



INTERNATIONAL
FOOD POLICY
RESEARCH
INSTITUTE

IFPRI Discussion Paper 01357

July 2014

**Can Market-Based Approaches to Technology
Development and Dissemination Benefit
Women Smallholder Farmers?**

A Qualitative Assessment of Gender Dynamics in the Ownership,
Purchase, and use of Irrigation Pumps in Kenya and Tanzania

Jemimah Njuki

Elizabeth Waithanji

Beatrice Sakwa

Juliet Kariuki

Elizabeth Mukewa

John Ngige

Poverty, Health, and Nutrition Division

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

The International Food Policy Research Institute (IFPRI), established in 1975, provides evidence-based policy solutions to sustainably end hunger and malnutrition and reduce poverty. The Institute conducts research, communicates results, optimizes partnerships, and builds capacity to ensure sustainable food production, promote healthy food systems, improve markets and trade, transform agriculture, build resilience, and strengthen institutions and governance. Gender is considered in all of the Institute's work. IFPRI collaborates with partners around the world, including development implementers, public institutions, the private sector, and farmers' organizations, to ensure that local, national, regional, and global food policies are based on evidence.

AUTHORS

Jemimah Njuki (jemimah.njuki@gmail.com) is a senior programme officer with the Canadian International Development Research Organization, Nairobi, Kenya.,

Elizabeth Waithanji is a gender consultant at the International Livestock Research Institute, Nairobi, Kenya.

Beatrice Sakwa is the director for Impact Evaluation and Monitoring at KickStart International, Nairobi, Kenya.

Juliet Kariuki is a PhD candidate in the Division of Social and Institutional Change in Agricultural Development at the University of Hohenheim, Stuttgart, Germany.

Elizabeth Mukewa is a PhD candidate in the Conservation Biology Graduate Program at University of Minnesota, Minneapolis, MN, USA.

John Ngige is the monitoring and evaluation manager for the Kenya Program, KickStart International, Nairobi, Kenya.

Notices

IFPRI Discussion Papers contain preliminary material and research results and are circulated in order to stimulate discussion and critical comment. They have not been subject to a formal external review via IFPRI's Publications Review Committee. Any opinions stated herein are those of the author(s) and are not necessarily representative of or endorsed by the International Food Policy Research Institute.

Copyright 2014 International Food Policy Research Institute. All rights reserved. Sections of this material may be reproduced for personal and not-for-profit use without the express written permission of but with acknowledgment to IFPRI. To reproduce the material contained herein for profit or commercial use requires express written permission. To obtain permission, contact the Communications Division at ifpri-copyright@cgiar.org.

Contents

Abstract	v
Acknowledgments	vi
1. Introduction	1
2. Conceptual Framework	3
3. Background and Setting	5
4. Data and Methodology	9
5. Results and Discussion	11
6. Conclusions	22
References	24

Tables

3.1 Types and specifications of pumps sold by KickStart	8
4.1 Sampling strategy and sizes for qualitative fieldwork in Kenya and Tanzania	10
5.1 Assets commonly owned by men, by women, and jointly	12

Figures

2.1 Schematic representation of the role of assets in a gendered livelihood conceptual framework	3
5.1 Irrigated crops preferred by men and women in Tanzania	14
5.2 Irrigated crops preferred by men and women in Kenya	15
5.3 Expenditure and investment priorities for men and women in Tanzania and Kenya	17
5.4 Benefits of KickStart pumps experienced by men and women in Tanzania	19
5.5 Benefits of KickStart pumps experienced by men and women in Kenya	20

ABSTRACT

Rural household economies dependent on rainfed agriculture are increasingly turning to irrigation technology solutions to reduce the effects of weather variability and guard against inconsistent and low crop output. Organizations are increasingly using market-based approaches to disseminate technologies to smallholder farmers, and, although women are among their targeted group, little is known of the extent to which these approaches are reaching and benefiting women. There is also little evidence on the implications of women's use and control of irrigation technologies for outcomes, including crop choice and income management. This paper reports findings from a qualitative study undertaken in Tanzania and Kenya to examine women's access to and ownership of KickStart pumps and the implications for their ability to make major decisions on crop choices and use of income from irrigated crops. Results from sales-monitoring data show that women purchase less than 10 percent of the pumps and men continue to make most of the major decisions on crop choices and income use. These findings vary by type of crop, with men making major decisions on high-income crops such as tomatoes and women having relatively more autonomy on crops such as leafy vegetables. The study concludes that market-based approaches on their own cannot guarantee access to and ownership of technologies, and businesses need to take specific measures toward the goal of reaching and benefiting women.

