of collective exchanges because the underlying hypothesis is that what stakeholders need is less a formalization of their own perception than an exchange among them (including experts and researchers) about such representations, and existing knowledge. By structuring these exchanges, the modelling process (van den Belt, 2004) helps the stakeholders to validate the interactions between different representations and visualize the farming system dynamics integrated in the model, and ends on a true learning process. These exchanges lead to eliciting different types of farm functioning and emerge from discussions on available scientific information (data, enquiries) or directly from the knowledge of each participant. Collective decision-making processes are facilitated by making more explicit the various points of view and subjective criteria, to which the different participants refer implicitly or even unconsciously. For instance, in the case study concerning the cooperative milk supply, comprehensive interviews were realised with farmers for identifying production processes and

changes in their farming system, and with cooperative managers to underline changes in market strategy. Milk curves at the farm level and the milk delivery curve at the cooperative level have been used as artefacts to support articulating farming systems dynamics and cooperative marketing forecast, in order to create a shared representation of the situation. This modelling process permitted the goat farmers and other stakeholders first to understand that the technical model considered as the unique solution to the management of milk supply was a dead-lock. It was also an effective way to co-construct a shared representation of the several existing farming systems and how they contribute to milk supply seasonality. Finally, organizing this complementarity became their main common agreement. In this case, the approach helped modify the way the different partners share the milk supply issue and permitted the legitimisation of some farming styles previously set aside. This approach therefore also contributed to the renewal of typological methodologies.

Visioning scenarios

Where organisational problems are paramount, the building phase of the model is completed by a period of exchanges of knowledge and point of views, directly facilitating the design and discussion of scenarios. Scenarios are used in this case as a mean to support a social learning and a communication process. They intend to raise awareness, increase knowledge on the environment, and widen the perception of possible future events (Röling & Wagemakers, 2000). During this period, new knowledge on the interactions between stakeholders managing common resources is produced. So, the objective is not to produce a unique and definitive ideal farming system, but to enrich the decision-making process by imagining a set of possible options and evaluating them in terms of technical (information assessed, technical quality of actions launched, etc.), or sociological (plurality of discussed matters, reinforcement of stakeholders power) aspects. We consider that dealing with complex farming systems requires the gathering of scientific and lay knowledge in order to co-construct a shared representation of these systems and provide flexible indicators to imagine and evaluate their future state. For instance, in the case study concerning the analysis of organisation and changes in sheep farming systems at a regional scale, the companion modelling process made easier for the group to imagine scenarios of co-evolution of resources and farming systems. These scenarios deal with possible changes in the interactions between ecological dynamics and forest and sheep farming activities on rangelands. Special attention will be paid to the impact of public policies on the use of public lands for grazing, the availability of water for irrigation, and future shifts in land-use between cereal and forage crops. Two global impacts will also be assessed: the arrival of wolf packs on herding practices and wildfire frequency increase due to global warming. The capacity of the model to visualize the co-evolution of ecological and farm dynamics makes easier the visioning exercise. The co-construction of the scenarios encourages participants to elicit their knowledges, facilitating the aggregation of these in a common knowledge. It leads the different technical disciplines to modify the way they represent and analyse the diversity and dynamics of the concerned farming systems.

Playing with the model

When the social group is heterogeneous, the use of a role-playing game as a boundary object obliging the players to adapt their strategy and behaviour according to the actions of all the other stakeholders allows to reveal these strategies and to stimulate creativity as advocated by Suchman in her situated action theory (Suchman, 1987). That is the reason why, in the land-use management project, we plan to develop a role-playing game involving sheep farmers. In this game, sheep farmers will have to adapt their herding practices to the changes caused by the processes identified as relevant during the scenario step. This stage stimulates the emergence of new modes of organising the interactions between sheep farming and landscape.

Conclusion

Co-constructing representations of a complex situation involving many stakeholders promotes the emergence and sharing of new knowledge on action processes and interactions between these processes. This approach allows to enlarge the points of view on the diversity of the farming systems by integrating new criteria and giving legitimacy to set-aside practices while participating in the construction of a common project.

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