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The role of groundwater as an accelerator of agricultural transformation: Insights from the CGIAR initiative on NEXUS Gains

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Abstract

The CGIAR Initiative on NEXUS Gains works at the critical intersection of food, energy, and water security while preserving the environmental systems underlying food systems in selected transboundary river basins. Among natural resources, groundwater has become increasingly critical to water, energy and food security, climate resilience and overall environmental sustainability. In many low-and middle-income countries, groundwater development is also essential for agricultural and economic growth.

Accelerated groundwater development is particularly needed in Sub-Saharan Africa where climate variability severely affects farmers' livelihoods and national food security. At the same time, groundwater development has led to substantial depletion and degradation of natural resources in key breadbasket areas of the world. This presentation covers three strands of research on groundwater that NEXUS Gains and partners are pursuing: 1) What are tradeoffs between maintaining renewable groundwater systems and global food security and how can we reduce the costs of these tradeoffs? 2) What is the potential of groundwater development for economic growth and poverty alleviation in areas where development and tradeoffs are more limited? And 3) What institutions can support groundwater governance to reduce groundwater depletion and degradation?

Our results suggest that groundwater use will continue to grow, particularly for irrigation, fueled by cheaper solar pumps that are becoming more widely available. Increased groundwater irrigation is key to agricultural and economic development in a climate crisis, particularly in Sub-Saharan Africa. There is a strong tradeoff between food security and more sustainable groundwater development. Several options can reduce the costs of these impacts, such as improving water management in rainfed areas, investing in agricultural R&D, or adjusting diets. More effective measures on dealing with depletion are starting to be developed but are unlikely to affect depletion in the near- to medium term.

Keywords: Food security, governance, groundwater, irrigation