Keywords: gender, irrigation technology, household decisionmaking, income management, market approaches

ACKNOWLEDGMENTS

This manuscript was prepared for the Gender, Agriculture and Assets Project (GAAP), a research and capacity building initiative jointly led by the International Food Policy Research Institute and the International Livestock Research Institute, supported by the Bill and Melinda Gates Foundation. This paper benefited from the helpful comments of and discussion with Ruth Meinzen-Dick, Amber Peterman, Agnes Quisumbing, and Deborah Rubin.

1. INTRODUCTION

Land and water are two key natural resources on which poor people depend for their livelihoods, and often more heavily than the nonpoor. Within agriculture, irrigation water is a vital resource for many productive and livelihood activities, and irrigation technology has been suggested as a key strategy to enhance agricultural productivity especially in economically water scarce areas, that is, areas where water is not a limiting factor but farmers lack the financial means to develop available water resources (Hussain and Hanjra 2004). Access to reliable irrigation water can enable farmers to adopt new technologies and intensify cultivation, leading to increased productivity, overall higher production, and greater returns from farming. This, in turn, opens up new employment opportunities, both on and off the farm, and can improve incomes, livelihoods, and the quality of life in rural areas. The productivity of crops grown under irrigated conditions is often substantially higher than that of the same crops under rainfed conditions. Higher productivity helps increase returns to farmers' endowments of land and labor resources.

In addition to higher production stemming from high yields, production is also increased by higher land use intensity and cropping intensity. Farmers using irrigation are known to raise up to three irrigated crops per year, unlike in rainfed agriculture where farmers can have only one or two crops per year (Dhawan and Datta 1992). Access to good irrigation enables crop-switching: replacing low-yielding and less profitable crops with new high-yielding and more profitable crops. Implicitly, this can imply switching from subsistence production to market-oriented production. Thus, irrigation can lead to crop diversification and enable the poor and smallholders to spread risk more evenly over the course of a year (Reardon and Taylor 1996).

Irrigation is also one of the technologies farmers can use to adapt to climate variability and change. Climate variability and change pose a major threat to agricultural production in developing countries (Thornton et al. 2009; Schmidhuber and Tubiello 2007; Thomas and Twyman 2005). For example, the harvests from rainfed agriculture in Africa south of the Sahara could decrease by as much as 50 percent by 2020 as a result of climate variability (PARRY, 2007). Further, scientists estimate that the effects will be inequitably distributed among certain socioeconomic groups, with women and the poor being particularly vulnerable (Tol et al. 2004; Thomas and Twyman 2005; Neumayer and Plumper 2007; Arora-Jonsson 2011).

Access to good irrigation not only allows poor people to increase their production and incomes but also enhances their opportunities to diversify their income base and reduce their vulnerability to the seasonality of agricultural production and external shocks. Water can also generate other streams of income as the poor use it for other farm and nonfarm production activities, particularly small-scale rural enterprises such as livestock rearing, fish production, brick making, and so on.

Such direct effects of irrigation may, however, be distributed inequitably. As the benefits of irrigation infrastructure are closely tied to landownership, the first-generation beneficiaries tend to be large, medium, and small landowners, respectively. Women may also not benefit from irrigation technologies due to their low access to and ownership of land and other gender-based constraints. Intrahousehold dynamics also influence how households manage their assets and the income derived from the use of those assets. As a result, women may not always share in subsequent benefits of irrigation technologies such as increased income.

The development and dissemination of irrigation technologies have to take into account gender considerations and recognize the roles that women play in agriculture and in climate adaptation. A variety of approaches have been used to increase women smallholder farmers' access to technologies. These include, but are not limited to, direct targeting of technologies to women smallholder farmers, subsidy programs, and developing technologies with the participation of women farmers, among others. Despite the recognition that women play and will continue to play a major role in agriculture production and climate adaptation given their contribution to African agriculture, recent reviews conclude that a critical gender gap exists between men and women smallholder farmers in access to and use of irrigation technologies across the developing world (FAO 2011).

