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"Competition for Resources in a Changing World:
New Drive for Rural Development"

Lessons from Model Integration and Coupling for Basin-Scale Irrigation Management, Applied to Region VII, Chile

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Abstract

The scientific knowledge of resource management for food production is embedded with the knowledge domains of various disciplines: The natural sciences often study the effects of human actions on natural systems, while the social sciences study the human causes of resource degradation and its effects on various social groups.

Integrated modelling is a means to build bridges amongst various domains, because their knowledge is embedded within computational models and the associated databases. Moreover, integration can generate new insights through the analysis of interactions and feedbacks between biophysical and socioeconomic systems. However, model integration is costly in terms of human resources. Technically it requires computer skills and procedurally it requires an understanding of integration as a step-by-step process that must be realised within complex project environments. Good integration work can add to the soundness of the results of individual disciplines, in addition to the insights derived from the integration itself. Both results ultimately increase the robustness of policy implications.

This PhD was conducted within the project "Integrating Governance and Modelling," which is part of the CGIAR Challenge Program on Water and Food. To analyse the interactions between an intensely irrigated system, the management regime and the agricultural producers, two models were dynamically coupled; the Mathematical Programming Multi-Agent System (MP-MAS) and the distributed Water Flow and Balance Simulation Model (WaSiM-ETH). Building on a common database, the resulting integrated modelling system can be used at various levels of integration, ranging from simple or iterative data exchange to full dynamic coupling, in order to respond to a multitude of policy-related questions.

The model system is designed to address policy questions in the realm of irrigation management for agricultural production. Unlike optimisation approaches, this system allows for the analysis of policy impacts on individuals and groups.

In this presentation, methodological lessons learned from integrating two complex models from two scientific disciplines will be shared. A framework that summarises our learning and goes beyond technical solutions will be offered for other scientists working in integrated natural resource management.

Keywords: Integrated model system, irrigation, lesson learning

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