Smallholder Irrigation and Pathways to Food Security

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Irrigation can facilitate the expansion of agricultural production in multiple dimensions – including increasing crop yields, extending the production calendar to previously unmanageable dry periods, and facilitating production of a diverse array of higher-valued crops like fruits and vegetables. For poor smallholder farmers, this productivity boost is assumed to lead an array of benefits, including improved economic conditions and better food and nutrition security, but results from many irrigation studies in developing regions of the world have been underwhelming. Here we explore the simple and intuitive hypothesis that the benefits to farmers and their families depend on how increases in production are utilized, including whether crops are consumed in the home, monetized, or put to other uses. We use data from a solar irrigation project in Benin, West Africa, and show how the same irrigation technology resulted in a range of impacts on hundreds of beneficiaries. This variation is largely explained by how much individual families either consumed or sold products, and how those changes in consumption and sales then translated into a broad range of benefits. These findings have important implications for work at the food-energy-water nexus, including design and evaluation of irrigation-based projects targeted at smallholders. Importantly, they suggest that historical evaluations of irrigation impacts have likely missed important pathways, and have thus under-estimated the total benefits of irrigation to smallholders in contexts like the semi-arid tropics.