A shift has occurred toward market-based approaches for technology development and dissemination, with the argument that such approaches are more sustainable and build local systems for technology delivery. This paper focuses on assessing the effectiveness of a market-based approach to technology dissemination in reaching and benefiting women smallholder farmers using KickStart irrigation technologies as a case study. KickStart is a nonprofit nongovernmental organization that sells mechanized, but nonmotorized, pumps targeting low-income farmers to reduce poverty by enhancing production and generation of agriculture-based incomes. The organization uses a market-based model in Kenya, Tanzania, and Mali, with distribution channels in Uganda, Rwanda, Sudan, Malawi, and Zambia. This assessment uses sales data generated by KickStart paired with qualitative data collected from men and women smallholder farmers and key informants in Kenya and Tanzania. The study seeks to answer four key research questions: (1) What are the key gender differences in pump acquisition, ownership, and control at the household level and is there need for specific strategies to reach women? (2) Does ownership of the pump by women influence decisions on crop choice and use of income from irrigated crops? (3) What are the household-level impacts of owning the pumps, as perceived by men and women? and (4) How effective has KickStart's Mobile Layaway program been in increasing reach to women and changing gender gaps in pump ownership?

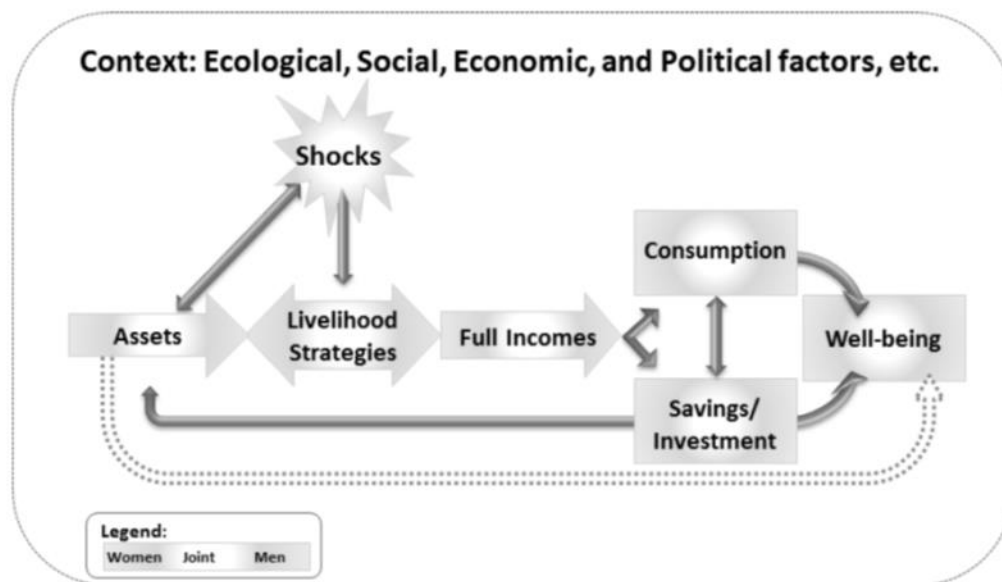
Results from sales-monitoring data in Kenya and Tanzania show that women purchase less than 10 percent of the pumps and men continue to make most of the major decisions on crop choices and income use. However, the findings vary by type of crop: men make major decisions on high-income crops such as tomatoes, whereas women have relatively more autonomy on crops such as leafy vegetables. Despite their low ownership of pumps, women describe household benefits from pump use including improved food security and ownership of complementary assets. Drawing from data on the new Mobile Layaway credit program implemented by KickStart to increase women's purchase of the pumps, the study concludes that specific measures need to be taken by businesses toward the goal of reaching and benefiting women.

2. CONCEPTUAL FRAMEWORK

Assets are the building blocks of a sustainable livelihood. By building assets, individuals and households develop their capacity to cope with the challenges they encounter and to meet their needs on a sustained basis. The Sustainable Livelihoods Framework (Scoones 1998) draws attention to the variety of assets (physical, natural, financial, social, political) that contribute to making a sustainable livelihood and to ways in which they are interdependent. These assets are combined in pursuit of different livelihood strategies to achieve sustainable livelihood outcomes.

Assets are, however, unequally distributed between rich and poor, and also between men and women, nationally as well as within communities and households (Hausmann et al. 2010). A growing empirical literature from both developed and developing countries has shown that distribution of assets within the household is critical to household and individual well-being, as measured by outcomes such as food security, nutrition, and education (Deere and Doss 2006; Quisumbing 2003). A gendered assets and livelihoods framework (Meinzen-Dick et al. 2011) is used for this study (see Figure 2.1).

