**Appendix 1.** Some explanations of the game.

Thanks to its multi-scale representation (see figure 1), the game allows rules, practices and their effects to be represented at the scale of a parcel, farmland (a set of parcels in figure 1), the local district (see the boundary of a district in bold in figure 1), the region (representing a particular regional landscape on each map) and of the whole country (the whole set of maps). Different land uses (represented by different pawns) can be positioned on and moved around the maps by farmer-players, depending on their farming choices and on the land access rules they previously designed for the game. In this spatial environment, local users (the players) use the different parcels depending on the range of possible uses at their disposal (different types of farming and livestock rearing, gathering wild products, forestry, environmental use, etc.), depending on the season and on the land access rules laid down by the land policies in the simulation they are running.

During the game sessions, players consume the natural resources shown on the maps that comprise the game board, via a wide range of possible uses (different types of farming and/or livestock rearing, gathering wild products, forestry, environmental use, etc.), depending on the season and on the local, regional and national access regulations they themselves drew up.
Several output indicators are provided. Environmental indicators, such as the quantity of the four natural resources available in each parcel as a function of annual climate conditions, past uses, and potential environmental risks (over-exploitation, bush fire, etc.). Other indicators allow multi-scale assessment of productivity: at the very local scale, the yield each user obtains depends on the land use and on the availability of natural resources in the parcel concerned, but also on socio-economic aspects, such as the food self sufficiency of the user, and, at other scales (district, region and country), total yield and the productivity of each type of land use.

The basic game components made available to the players are:

- A game board comprising separate squared maps (up to five maps), representing different benchmark landscapes in the region;
- Colored pawns representing different land uses (extensive or intensive agriculture, livestock rearing, hunting, gathering, etc.);
- Small marbles, representing units of capital earned with different types of uses. The marbles are added to the family resources box at the end of each season. The number of marbles depends on the success of the uses chosen by the family;
- Plastic boxes, representing each player's « family box », where each player's capital (represented by marbles) is visible;
- A dice to introduce an element of chance in the climate scenarios;
- Yellow "events cards", representing any sort of event or risk the participants wish to include (bush fire, changes in the price of goods, the arrival of migrants, etc.);
- A scenario building framework to design scenarios concerning land access rules;
- "Red cards" the players receive when they do not achieve food sufficiency;
- Participatory charts to analyze and summarize the impacts of scenarios on the different assessment indicators linked to the range of issues defined in stage 1.

The players are distributed on the different regional maps to account for the different regional contexts included in their game and/or simulations.

There are three stages to the game that match the three Sahelian seasons: the rainy season, the cool dry season, and the hot dry season. During each stage, the players place colored pawns on the maps, according to the choice of uses they made based on their capital and the family work force. At the end of each stage, the game master counts up the yield each player has

produced, which will vary depending on the uses they chose and on the natural resources available in the parcels they used (depending on the kind of landscape, but also on rainfall and past uses of the parcels).

The rules governing the production enabled by each use were checked and validated by the players in the first stage of the game. The game master scores each player's results by counting the pink marbles in each family box, subtracting some of them to represent food sufficiency needs in relation to the size of each family. At this point, climate changes are introduced into the game through "events cards", i.e. the unpredictable events that occur during the year being simulated: extreme rainfall events or drought, off-season rains, a very dry wind, etc.

After several simulated years, participants examine the results of each indicator of environmental policy challenges they previously defined:

- Economic indicators: the capital and food sufficiency accumulated by each player; overall production and all forms of productivity at each scale of the game (grassroots user, local district, regional landscape, the whole country);
- Environmental indicators: the overall qualitative environmental status of each parcel in the different regional landscapes;
- Social and cultural indicators: profile and rate of losers (users, local districts, regions, etc., but also more complex phenomena spontaneously simulated by players during the game sessions, such as conflicts, agreements, respect of collective rules, etc.

The participants then use the game to shape and test improvement scenarios concerning users' practices, land access rules, or new facilities or incentives to improve the results of the indicators. This implies accounting for the whole range of points of view and the scale of management issues: families, local districts, regions, and the country as a whole. Indeed, participants play two different roles: individually they play the role of users, and together they play the game master, defining scenarios and changing the rules of the game (land access, users' practices, facilities included on the maps, etc.).