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► To cite this version:

Marion Robert, Alban Thomas, Jacques-Eric Bergez. Namaste: A Dynamic integrated model for simulating farm practices under groundwater scarcity in semi-arid region of India. 14. Congress of the European Society for Agronomy, ESA 14, Sep 2016, Edinburgh, United Kingdom. hal-01602962

HAL Id: hal-01602962

<https://hal.science/hal-01602962v1>

Submitted on 3 Jun 2020

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NAMASTE: A DYNAMIC INTEGRATED MODEL FOR SIMULATING FARM PRACTICES UNDER GROUNDWATER SCARCITY IN SEMI-ARID REGION OF INDIA

Marion ROBERT¹ – Alban THOMAS² – Jacques-Eric BERGEZ¹

¹UMR 1248 AGIR, INRA, F-31326 Castanet-Tolosan, France, marion.robert@toulouse.inra.fr

²Toulouse School of Economics, UMR 1081 LERNA, INRA

Introduction

Farming systems are complex structures with several dimensions interacting in a dynamic and continuous manner around farmers' management strategies. This complexity peaks in semi-arid regions of India, where small farms encounter a highly competitive environment for markets and resources, especially unreliable access to water from rainfall and irrigation. To represent such strategies, we propose the model NAMASTE, which was conceived and based on data collected in the Berambadi watershed in southern India.

Conceptual approach

The farm system is divided into three interactive sub-systems: i) the decision sub-system (manager or agent), which describes the farmer's decision process; ii) the operating sub-system (technical system), which translates the decision orders into action execution and dynamics of farm resources; and, iii) the biophysical sub-system, which describes interactions between physical and biological elements, in particular the relations between ground water, soil, and plant growth and development. The farm system interacts with an external system that simulates pressure and conditions in the farming environment such as rainfall (Weather), market prices (Market), electricity service (Electricity) and the village source of labor and equipment (Village). The model is implemented in the RECORD platform.

Dynamic functioning

Farmers make decisions at different stages of the decision-making process:

- 1) Yearly loop, beginning of the year: Farmers decide whether to invest in irrigation equipment and select the corresponding cropping system that will ensure the best income for their long-term climatic and price expectations.
- 2) Seasonally loop, beginning of the season: Farmers integrate new observed knowledge about climate and prices so that the cropping system initially selected in the strategic stage may no longer best optimize their income. They review their crop selection and match the best practices to obtain the best cropping system for the known farming conditions.
- 3) Daily loop, every day over the entire season: From the cropping system selected in the tactical stage, farmers decide and adjust their daily crop operations in each plot depending on climate conditions and resource constraints.

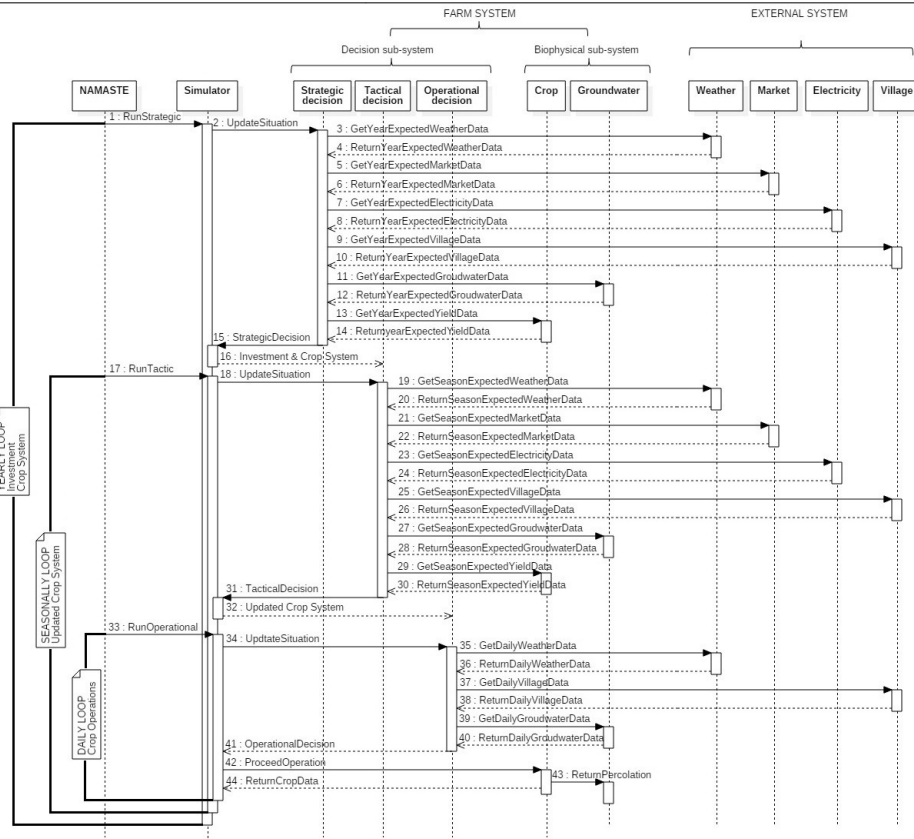


Figure 1. Sequence diagram of a NAMASTE simulation

Conclusions

A baseline scenario was developed to simulate current farming practices. Scenarios with changes in climate, groundwater table, and government subsidies were developed to predict their impacts on cropping systems and the water table.

Acknowledgements

This study was funded by the CEFIPRA, the INRA flagship program ACCAF and the Doctoral School of the University of Toulouse (EDT).

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