Figure 2.1 Schematic representation of the role of assets in a gendered livelihood conceptual framework



Source: Meinzen-Dick et al. (2011).

The framework uses assets as the starting point, or the base, through which households or household members determine what livelihood strategies to pursue either jointly or individually. For our purposes, women must own an irrigation technology, either individually or jointly with their husbands, in order to pursue irrigated agriculture. And the decisions that women can make regarding livelihood strategies and the degree to which they control the outcomes of those strategies are dependent on the relative autonomy they have regarding the use of assets. Such outcomes may include consumption or investments and savings, which can in turn be used to purchase or accumulate more assets.

In our study, assets used in various livelihood options and assets purchased or acquired as a result of the pump were also categorized into natural, physical, human, financial, social, and political. Natural assets include land, water, trees, genetic resources, and soil fertility; physical assets include agricultural and business equipment, houses, consumer durables, vehicles and transportation equipment, water supply and sanitation facilities, and communications infrastructure; human assets include education, skills, knowledge, health, and nutrition, which are embodied in the labor of individuals; financial assets include

savings, credit, and inflows (state transfers and remittances); social assets include membership in organizations and groups and social and professional networks; and political assets include citizenship, enfranchisement, and effective participation in governance (Meinzen-Dick et al. 2011). The framework is especially useful in testing the hypothesis that interventions that increase women's stock of a particular asset can improve the bargaining power of the individual or individuals who control that asset, leading to increased autonomy and decisionmaking and to better development outcomes. In the case of the KickStart pump, purchase and ownership of the pump is expected to lead to a higher say by women on crop choice and on management of the income from the irrigation pumps. This would then translate to higher incomes in the hands of women, and an accumulation of other assets by women.

3. BACKGROUND AND SETTING

Role of Irrigation Technology in Kenya and Tanzania

Tanzanian and Kenyan household economies depend largely on rainfed agriculture. Due to weather variability and the aridity or semi-aridity of most agroecological zones in both countries, rainfall has been historically unreliable and crop output is, therefore, inconsistent. Historically, dry season irrigation was practiced in eastern and southern Africa to help farmers produce crops throughout the year (Rockstrom 2000), but due to the inefficiency of watering using buckets and other such basic equipment, production by irrigation remained minimal. Changes in smallholder and large-scale schemes in recent years have led to adoption of new technologies by individual irrigator farmers such as motorized pumps, manually operated treadle pumps, low-head drip-irrigation kits, and locally manufactured sprinkler and drip systems (Giordano et al. 2012). These technologies allow farmers to access water sources previously unavailable, as well as to use water more effectively in their plots. Irrigation also allows smallholder farmers to move from traditional food grain crop production for subsistence to producing high-value vegetables and fruits and to commercialize their production (Giordano et al. 2012).

Half of Tanzania receives less than 762 mm of rainfall annually (Shemsanga, Omambia, and Gu, 2010). A large portion of the country requires irrigation to attain agricultural production that can sustain livelihoods. Responding to this production challenge, Tanzania launched the National Irrigation Master Plan in 2002. Four types of irrigation schemes can be identified in Tanzania: (1) traditional, including gravity irrigation through furrows; (2) rainwater harvesting; (3) improved schemes, which according to the United Republic of Tanzania (2001) are schemes that receive support to ensure effective performance of improved rainwater harvesting for increased and stable production, productivity, and profitability—such support ranges from rehabilitation of traditional irrigation infrastructure to the development of water storage facilities and technical facilitation and capacity building for farmers to improve the management of their irrigation schemes; and (4) large-scale commercial irrigation schemes (Ministry of Water and Irrigation 2010). Traditional schemes are managed by farmers and are often characterized by poor infrastructure and conflicts over water use especially where community institutions are weak. Traditional irrigation schemes in Tanzania cover a wide range of approaches ranging from traditional furrows in highland areas to basic water-diversion practices, pit and trench farming in the lowland areas, and labor-intensive terracing in hilly areas (AGWater Solutions 2011; United Republic of Tanzania 2001). Rainwater-harvesting schemes are mainly found in the arid and semiarid areas of central and western Tanzania and involve either direct tapping of rainwater in banded¹ fields or diversion of rainwater runoff from seasonal and ephemeral rivers. Farmers using rainwater-harvesting techniques often suffer from poor infrastructure for diverting harvested water and lack control of water in the bunds. The large-scale commercial irrigation schemes are mainly government or private-sector funded and managed, often have permanent structures and facilities for irrigation, drainage, and flood protection, and have been designed with full water control and measurement to assist in water delivery and management. The performance of the large-scale schemes has gradually increased in terms of water management, water use efficiency, and crop yields. For example, paddy yields of up to 10 metric tons per hectare (/ha) have been achieved by some smallholder farmers, but most farmers still yield about 4.0 to 5.0 tons/ha on average. Rice is by far the most important irrigated crop in Tanzania. Other irrigated crops include maize, onions, tomatoes, sugar cane, tea, coffee, and cut flowers.

