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Alternative Models of irrigation development in Ghana

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Expansion of irrigated agriculture is central to efforts to enhance food security, reduce rural poverty, and increase resilience to climate change across Sub-Saharan Africa (SSA). A broad variety of irrigation system typologies currently exist in SSA, ranging from 'formal' publically-financed surface water irrigation systems served by engineered infrastructure (e.g. dams and canals) to 'informal' farmer-led irrigation systems that receive little official support or recognition (e.g. private groundwater pumping and small-scale river diversions). Yet, at present, there is little objective or reliable information about the differences in agricultural productivity and livelihood outcomes resulting from these alternative approaches to irrigation developments in SSA, limiting capacity to design effectively new irrigation investments and evaluate reliably current and future trade-offs with other water uses (e.g. hydropower). Understanding the comparative performance of alternative existing approaches to irrigation development, along with the extent to which formal and informal systems complement or substitute one another, offers a valuable opportunity to generate new insights about best practice approaches for irrigation expansion. This paper seeks to address this challenge by exploring how alternative bio-physical, socio-economic, and institutional characteristics of irrigation developments influence welfare outcomes for smallholders.

Our analysis uses primary household panel data (n=646) collected in 2018 and 2019 from Upper East Ghana evaluate the characteristics of irrigation typologies and impacts on agricultural productivity. As a basis for our empirical analysis, we analyse the drivers of productivity differences across farmers in different irrigation typologies. We use descriptive statistics from the survey data to make inferences on heterogeneity of irrigation access across farmer groups. We then use a subset of the sample - limited to the main crops, paddy rice in the rainy season and pepper in the dry season- to analyse the differences in crop yields across farmer groups. To assess whether irrigation access and behaviour affects agricultural production and technical efficiency, we decompose the effects of agricultural inputs - including irrigation - and technical efficiency on crop yields.

Our preliminary findings demonstrate that farmers in formal irrigation schemes have higher yields, technical efficiency of agricultural production and lower costs compared to farmers in informal schemes across both growing seasons. We also find that farmers in formal schemes enjoy a broad range of benefits (for e.g., subsidised fertilizers and higher prices for their produce), which go beyond direct benefits from reliable and inexpensive water access. As a result, these farmers have lower agricultural costs, higher production and better welfare outcomes. These findings highlight the need for broadening public support for irrigators outside the government

managed irrigation schemes, who are often neglected in official irrigation development narratives. Fertilizer subsidies, proper channels to sell agricultural output and proper maintenance of existing infrastructure outside formal schemes present opportunities to increase the efficiency and agricultural productivity of farmers in informal schemes.