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Alassane Bah

Université Cheikh Anta Diop de Dakar, Senegal

Ibra Touré

CIRAD, France

Alexandre Ickowicz

CIRAD, France

Amadou Tamsir Diop

PPZS, Senegal

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Simulation tools and pastoral resources dynamics in Sahelian area : the Senegalese example

Alassane Bah¹, Ibra Touré², Alexandre Ickowicz², Amadou Tamsir Diop²

¹ESP/PPZS, Université Cheikh Anta Diop de Dakar, B.P. 15 915 Dakar Fann (Sénégal), E-mail : bah@ucad.sn

²Cirad/Isra/PPZS, E-mails : touré@cirad.fr, ickowicz@cirad.fr, amtadiop@orange.sn

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Introduction The Sahelian area in Africa is characterized by multi-uses of the space and resources determined by a set of very precarious bioclimatic and social economic factors. This coexistence between several complementary production systems is currently the theatre of a space competition to access to natural resources. At the heart of these spaces, resource and actor strong interactions, several scientific methods and research tools are trying to apprehend and model the functioning and durability of these surroundings. How then a common approach or concomitant approaches can be built to contribute towards piloting agricultural ecological and social economic systems? The aim of this paper is to show the contributions of multi-agent simulation and GIS to the understanding of the complex dynamics underlying the evolution of natural resources in the pastoral area in Senegal.

Materials and methods The analysis of the functioning of a production system as complex as pastoralism required the setting-up of a multi-disciplinary team of research in partnership around scientific stakes and development on workshop sites representative of the Sahel pastoral spaces. At the heart of the present approach, complementary tools were instructed :1-for inventory-diagnosis (investigations, polls, interview guides, positioning) ... 2-for representation and working out knowledge bases (speech analysis, working groups, self cartographical design, workshop result sharing validating) ... 3-for accompanying the modelling process (participative multi-agent systems design, co-working out of rules, role playing, and scenario, etc) to better grasp the multifunctionality of shared spaces and common resources. The first tools made it possible to better conceptualize the chosen study fields and check the research hypotheses. The second tool category promoted knowledge deepening and its reproduction expression or communication media. The last battery of tools formalized and crystallized the set of information and knowledge in simulation prospective and exploratory models.

Results and discussion Many experiments were carried out by our team in the field of the development of simulation tools for pastoralism combining GIS, Agent-based models (Figure 1) and role playing games (Bah and al. 2006) (Touré and al. 2006). This research work made it possible :Starting from a dialogue, discussion and negotiation framework to set up different actors around common stakes of sustainable development of the space of those resources-To design platforms and simulators with interfaces adapted to the actors perception ;To clarify and formalize local knowledge between researchers and actors.

Conclusions The current research work is moving towards the formalization of an adaptable heuristic and generic approach : The Actor-Group-Role-Resource-Object method (AGRRO) which is supported by a generic platform (Figure 2). But we can note according to our experience that the co-building and learning process is quite long and onerous even if the appropriation and the use of results from models by the actors is very satisfactory.

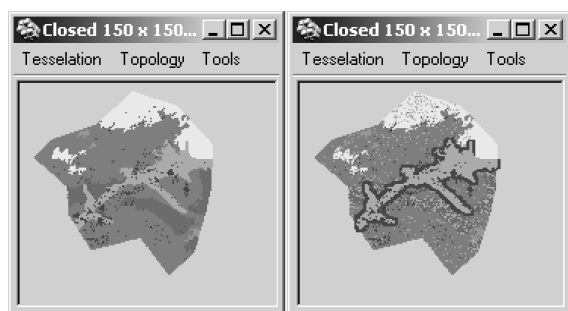


Figure 1 The simulation space of the Pastoral Unit of Thieul (Senegal).

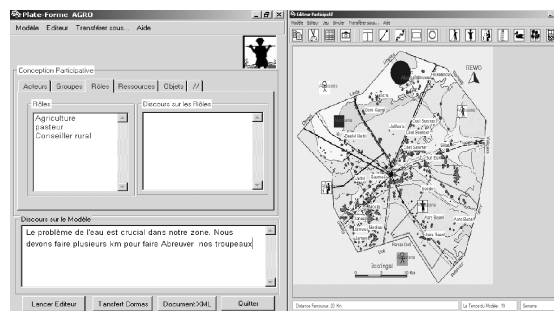


Figure 2 AGRRO platform.

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