Similarly, in Kenya, more than 80 percent of the country is classified as arid or semiarid. Three organizational types of irrigation schemes are commonly practiced, namely, smallholder, large-scale surface, and agro-industrial (IWMI 2002). Smallholder schemes are operated by individuals or small groups of farmers. The produce from such schemes is used to meet subsistence and domestic and local market demand. Smallholder irrigation schemes are often financially challenged and characterized by

¹ *Banding* refers to the building of an earth embankment, or *bund*, around the field boundary to allow water to be stored, conserved, and made available to the crop in a controlled manner.

poor maintenance, absence of functional farmer support services, and low-income earnings by farmers. Large-scale surface schemes are operated and maintained by the government, large development corporations, or farmer associations. Some of those schemes have since collapsed, and where they have not collapsed, farmers struggle to buy inputs and to market their produce. Agro-industrial irrigation schemes have been developed for high-value crops, notably flowers, and are financed and developed by private corporations and individuals. They are produced exclusively for export markets and bring high profits to the owners (IWMI 2002).

Gender and Irrigation Technology

Attention to gender issues in irrigation arises from two basic concerns. The first is the ineffectiveness and inadequacy of technologies and institutional choices as a result of the neglect of gender considerations in many irrigation programs. The second arises from the need to recognize the important roles of women in agricultural activities and the constraints that they face in accessing productive resources including technologies.

Over the past decade and longer, there has been emphasis on the need to integrate gender analysis into irrigation programming. However, the extent to which that actually occurs has been negligible. One reason for this lack of congruence between stated intentions and actual practice is that water-related projects usually have strong technical components and are implemented by engineers who rarely have requisite skills and training to integrate gender concerns (Van Koppen 2002; Zwarteveen 1998; Rathgeber 2003). A review of a set of World Bank irrigation projects that became effective after 1997 found that less than half (47 percent) had addressed basic poverty issues, 11 percent had special assistance components for the poor, 6 percent monitored impact on the poor, and only 23 percent had special provisions to assist female farmers (Van Koppen 2002; World Bank 2002).

Studies of traditional irrigation projects show that in spite of the projects' aim to alleviate poverty, rights to irrigated land and water are rarely vested in poor men, and even less frequently in poor women (Van Koppen 1998). There is evidence that in some instances, the change from rainfed agricultural systems to irrigation can erode women's rights to use of land and other resources. Some early studies of the Jahaly-Pacharr irrigation project in the Gambia provide a good example of the potentially detrimental effects of irrigation projects on women. With the introduction of irrigation technology, women's resource and access rights declined. They had formerly grown swamp rice in the region, but when the irrigation project was set up, their land was redesigned as part of communal or household farms, under the direction of male household heads (Whitehead 1998). Although women benefited from the increased economic prosperity of the area, they became more dependent on male heads of households, providing labor for their lands, whereas in the past they had had usufruct rights of their own (Carney 1993).

Although women have often been disadvantaged and have lost rights and status as agricultural systems became increasingly technology-based and commercialized, there also have been instances where they have benefited from changes, sometimes as a result of their own negotiations to ensure that they received benefits or rights. Van Koppen, Nagar, and Vasavada (2001) report on a project in India where a women's group came together to manage an irrigation project. The report shows that putting irrigation technologies into the hands of women in order to irrigate plots over which women share decisionmaking power is well feasible and leads to multiple benefits. Women's ownership and management of equipment bring with it the social status attached to serving the community and, in principle, a water income for the group as a whole.

