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Analysis of future water demand for food consumption in drylands of Central Asia: The case of Uzbekistan

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Central Asia is considered among the most vulnerable areas to climate change and prone to problems issued by climate change. Climate change, all things held constant, will reduce regional water availability and thus will adversely impact rural livelihoods in drylands of this region. It is widely recognized that in addition to projected water supply scenarios, the water situation has to be assessed from the perspectives of future requirement of water for food consumption of growing population of the region which is expected to increase by about 20% in next 15 years. This water requirement depends on population diets and thus responsive to ample variations of income. Therefore, the analysis of water requirements for food consumption should also incorporate most likely scenarios of population income growth.

On example of Uzbekistan, this study demonstrates an elegant approach that can be applied for projecting the impact of income-driven changes in food consumption pattern on water requirements in post-Soviet countries of Central Asia. To reveal the influence of large income changes on food diets, the Normalized Quadratic – Quadratic Expenditure Systems (NQ–QES) was calibrated and applied to the year 2007 using the minimum set of data available from secondary sources. Using the parametrized demand system, the national water requirements for main food items consumed in Uzbekistan were projected till 2025 via the introduction of virtual water concept. To analyze the future water requirements via consumers' domain, the chosen approach proved to be reliable with respect to the forced theoretical conditions and convenient for parametrization without imposing a computational burden and extensive data requirements.

The results show that for Uzbekistan the increase in water requirements will be largely caused by the income growth than by the expected population growth. Unless proper measures are taken, due to the high income responsiveness of food consumption pattern in Uzbekistan, the economic growth can put higher pressure on already scarce water resources. The analysis of projected population and income patterns of water demand shows that the improvement of crop yields and livestock productivity as well as introduction of water-wise technologies and less water demanding fodder crops will cushion water deficit in Central Asian region. Policies towards adjusting the population diets via raising the awareness in water requirements for producing a unit of food item is likely to contribute to the mitigation of expected water scarcity. Ultimately, considerations towards virtual water trade can be an option to address the issue on the regional water implications of growing population and incomes in scope of climate change.