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# Territorial management

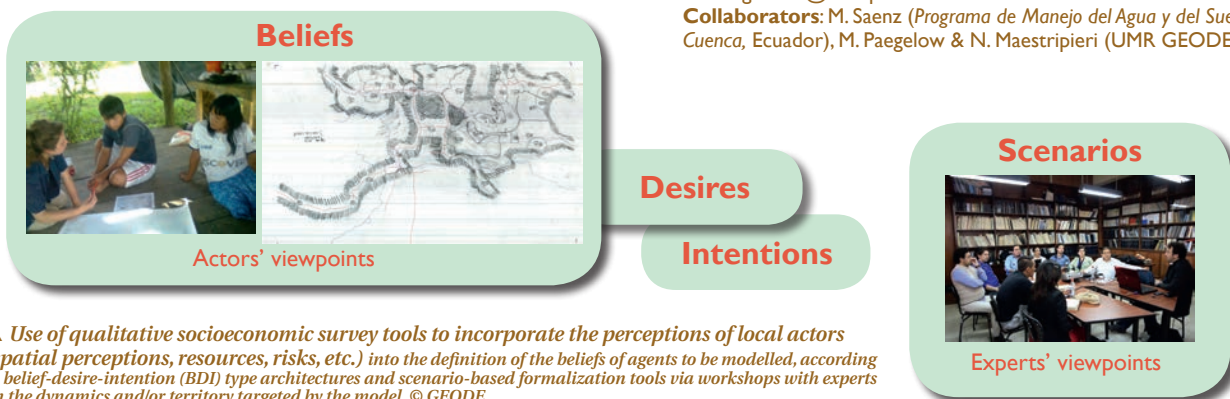
## Modelling societies and their territories – the importance of social science

An agent-based platform is a simplified description of reality built using a systemic approach whose development has been heralded over the past two decades. This involves the formalization of a high number of entities called agents, each representing a social unit, individual, family or other community, and with a certain degree of autonomy in a given context. The latter can include all links between these agents, a biophysical setting or a combination of both. All interactions between these entities create emergence dynamics—which represents a major contribution of these models—revealing non-linear social dynamics, which are not necessarily predictable, while accounting for their weight in terms of impacts on the environmental and social contexts. These models are often used in the agroenvironmental field to reflect the impact of human activities over an area. Here it is important to differentiate the research scope and subject. While research subjects are often focused on studying human dynamics

and their impacts, the research scope often mostly concerns the territory, thus creating a fundamental bias, i.e. only human dynamics directly related to the territory are integrated. However, many social dynamics are not derived from the local territory. For instance, the demographic dynamics, particularly with regard to the inheritance transmission of farms in France, may be vital. These are decisive in the land-use dynamics over a generation, but also in the agricultural and environmental strategies of the present generation—farmers do not reinvest when they know that the farm will not be revived. More generally, the integration of environmental dynamics is progressing well in multiagent models through explicit and formalized coupling via geographical information tools, e.g. through dedicated platforms such as GAMA (see p. 50), but there is still a need to incorporate the human sciences, beyond the economic aspects.

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▲ Use of qualitative socioeconomic survey tools to incorporate the perceptions of local actors (spatial perceptions, resources, risks, etc.) into the definition of the beliefs of agents to be modelled, according to belief-desire-intention (BDI) type architectures and scenario-based formalization tools via workshops with experts on the dynamics and/or territory targeted by the model. © GEODE

## Modelling assessment of strategies for reducing herbicide usage in wine-growing catchments

Reducing the risk of herbicide contamination of surface and groundwater is a major issue in the Mediterranean wine-growing region due to the considerable risks associated with the high rate of surface runoff and herbicide use. The SP3A project has developed a method



for evaluating prospective soil maintenance strategies proposed by a group of experts to reduce herbicide-contaminated runoff while preserving production. This method is based on a chain of models developed on the OpenFLUID (see p. 45) and DIESE\* modelling platforms, which can simulate, in different climatic settings, technical soil maintenance sequences, soil surface dynamics, pollutant runoff flows, water and nitrogen stress in vineyards and their impact on grape yields. Multidisciplinary modelling couples representations of vineyard work sites,

hydrological flows at the catchment scale and vine growth. It provides a quantified basis for discussion on how practices could be changed. In the presented example, the model assessment was consistent with the wine growers' opinion on the need to be more flexible in the definition of herbicide usage reduction strategies. It demonstrates that a certain degree of flexibility is: (i) necessary to meet production objectives, and (ii) possible without drastically increasing the runoff contamination level. However, it also indicates that the ultimate goal should be to completely abandon herbicides in order to safeguard the quality of water bodies fed by runoff. The modelling approach alone is of course not sufficient to formulate strategies that will meet production and environmental objectives while being tailored to local conditions of an area, whereas it could be effectively included in a stakeholder co-construction process.

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\* For further information on the DIESE platform (Discrete Event Simulation Environment): <https://carlit.toulouse.inra.fr/diese>