Studies in Carchi, Ecuador, have shown that irrigation is adopted less by female-headed households than male-headed households (Bastidas 1999), and Kulkarni (2012) reports that in Sri Lanka men are generally more involved than women in decisionmaking and water management in the irrigation schemes. Studies on individually owned treadle pumps are less widely documented (Chancellor and O'Neill 2000). However, evidence exists that demand for such technology for smallholder irrigation is growing in, for example, Zambia (Chabayanzara and Breth 1994). Female farmers are, however,

disadvantaged in accessing such technology because of limited access to information, high initial costs, and lack of proper financial tools (Giordano et al. 2012). Just as with the smallholder irrigation schemes, relatively well-off farmers have a significantly higher probability of adopting the treadle pumps. In addition, evidence from Malawi has shown that in cases where women have access to such technology, they are more likely to pay cash for the pump, whereas male adopters mostly acquire the pump through a loan (Kamwamba-Mtethiwa et al. 2012). This may reflect biases that women face in credit markets or women's lack of ownership of assets that are suitable for collateral.

Addressing gender issues in irrigation programs can have an impact on adoption of technologies (Descheemaeker, Amede, and Hailelassie 2010) and can lead to broader changes in gender relations. When women were engaged in the rehabilitation and design of an irrigation project in South Africa, the male-dominant community they belonged to changed its behavior toward them because their involvement in the project improved the community's economic situation (Stimie and Chancellor 1999). Similarly, in Burkina Faso, a case study by the Gender and Water Alliance showed that overall productivity increased when women and men were allocated small separate plots rather than larger household plots. Women proved to be good irrigation farmers and preferred to work their own plots. As they became economically less dependent on their husbands, they were able to help support their relatives and increase their own opportunities for individual accumulation of wealth in the form of livestock. The effects of having an individual plot also significantly improved the bargaining position of women within households (Appleton and Smits 2003).

KickStart International

Established in 1991, KickStart International has on-the-ground country programs in Kenya, Tanzania, Zambia, Mali, and Burkina Faso, with a team of more than 120 locally based field agents who implement extensive marketing, education, and awareness-building activities designed to encourage adoption and generate demand for its manually powered irrigation pumps. KickStart also sells its products to other countries in Africa through its Global Institutional Partnerships Program. Because changing the behavior of farmers who have practiced rainfed farming for generations is a long process, KickStart's agents use a variety of methods to demonstrate the impacts of irrigation and encourage the adoption of the pumps. An essential part of the outreach strategy is to partner with NGOs, agricultural companies, local farmer cooperatives, and women's groups to demonstrate the pumps to their memberships and educate partners on the critical role irrigation can play in helping farmers secure their livelihoods and take themselves out of poverty (KickStart 2012).

KickStart has continued to develop and improve its pumps, in particular starting with the MoneyMaker Suction Pump originally released in 1996 (Table 3.1). It released the Super MoneyMaker in 1998 and the MoneyMaker Plus in 2001. In 2002 it improved upon the Super MoneyMaker and the result was the Super MoneyMaker Plus. KickStart upgraded the Super MoneyMaker Plus to the current MoneyMaker Max, designed in 2010 and launched in 2012. In addition to treadle pumps, which are the most common of the KickStart pumps, the company also developed the hand-operated, lightweight MoneyMaker Hip Pump that it released in 2006. KickStart created the Hip Pump as a lower-cost, lighter-weight, portable pump that women would prefer (Sijali and Mwago 2011). Prices for the pumps vary from approximately 12,690 Kenyan shillings (US\$155²) for the latest model, the MoneyMaker Max, to 5,990 Kenyan shillings (\$73) for the Hip Pump. Further information on pump models and functions is available at www.kickstart.org.

² All currency in Dollars refers to US dollars.

Table 3.1 Types and specifications of pumps sold by KickStart

Pump type	Pumping height (meters)	Irrigable area (acres)	Pumping capacity (liters/second)	Pumping distance (meters)	Design date	Weight (kilograms)	Price (\$US)
MoneyMaker Max	14 ^a	2	1.1	200	2010	16	155
Super MoneyMaker Plus	14	2	1.1	200	1998	21	73
MoneyMaker Pump	14	1.5	1	200	1996	11	100
MoneyMaker Hip Pump	14	1.25	0.7	200	2006	4.5	50

Source: KickStart (2012).

