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The impacts of groundwater development on agriculture food system in Senegal: A general equilibrium assessment

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Abstract

Most country in sub-Saharan Africa, including Senegal mainly rely on rain-fed system for the agricultural production that provides sub-optimal productivity level compared to the irrigated production system. This condition has led to food and economic insecurity given variability in agriculture production that inhibits the poor from improving their livelihoods. On the other hand, there is huge potential of groundwater resources in the region that could potentially help improve agricultural production through groundwater irrigation. This study examines the potential impact of groundwater in Senegal by using Rural Investment and Policy Analysis Water (RIAPA-W) model to understand how groundwater development across different regions in the country shape agricultural food system and how it affects income distribution, poverty, and food security in year 2030. Simulation results show that increasing water supply by around 20 percent through groundwater development in 2030 would increase agricultural production in both crops and livestock sectors. This spur on production leads to an increase in agriculture and national GDP by 3.4 and 1.5 percent respectively. The simulation results also capture the spillover effect on non-farm food system where larger economic impact shown in food service sector, while higher employment effects observed in food processing industry. Income distribution shows that both rural and urban poor are gaining more than the non-poor household despite all household generated higher income under new groundwater development. As income increases across different households, especially the poor, we found poverty is reduced by around two hundred thousand people in 2030. Increase in groundwater supply also helps provide clean water which is estimated around three hundred thousand people have access to clean water.

Keywords: Agriculture and food system, general equilibrium, groundwater