



The 3rd International Forum
on Water and Food
Tshwane, South Africa
November 14 – 17, 2011



Co-hosted by:



Application of Crop Growth Modeling for the Economic Valuation of Water in Agriculture

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Session: Basin (Andes) and Spatial Analysis Modeling

Key Message

The use of simulation models can play an important role in applying economic valuation methodologies of agricultural water-use. The models can help reduce project costs and time by allowing the evaluation of different scenarios with relative ease. More attention should be given to model validation processes in the tropics, especially in relation to crop productivity, so as to generate greater recognition and appreciation of the use of such tools within research.

Summary

Based on local information, and with the assistance of crop growth modeling, the marginal benefit was calculated for the use of irrigation water in corn by farmers in Cañete Valley (Peru) as an indicator of the value of the water. This method was applied based on Crop Water Production Function (CWPF).

Records of local productivity were taken as reference values of the potential productivity of the crop (under the given conditions and current management) and the potential evapo-transpiration was calculated using FAO tools and based on local parameters.

Using the SWAT, various future scenarios were modeled indicating projected results of differing levels of reduction in water availability for irrigation. From this, changes in productivity and evapotranspiration for each scenario were forecast. Using this approach the marginal productivity of water for corn was calculated. As a result, the marginal value of water (U.S. \$ / m³) for each stage of the crop was differentially calculated.

The combination of economic methods with biophysical models has reduced costs and time in the process of determining the value of water for farmers. Nonetheless, despite how useful the modeling appears to be for forecasting the impact of different levels of water supply on productivity, it is still necessary to deepen the understanding of the uncertainties SWAT might have for estimating productivity and how this tool compares to other possible models.