Notes: The price for the MoneyMaker Max and the Hip Pump is a bundled price (it includes the 10-meter inlet and the 18-meter outlet pipes). The Super MoneyMaker Plus and the MoneyMaker Pump are no longer being sold. A deep-lift pump had not been released in the market at the time of the study. ^a It draws water from seven meters deep and can take the water seven meters high—hence the pumping head of 14 meters.

While KickStart builds market demand for irrigation pumps, it seeks to optimize a sustainable supply chain through a network of more than 400 local, private-sector dealer shops across the countries where they work. The dealers work closely with KickStart’s field agents as the main point of sale for the pumps. Creating sustainable local knowledge about irrigation, training farmers on how to use the pumps, and building a local for-profit supply chain to sell the pumps and spare parts are the essential components of KickStart’s work to create long-term sustainable impacts for farmers. Starting in the mid-2000s, KickStart began implementing strategies to increase uptake of the pumps by women farmers. For example, the organization has made a number of adjustments to marketing and targeting strategies such as using women extension workers and sales representatives in campaigns to establish pumps in new areas and including women in demonstrations and outreach activities in rural areas. In 2011 KickStart began a Mobile Layaway pilot program that facilitates gradual purchase of pumps by financially constrained farmers.

4. DATA AND METHODOLOGY

Data Collection

Data for the qualitative component of the study were collected in Tanzania's Mwanza, Tabora, and Iringa regions and in the Murang'a, Thika, and Bungoma districts of the Central and Western provinces in Kenya between May and July 2011. The sites were purposively selected to represent areas with high numbers of pump purchases due to their agroecological characteristics that required irrigation for crop production. They were also selected to represent different levels of gender stereotyping (low and high) and proximity (low and high) to urban centers. Areas with strong gender stereotyping were taken to be those where gender divisions of labor, ownership patterns, and general gender stereotypes were thought to be strong and to be both culturally and socially embedded in people's lives. Areas with weaker gender stereotypes were areas where gender roles and responsibilities were continually changing and evolving either due to increasing urbanization or an increasing mix of ethnic groups with different gender norms and beliefs.

In Tanzania, Mwanza represents the Lake Zone, which is characterized by semiarid to subhumid conditions with an annual precipitation of 500 to 1,000 millimeters (mm) per year (De Pauw 1985). Flood irrigation of rice is common, and small-scale irrigation using pumps and buckets is also an emerging practice. According to sales data, from 2005 to 2009, the Lake Zone accounted for about 20 percent of the pumps sold in Tanzania (Nkonya et al. 2011). Tabora Region represents the Western Zone, a plateau region rising 800 to 1,500 meters above sea level and with annual precipitation of 800 to 1,300 mm (De Pauw 1985). Tabora is rural with expected medium to high gender stereotyping. Iringa is the most rural of the three regions and represents the Southern Highlands with an altitude of 1,200 to 2,300 meters above sea level and annual precipitation of 800 to 2,000 mm (De Pauw 1985). Iringa is also the breadbasket of Tanzania with fertile volcanic soils. The Southern Highlands accounted for 14 percent of KickStart pump sales in Tanzania from 2005 to 2009. In total, the three zones represented in this study accounted for approximately 53 percent of KickStart pump sales in Tanzania (Nkonya et al. 2011).

In Kenya, Murang'a and Thika represent two of the several districts in the agriculturally productive and partly humid Central Province. The areas of highest agricultural potential in Murang'a receive an average annual rainfall of between 1,400 and 1,600 mm. Reliable and well-distributed rainfall facilitates a suitable environment for the commonly practiced cultivation activities in this area. In some of the dryer regions, the challenge of inadequate water supply has led to an increase in water-harvesting interventions in the region. Maize, beans, tomatoes, French beans, and Irish potatoes are among the main food crops grown in the region (NEMA 2011a). Thika District receives rainfall ranging from 965 to 2,130 mm. The semiarid eastern part of Thika is reported to receive rainfall ranging from 116 to 965 mm (Environmental Resources Management, 2011). Topographically, although Thika is suited for irrigated plantation farming, rainfall patterns determine the agricultural activities and the types of crops being grown in the district (Municipal Council of Thika 2008). Murang'a and Thika accounted for approximately 20 percent of pump sales in Kenya and represented areas of low gender stereotyping owing to their close proximity to Nairobi. Finally, Bungoma District, the third study site, is located in western Kenya and is characterized by a mean annual rainfall of 1,000 to 2,000 mm. The main food crops grown in Bungoma are maize, beans, tomatoes, and sweet potatoes, whereas, tea and sugarcane are among the main cash crops. According to the District Plan (NEMA 2011b), the main sources of water for irrigation are wetlands, small streams, and runoff. Western Province accounted for approximately 20 percent of pump sales in Kenya from 2005 to 2009. Bungoma District is rural and typically more gender stereotyped than the other study districts in central Kenya.

