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Implications of water policy reforms for agricultural productivity in South Africa: Scenario analysis based on the Olifants river basin

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ABSTRACT

This paper uses the water-reallocation scheme created within the National Water Act (1998) to analyze the impacts of water policy on farm livelihoods in South Africa. Based on one of the most water stressed catchments in the country, the Olifants river basin, we provide an integrated modeling approach combining water and agricultural modules to investigate the impacts of compulsory licensing and water market on crop production and investment made to improve water use efficiency. The model maximizes net farm profits and takes into account the characteristics of the agricultural sector in the region in classifying farmers between large-scale (LSFs) and emerging (EFs) groups, according to their land acreage, irrigation efficiency and historical heritage. Compulsory licensing is analyzed through curtailment of water-use rights from large-scale to emerging farmers. The water market is investigated to provide conditions under which farms trade water to complete their irrigation schedules. Our results show that, though compulsory licensing might promote a rise in emerging farmers and a re-balance of past riparian-based water allocation schemes, care should be given to the level of that curtailment rate in order to balance equity measures with efficiency objectives. Indeed, we found that the losses associated with water curtailment for LSFs are not entirely captured by the EFs. Therefore, beyond water policy, there are other factors, which also influence farms'

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profits and water use efficiency. The results also demonstrate that a water market provides a good opportunity to increase water use efficiency. The introduction of water market induces LSFs with good water storage facilities a possibility to trade their remaining water-use rights. It also offers EFs an alternative to diversify their water supply sources when they encounter shortfalls in amount of water allocated.

1. Introduction

Water allocation in South Africa is undergoing many changes to integrate additional aspects such as equity in distribution among the different users, control of the resource's sustainability and integration of local stakeholders into the water management practices. High water demand for food production and industry development has stressed many catchments and deteriorated water quality in South Africa [1–8]. Moreover water allocation for agricultural use, the major water user in the country, used to be tied to land ownership hence excluding historically disadvantaged individuals[1] from access to water rights. This paper uses one of the most water stressed catchment in the country – the Olifants river basin – to assess the impacts of water market (WM) reform and the policy of compulsory licensing (CL) on farms' livelihoods. These policies are chosen because they are among the main policy incentives incorporated in the National Water Act (1998) and the National Water Services (1997) to improve water allocation for productive purposes[2] within the country. For instance, compulsory licensing is a policy which aims at promoting a re-allocation of water resources in water stressed[3] catchments in South Africa. Beyond areas already under water stress, compulsory licensing is also applied to areas where water stress is expected and water quality is damaged by pollution. The water market is a mechanism used in promoting a voluntary transfer of water-use rights for financial compensation. The water market provides the possibility of water trade between farmers, after the public authority has already allocated the water-use-rights. In the agricultural sector water market assumes that farms holding licenses that are not used after a completion of irrigation schedules (surplus license holders) sell such licenses to the ones that still need additional water (deficit license holders) to complement their irrigation schedules. The South African water sector has experienced many institutional and policy reforms, since the democratization of the nation in 1994. Major elements of the water sector reforms included removal of price subsidies, compulsory licensing, and promotion of water trade (water market) to improve efficiency in water use and allocation [10–13]. Such reforms have also established a new institutional structure (e.g. catchment management agencies-CMA and water user associations-WUA) that promotes a more inclusive water management practice. However, despite these reforms little effort is made in investigating how such policy changes might influence farmers' production and investment decisions in the agricultural sector. This is what the present study aims to contribute to in assessing the impacts of compulsory licensing and water trade on crop production choice and investment made to improve water use efficiency. To the best of our knowledge, no empirical study has computed the impacts of CL on the agricultural sector in South

[1] In the Preferential Procurement Policy Framework Act, Historically Disadvantaged Individual (HDI)" refers to South African citizen—(a) who, due to the former apartheid policy, had no franchise in national elections, prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act No 110 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act No 200 of 1993) and/or (b) who is a female; and/or (c) who has a disability.

[2] To direct water to its most economically productive uses and induce adoption of more efficient water use technologies and conservation practices.

[3] It is important to highlight that water scarcity (stress) is different from vulnerability in water access. Different indicators (indexes) are provided for a determination of water scarcity (i.e: Falkenmark indicator, Basic Human Water Requirement, Social Water Stress index etc). [9] provides the panorama of indicators measuring both water stress and water access vulnerability.