Agricultural Water Management 131 (2014) 194–203

Contents lists available at ScienceDirect

Agricultural Water Management

journal homepage: www.elsevier.com/locate/agwat

Adoption patterns and constraints pertaining to small-scale water lifting technologies in Ghana

Regassa E. Namara[a,*,1], Lesley Hope[b], Eric Owusu Sarpong[c], Charlotte De Fraiture[d], Diana Owusu[e]

[a] The World Bank, 1818 H Street, NW, Washington, DC 20433, USA
[b] International Water Management Institute (IWMI), IWMI Regional Office for Africa and Sub-Regional Office for West Africa, PMB CT 112, Cantonments, Accra, Ghana
[c] Council for Scientific and Industrial Research, Food Research Institute, P.O. Box M.20, Accra, Ghana
[d] UNESCO-IHE, P.O. Box 3015, 2601 DA Delft, The Netherlands
[e] Consultant, P.O. Box CT 2889, Cantonments, Accra, Ghana

ARTICLE INFO

Article history:
Received 22 December 2011
Accepted 29 August 2013
Available online 10 October 2013

Keywords:
Agriculture
Small pumps
Smallholders
Irrigation

ABSTRACT

Irrigation is a priority development agenda item in Ghana and other countries in sub-Saharan Africa. There is a genuine endeavor to increase public and large-scale private investment in the sector. The on-going smallholder-driven private irrigation development that is largely based on water lifting technologies is not yet fully appreciated. We propose that smallholders themselves can play a significant role in achieving national irrigation development plans, provided they have access to water lifting technologies, especially small motorized pumps. We analyze adoption patterns and constraints pertaining to water lifting technologies in Ghana and suggest interventions that would enhance wider dissemination. Currently, these technologies are largely accessible only to better-off farmers. The primary factors inhibiting wider application are poorly developed supply chains, lack of access to finance, high operational and maintenance costs, high output price risks, and lack of institutional support. To realize the potential of water lifting technologies, improvements are required in the entire value chain of lift irrigation systems.

1. Introduction

In the aftermath of the food crisis in 2008, food security is high on the agenda of governments, donors and NGO's. An estimated 240 million people in sub-Saharan Africa (30% of the population) are food insecure, with volatility in food prices since 2008 one of the major contributing factors (FAO, 2011). Investments in irrigation development are often regarded as an effective policy measure to increase food production, provide rural income and improve food security (Faures et al., 2007; Turral et al., 2010).

The positive links between access to irrigation, increased income and food security at household level are well-established (Hussain and Hanjra, 2004; Hussain, 2007; Saleth et al., 2003; Shah and Singh, 2004; Huang et al., 2005; Gebregziabher et al., 2009). Evidence from, among others, India, China, Bangladesh, Sri Lanka, Indonesia, Thailand, Ethiopia and Kenya shows that incomes and nutrition status are generally higher in irrigated areas than in rainfed areas (Castillo et al., 2007; Namara et al., 2010). Irrigation reduces poverty and improves food security through four interrelated pathways (Smith, 2004): (1) improvements in the levels and security of productivity, employment and incomes for irrigating farm households and farm labor; (2) linkage and multiplier effects of agricultural intensification for the wider economy; (3) provision of opportunities for diversification of rural livelihoods; and (4) multiple uses of irrigation supply.

However, while studies based on household surveys find positive links, the impacts of irrigation investments at the macro level are less clear (Gebregziabher et al., 2009). Researchers from the International Food Policy Research Institute (IFPRI) show that government expenditure on irrigation has modest impact on economic growth and poverty reduction and that returns to investment in irrigation have been small (Pender et al., 2002; Fan et al., 2000; Rosegrant and Evenson, 1992). Financial, environmental and social costs of new irrigation infrastructure are high and, at the same time, part of the infrastructure is underutilized or underperforming due to lack of maintenance, bad management and financial difficulties (Faures et al., 2007).

Impact of public irrigation investments on equity is mixed. Investments targeted to the poor can be an effective way to reduce inequalities (Castillo et al., 2007). Huang et al. (2005) provide

* Corresponding author. Tel.: +1 202 8177576.
E-mail addresses: rnamara@worldbank.org, rensermunamara@yahoo.com (R.E. Namara).
[1] Formerly with IWMI based at West Africa Office.

0378-3774/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.agwat.2013.08.023

evidence from China showing how irrigation leads to less inequality. But there are also examples of increased inequality because of displacement, increased inequality between geographic areas, land consolidation in which poor people may lose rights to land and water (Hasnip et al., 2001; Castillo et al., 2007). Tail-end farmers, often the poorest, benefit less from the gains due to irrigation than farmers at the upper reach of the water source or canal. Given the important role that women play in agriculture, they are underrepresented in irrigator groups, Water Users Associations and owners of irrigation equipment (Meinzen-Dick et al., 2012; Van Koppen, 2002; Meinzen-Dick and Zwarteveen, 2003).

