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Determinants of farmers' participation in collective maintenance of irrigation infrastructure in KwaZulu-Natal

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ABSTRACT

The decentralization framework and the Dublin Principles on Integrated Water Resource Management (IWRM) emphasize the need for a participatory approach to irrigation water management. This study identifies the factors influencing farmers' decision to, and extent of participation in the maintenance of irrigation infrastructure in KwaZulu-Natal province, South Africa based on cross-section data collected from 320 randomly selected smallholder irrigating farmers. A two-step Heckman regression model was applied in the analysis. It was established that households whose heads were older, block committee members, with larger irrigation plots, good soil quality and experiencing severe irrigation water shortages are more likely to participate in maintenance of irrigation infrastructure. On the other hand, farmers with insecure land tenure and with no access to irrigation water were less likely to make the decision to participate. Farmers who were members of the farming cooperative as well as block committee members and those paying irrigation water costs were likely to intensively participate in maintaining irrigation infrastructure. Therefore, decentralization alone cannot lead to improved irrigation outcomes. Several factors are necessary for households to participate intensively in the maintenance of irrigation infrastructure. Governments should address these challenges before handing irrigation schemes to their beneficiaries.

1. Introduction

Maintenance of irrigation infrastructure is crucial for the sustainability of irrigated agriculture (Mwendera and Chilonda, 2013; Hedayat et al., 2011). According to the Food Agricultural Organisation (FAO, 2000), the Participatory Irrigation Management (PIM) strategy which calls for smallholder farmers' active participation in development processes is considered to be key for sustainable management of communal resources. As a result, decentralized management of irrigation schemes is a suitable approach for increasing resource users' sense of responsibility and, thereby, boosting their involvement and commitment (Mwendera and Chilonda, 2013; FAO, 2000).

In South Africa, most communal area irrigation schemes are undergoing decentralization or Irrigation Management Transfer (IMT) (Muchara et al., 2014; Letsoalo and Van Averbeke, 2006). However, studies on South African smallholder irrigation schemes (e.g., Letsoalo and Van Averbeke, 2006; Bembridge, 2000) have concluded that poor maintenance of infrastructure and equipment undermines the performance of irrigation projects. Likewise, poor participation in irrigation infrastructure maintenance has been a challenge in many developing countries leading to underperformance of irrigation schemes. Thus, it is imperative to understand the factors influencing the low levels of participation among water-users in order to recommend policy on IMT in South Africa, and for communal smallholder irrigation, in general. This study investigates the determinants of water-users' participation in the maintenance of irrigation infrastructure in KwaZulu-Natal province of South Africa. This study differs from a similar study done by Muchara et al. (2014) on factors affecting collective action in as it uses labor contributions as the indicator of participation not just attendance of meetings. Moreover, it uses the Heckmen two step method arguing that farmers' decision to participate is a sequential two-stage decision making process.

2. Concepts of decentralization and participatory approach to irrigation management

Decentralization is the recommended approach to water management in irrigation schemes (Meissner et al., 2013; Ribot et al., 2006). Conyers (1999, p. 6) defines decentralization as "a process of change in which functions previously undertaken by government institutions at

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national level become the responsibility of government or non-government institutions at sub-national level". This definition resonates with Rondinelli and Cheema (1983) cited by Mulwafu (2010) who argue that decentralization allows for the disaggregation and tailoring of development plans and programs to the needs of heterogeneous regions and groups.

According to Peter et al. (2008) farmer participation in the collective management of irrigation schemes is key to decentralization. Collective action has become an important strategy for smallholder farmers' management of communally owned resources. The theory of collective action, first coined by Olson (1965), is widely accepted in the management of common pool resources like irrigation schemes. According to Scott and Marshall (2009), collective action refers to action taken by a group in pursuit of a shared interest. The basis of collective action is participation among users (Muchara et al., 2014; Ostrom, 2010). Thus, participation is considered a key factor to the long-term sustainability of irrigation schemes (Alam et al., 2012). Farmer's participation in decision making is more likely to lead to sustainable food production and development (Mwendera and Chilonda, 2013). Thus, it is crucial that research on maintenance of irrigation infrastructure should focus on the factors influencing farmers' participation.

2.1. Factors affecting farmers' participation in maintenance of irrigation infrastructure

While decentralization is applauded for increasing citizen participation in development projects, in most developing countries only a minority of individuals participate. Several factors have been reported to influence farmers' participation in collective action. They fall into several categories including: psychological/social, natural/ecological factors, economic factors, managerial/administrative factors (Fig. 1).

