Rangeland Rummy: a tool to trigger discussions between pastoral farmers about their grazing system and co-construct adaptive strategies to climatic hazards.

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Abstract

Sylvo- pastoral systems in Mediterranean areas are increasingly recognised for their natural, social and cultural value; however, they strive for economic and ecological sustainability, while constantly coping with climatic hazards. The Rangeland Rummy is a serious game aimed at helping farmers to design sustainable feeding strategies for sylvo-pastoral systems. It is to be played by a group of farmers accompanied by a technician. A game board, sticks and cards are used to represent the feeding system, which performance is evaluated by a simple simulator. Various animals, vegetation types and grazing practices can be simulated; the local climatic conditions and climatic hazards can be taken into account with basic calibrations before or during the game. Thus, famers can play in a context close to their own farm. The latest version of Rangeland Rummy was tested and validated during summer 2016 with 3 groups of farmers. The users described it as a serious and technical game. It was deemed most useful for players sharing similar production systems and either starting in the activity, envisaging changes in the grazing system or having to face climatic hazards. The Rangeland Rummy is also being used for educational purposes in agricultural faculties.

Keywords: rangeland, management, serious game, climate change

Introduction

Silvo-pastoralism is a widespread land-use system in Mediterranean areas, involving livestock husbandry in rangelands or in wooded pastures. Silvo-pastoral systems are highly diverse in terms of: vegetation types, animal species and associated products, management practices. However, they share common issues (Jouven et al., 2010): i) securing economic sustainability by minimising inputs and maximising forage intake at pasture; ii) providing ecosystem services through an ecologically sustainable use of natural vegetation; iii) coping with climatic hazards, which increase the variability and unpredictability of forage availability over seasons and years. In order to meet such challenges, farmers need to design management strategies taking the best advantage of the biological diversity of rangelands and animals and including securities in case of climatic hazards. Farmers' management strategy can be evaluated based on the results obtained each year, then modified if deemed inefficient in relation to the issues presented above. In order to speed up this process, we designed and tested a serious game called "Rangeland Rummy" capitalising on both the available scientific knowledge and on the local ecological knowledge of the farmers playing the game.

Materials and methods

The basic concept of the Rangeland Rummy is to put together a small group of farmers, playing together at designing on a physical board, with cards and sticks, a sustainable pasture-based feeding system. Next to them, a technician enters the chosen setup in a simple simulator, which provides the group with the predicted performance of the system (feeding management in line

or not with animal requirements, forage self-sufficiency, reliance on grazed forage and on rangeland, sustainability of rangeland utilisation). One or more strategies can be tested, thus allowing *ex-ante* optimisation and learning about pastoral farm management. This concept was first applied to a game intended for grassland-based systems (Forage Rummy: http://www.scoop.it/t/rami-fourrager); in 2013, the concept was transferred to sylvo-pastoral systems (Farrié et al., 2015), which implied changing the underlying conceptual model and including a qualitative approach of the grazing system. New vegetation types (rangelands and woodlands) and new animals (sheep) were introduced; forage availability (in grazing days) was represented as a function of grazing management and season (instead of grass growth rates). This first version was tested in 2013 with groups of farmers and used in 2013, 2014 and 2015 with groups of students. On these occasions, a number of limitations were identified. In 2016 the tool was further refined, in order to: 1) focus on grazing management, 2) increase the diversity of rangelands documented (>400 sticks based on available pastoral references), 3) describe the local vegetation dynamics and the changes in animal body reserves, 4) provide indicators of sustainability of rangeland utilisation and 5) introduce climatic hazards in terms of timing and amount of [pastoral] resources available.