Under the framework of the New Partnership of African Development (NePAD), an initiative of the African Union, many African countries pledged to spend 10% of their government budget on agriculture. The first out of four pillars of Comprehensive Africa Agriculture Development Plan (CAADP), advocated by NePAD, is land and water development, with a heavy emphasis on the construction of irrigation systems.[2] Recently the Africa Development Bank Group called for investments of US $50 billion per year for new agricultural water infrastructure in sub-Sahara Africa (McClain, 2012). In line with these initiatives the national water policy of Ghana sets a goal of 100,000 ha under irrigation by 2020. This implies a tripling of the area reported to be under irrigation in the country now. Given the past pace of public irrigation development it seems unlikely that this target will be met (Svendsen et al., 2011). Further, cost estimates of constructing new irrigation schemes vary between $5000 and $20,000 per hectare, making the implementation of the policy expensive (Svendsen et al., 2011).

The renewed emphasis on irrigation development in sub-Saharan Africa seems to emphasize large scale gravity based surface irrigation and/or centrally managed large pumps. It thus ignores the growing group of farmers who use privately owned pumps to irrigate their land, individually or in small informal groups. This small private irrigation draws water from rivers, lakes, reservoirs and wells, using small pumps (1–10 HP) to grow dry season vegetable for the market (Abric et al., 2011; Pukey and Vermillion, 1995). Though data are scarce, available evidence suggests that small privately owned pumps play a dominant role in West Africa's irrigation sector and provides many smallholders with additional income during the dry season (Abric et al., 2011, Giordano et al., 2012). This sector is promising because it is driven and financed by farmers themselves. However, there is also evidence that small farmers and women are underrepresented in the group of beneficiaries and the potential to reduce poverty is not fully materialized (Namara et al., 2011).

We argue that farmers using small pumps contribute significantly in fulfilling the irrigated area targets as set by Ghana's irrigation policy. To harness its full potential, however, systematic knowledge is needed on the adoption pattern, extent of use in terms of area and beneficiaries, and potential of privately owned lift irrigation. As far as we know, no official statistics on small private irrigation in Ghana exist and the dynamics of adoption are poorly understood. We contribute to filling this gap by addressing the following questions:

- To what extent are privately owned small water lifting devices being used in Ghana? What is the current rate and pattern of adoption?
- Who are the current adopters? Are they the better-off farmers?
- What can be done to enhance uptake by a broader group of beneficiaries?

[2] www.nepad-caadp.net (last accessed June 2013).

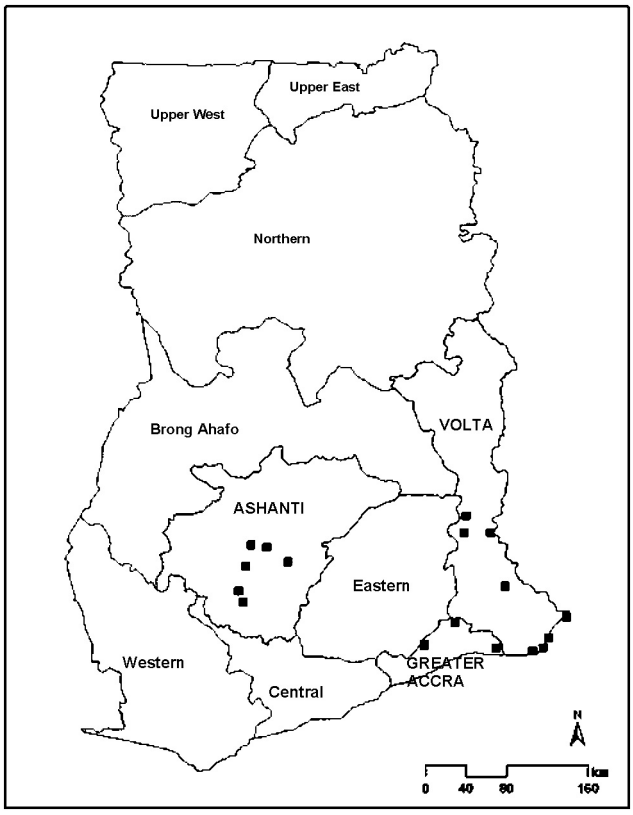

Fig. 1. Map of regions in Ghana and study locations.
Source: Based on farmer surveys conducted in 2010.

We further suggest measures with the intent of enhancing wider uptake of water lifting technologies in Ghana in particular and in SSA in general. While the study was conducted in Ghana, the results have sub-Saharan Africa wide implications.

2. Methodology, data sources, and the study locations

Two interrelated types of data collection methods were employed. First, a census was conducted in selected communities of the five regions of Ghana during the second half of 2010 where the adoption of water lifting technologies was known to be happening. The five regions were Ashanti, Greater Accra, Volta, Upper West and Upper East (Fig. 1). Second, a follow-up detailed sample surveys were conducted in only three regions (i.e., Volta, Accra, and Ashanti) using the list of farm households generated from the census as a sampling frame. Additionally, in 2005/2006 cropping season, a sample survey had been done to assess the adoption pattern of treadle pump technology in Ashanti and Volta regions (Adeoti et al., 2007). The 2005/2006 sample was deliberately included in the current sample survey to generate panel data that enabled the analysis of the dynamics of treadle pump and other water lifting technologies adoption.

2.1. Census in selected communities, districts, and regions

The five regions selected for the census, namely Volta, Greater Accra, Ashanti, Upper West, and Upper East represent the major agro-ecological zones of the country where water lifting technologies are potentially applicable, namely the southern and coastal (Volta and Greater Accra), the semi-deciduous forest (Ashanti), transitional (Ashanti), and the savanna (Upper West and Upper East) agro-ecological zones. From these regions, a total of 20 districts and 68 communities were selected based on the prevalence