2.1.1. Institutional factors

Institutions affect farmers' participation since they determine levels of trust, the predictability of interactions and interest in collective action (Poteete and Welch, 2004). Hardin (1968) presents the theory of 'tragedy of the commons', which postulates that participation in collective action is affected by the inherent selfishness of humans and the rational self-interest that always prevail over the interest of the common good. Hardin's model assumes the inability of individuals to cooperate and the problem of "free-riders" as affecting participation (Hardin, 1968). Due to institutional failures and lack of compliance to rules governing schemes, poor participation can lead to scheme degeneration into open access resources, as defined by 'the tragedy of the commons'.

On the contrary, Ostrom (2010) argues that when rules are easy to understand and enforce, locally designed and accepted, take account different types of violations, help manage conflict and hold users and officials accountable, they could lead to effective participation in collective action. Ostrom (2010) and Ito (2012) argued that customary rules and agreed norms in rural communities can result in well preserved and utilized common property resources (CPRs). Carrying out actions in a transparent and accountable manner also encourages participation in collective activities. Thus, operation, maintenance and sustainability of an irrigation scheme depends on the functioning of its institutions (Bembridge, 2000; Mishra et al., 2011).

2.1.2. Perceived economic benefits

Individuals' decision to participate in any programme depends on the perceived economic benefits (Maleza and Nishimura, 2007). The potential to earn high revenue is likely to attract community members, hence leading to more participation (Maskey et al., 2006). The level of users' dependence on the irrigation scheme, affects their participation in maintenance of irrigation infrastructure (Kim and Khiev, 2007). Other economic factors influencing participation in collective maintenance of irrigation infrastructure include the cost of labor, access to credit facilities, cost of farm operation, and maintenance and ability to purchase pumps. The cost of labour, operation and maintenance affect

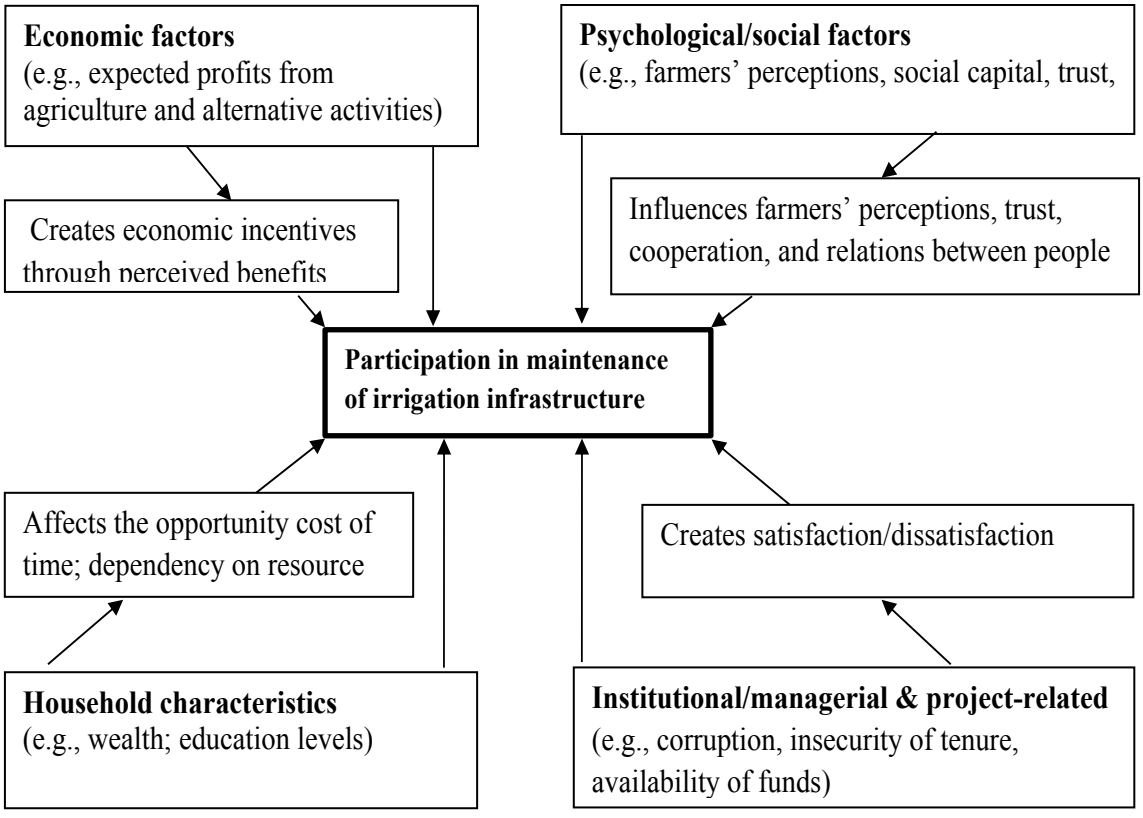

Fig. 1. Factors influencing the farmers' participation in maintenance of irrigation infrastructure.