



Tropentag, September 16-18, 2015, Berlin, Germany

“Management of land use systems for enhanced food security:  
conflicts, controversies and resolutions”

## Multiple Policy Instruments for Sustainable Water Use in Crop Production in China

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### Abstract

Massive expansion of irrigation agriculture and consecutive overuse of water resources leads to aggravating ecological and economic problems in the extremely arid Aksu-Tarim Region (ATR) in northwestern China. Therefore the evaluation of policy instruments aiming at a more sustainable water management in crop production is of high relevance for research and regional decision makers. Building on a primary crop production data set of more than 250 farm households, a regional farm model was developed applying a positive mathematical programming approach. The tested water policies (taxation, pricing and quota) differ significantly in their effectiveness and efficiency, with water pricing constituting the most promising policy option. However, the scenario simulations revealed a strongly negative effect of water policy implementation on crop production and agricultural incomes. Therefore, the water policies are applied in an integrated approach together with agricultural policies, namely subsidisation of advanced irrigation technology for cotton production as well as a subsidisation of cereal production. With this integrated approach water saving could be realised with much less negative impact on crop production. Aiming at water saving rates of 10 % and 20 % decreased cotton production by 7 % and 15 %, increased cereal production by 17 % and 4 %, and caused an overall agricultural income deficit by 6 % and 13 %, respectively. The study complements existing literature by the assessment of multiple policy instruments and presents a useful model framework to address further research questions of crop production and agricultural water management in water scarce regions of China.

**Keywords:** China, crop production, irrigation, mathematical programming, policy instruments, regional model, water saving