

## **Exploring farmers' drought adaptation behaviour -The role of risk perception, coping factors and social interactions-**

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Droughts are threatening agricultural production and threaten to undermine food security worldwide. Reduced water availability and increasing salinity harm crop production and consequently cause farm income loss. With climate change the probability and severity of droughts are expected to increase. Farmers need to adapt in order to decrease their vulnerability to drought risk. However, private adaptation can be constrained by many factors, such as socioeconomic, institutional, biophysical, psychological and financial barriers. In that case, public adaptation policies are needed to reinforce private initiatives. In order to design policy instruments that enhance private adaptation, farmers' adaptive behaviour and its consequences for the vulnerability of the agricultural sector at large need to be well understood.

When designing adaptation strategies policy-makers employ drought risk assessment tools. They often rely on economic models, in which individual behaviour is formalized in line with Expected Utility Theory that assumes perfectly informed and rational agents. These theoretical foundations make it possible to trace back the aggregated effects of gradual changes and to determine the crucial factors that explain them. However, when socio-economic systems are exposed to non-marginal changes, such as severe droughts causing structural changes in farming activities, the representation of individual adaptive behaviour according to Expected Utility Theory faces limitations. Empirical research reveals that farmers demonstrate heterogeneity in their decisions. This heterogeneity can be mainly attributed to personal circumstances, personality traits and social influence that affect individual risk perceptions and coping perceptions and consequently adaptive decision-making.

Heterogeneity and interactions through social networks may result in unpredictable patterns of diffusion of adaptation measures that affect the regional economic performance of the agricultural sector and water demand. In order to explore and understand the adaptive dynamics that are crucial in determining the magnitude of potential impacts in the presence of non-marginal changes, we need to consider the agricultural sector as being a complex adaptive system, including 1) bounded-rationality, 2) non-optimizing behaviour, 3) heterogeneity, 4) behavioural dynamics and 5) linkages and feedbacks across scales. To enable the design of effective and efficient public adaptation strategies it is crucial to understand how individual adaptation behaviour and interactions through social networks generate the properties that determine the vulnerability of an emerging system.

This study adopts an agent-based modelling approach to increase the understanding of the role of farmers' adaptation behaviour and social interactions in a drought risk context explaining the regional drought vulnerability of the agricultural sector. In this seminar I will present the outcomes of three related papers:

1. The results of a study on farmers' drought risk perceptions using survey data. It is vital to understand how these perceptions are shaped as they determine largely the agricultural sector's adaptive capacity.
2. The results of a study on the application of Protection Motivation Theory (PMT) to explain farmers' adaptive action in the context of drought risk.
3. The results of several experiments with an agricultural sector agent-based model, called SAGA. The goal of this model is to investigate the effects of empirical social networks and different behavioural rules on farmers' irrigation adoption under drought risk and its impacts on several macroeconomic indicators such as the rate of adaptation, water demand and regional agricultural income.