Results and discussion

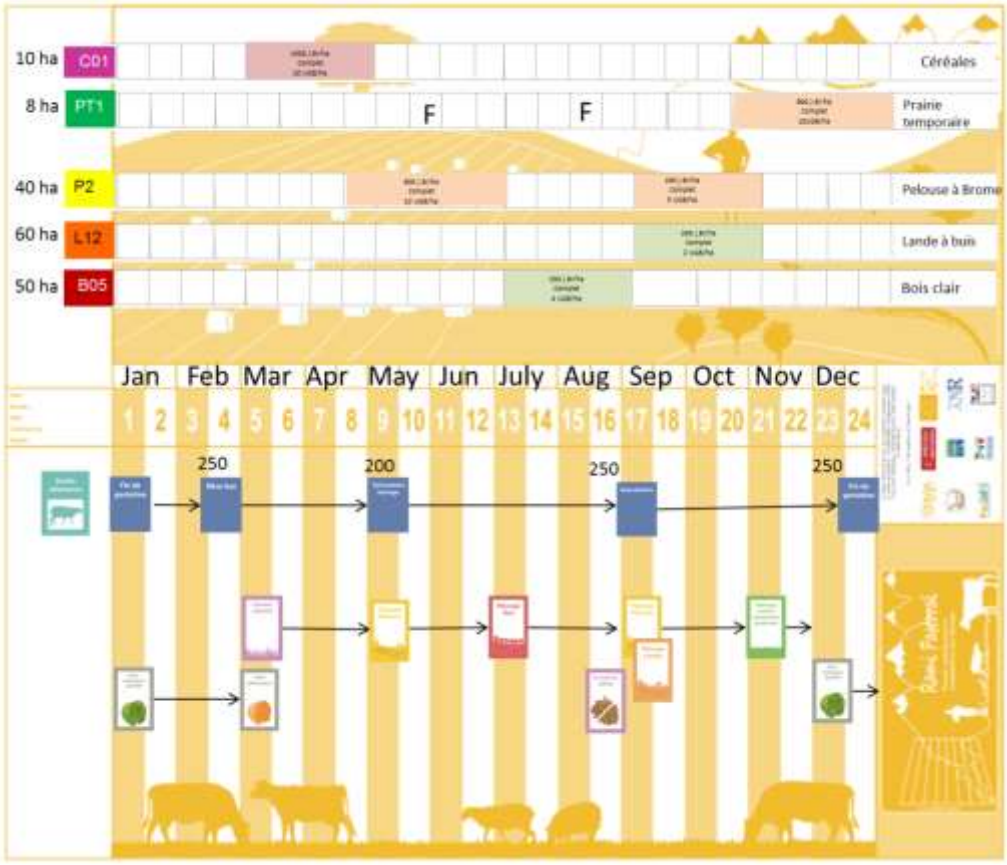

Figure 1: *Example of layout for the game board. In the upper part, the sticks represent the chosen utilisations of the available types of vegetation (grazed crops: lilac, grassland: green, open rangeland: yellow, shrubland: orange, woodland: red) and the surface area devoted to each. In the lower part, the plain blue cards enable players to trace the various physiological stages of the animal group (here only one group represented) and the number of animals present through time. Below, coloured cards represent the types of vegetation grazed during the year, and/or the conserved forage and concentrate distributed by the farmer.*

The physical component of the Rangeland Rummy is presented in Figure 1. A set of "vegetation x utilisation" sticks is prepared by the technician before the game, by applying a calibration for

seasonal dynamics (and if needed climatic hazards) to a selection of vegetation types chosen from the database available in the simulator. In order to do this, it is important that the players anticipate the type of farm they want to represent. The game lasts two to three hours. First, the surface areas available per vegetation type and the composition of the animal groups in terms of number of individuals and physiological stage are set. Up to three different animal groups can be identified, with for each group one or two types of animals and a specific feeding sequence. Then, "vegetation x utilisation" sticks are chosen among the available set in order to feed the animal groups at pasture during the grazing season. Based on the knowledge of the players, a surface area is attributed to each stick and conserved feed can be added. The simulator provides a comparison between the requirements of each animal group and the amount and quality of the predicted intake with the chosen feeding management; the users are also informed if a change in body condition is likely. At farm scale, the simulator provides indicators of self-sufficiency for forage, concentrate consumption and reliance on grazed forage at farm scale plus the contribution of each vegetation type to the feeding system; for each "vegetation x utilisation", it also calculates the actual utilisation of the available biomass and informs the user in case of under-utilisation throughout the year. Based on simulation results, farmers can modify the feeding strategy.

The Rangeland Rummy was used in the summer 2016 by three groups of 3 to 4 "pastoral" farmers interested in discovering the game and in discussing their grazing and feeding practices with peers. The farmers within a group came all from the same area, and sometimes knew each other. GROUP1 included farmers breeding sheep for meat and starting in the activity, interested in finding a sustainable sizing for their system; GROUP2 included farmers breeding goats for milk, with different levels of experience, interested in testing the inclusion of new pastures (in terms of vegetation or surface area) in their feeding system; GROUP3 consisted in farmers breeding either sheep or cattle for meat, which were part of a group already involved in training sessions and workshops about grazing management, and which interest lied in evaluating the potential of the game. These tests confirmed that the Rami Pastoral triggered discussions among farmers about their grazing and feeding practices at all stages of the game. The players found the game very sharp on technical aspects. Based on the outcomes of the game sessions (and on previous tests), we determined the following criteria for optimal use: 1) mix unexperienced farmers with experienced ones, 2) represent a system close to that of one of the players, but in a simplified version, 3) set clearly an objective for the session, known to all participants.

Conclusion and perspectives

The Rangeland Rummy is a serious game which helps triggering and focussing discussions among "pastoral" farmers about their grazing and feeding system. The game is useful for participants envisaging changes in their system either because it is not stabilised yet, or due to climatic hazards or to specific opportunities. The latest version of the rangeland Rummy will be available very soon in the French version for extension services and farmers' associations, and to be used for educational purposes in agricultural schools and faculties.

References

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