A total of 27 focus group discussions (FGDs) were carried out across the two countries. Of those, 11 were women only, 11 were men only, and five were mixed. Focus group participants were selected from lists of farmers from the selected villages who had purchased pumps. As the FGDs involved only farmers who had bought pumps, the selection of the villages was done based on numbers of farmers in those villages that had bought pumps. These villages therefore had the highest numbers of pump buyers in

their respective districts. The minimum number of people per group was six and the maximum was 18. In some cases, the groups were split to facilitate discussion. Table 4.1 shows the total number of FGDs and participants. During the FGD, any conversation that could be presented graphically during the discussion was documented and displayed in flip charts for all to see (for example, the impact diagrams). The checklist was pretested and subsequently administered to sex-disaggregated groups of men only, women only, and mixed groups of men and women. The questions for each type of FGD were similar, but language was adjusted to suit the different gender groups. FGDs took an average of three hours, and participants were encouraged to ask questions or make comments during and following each discussion.

Table 4.1 Sampling strategy and sizes for qualitative fieldwork in Kenya and Tanzania

Country	Classification	Number of villages	Number of Focus group discussions by type			Total participants	
			Men	Women	Mixed	Men	Women
Tanzania	Urban, weak gender stereotypes	4	4	4	1	71	60
	Rural, strong gender stereotypes	2	1	1	1	42	27
Kenya	Urban, weak gender stereotypes	1	1	1	1	13	11
	Rural, strong gender stereotypes	2	5	5	2	76	58
Total		9	11	11	5	202	156

Source: Focus group discussion data (2011).

In addition to the FGDs, a second study, consisting of two components, was done in Kenya. First, in-depth individual interviews were conducted to provide more data on decisionmaking and control of income, areas that were deficient in the initial study. The decision to conduct the second study was made during the end-term review of the project when gaps in the decisionmaking component of the earlier study were identified. The individual interviews were carried out to gain more in-depth information on the ownership and use of the pumps and decisionmaking (nine households; six male- and three female-headed).

Second, a rapid assessment of layaway pump purchases was done to establish the benefits, challenges, and ways of improving the service. The need for the layaway study arose from discussions at a presentation of results of the initial study and from recommendations that KickStart needed to do more to increase women farmers' access to its pumps. For this study six men and six women were interviewed. These farmers were selected purposively based on pump sale information obtained from KickStart records and availability of respondents to be interviewed.

Analysis Methodology

We analyzed the data from the FGDs using the content analysis technique, where responses are arranged into categories and analyzed according to themes (Powell and Renner 2003). The data were analyzed along five categories of questioning, namely, (1) understanding asset ownership, the pump, and its use; (2) main crops irrigated and decisionmaking about them; (3) understanding impacts of the pump; (4) understanding challenges of accessing, owning, and using the pumps; and (5) strategies for increasing access to pumps by women.

5. RESULTS AND DISCUSSION

Awareness, Purchase, and Perceptions of KickStart Pumps by Men and Women

Results from sales data show that overall approximately 6 percent of pump sales in Tanzania and 18 percent of pump sales in Kenya were made to women between 2005 and 2013. In terms of numbers, of 38,530 pumps sold in Kenya between 2008 and April 2013, 4,942 were bought by women and 25,060 were bought by men. Farmer groups bought the remainder.

From the sales data, the MoneyMaker Plus was the most commonly used pump in Tanzania, whereas in Kenya, the most commonly purchased was the Super MoneyMaker Plus. In Kenya, most FGD participants used the Super MoneyMaker Plus. The difference between the two countries in pump preference was due to different strategies being used in the launch of the different pumps. In Kenya, a lot of publicity during the launch of the Super MoneyMaker Plus characterized it as a pump suitable for the poor. Women in particular preferred the MoneyMaker Hip Pump because it was easy to use and had no operational cost. Participants in some areas, for example, in central Kenya, mentioned that the use of legs to pump water is culturally inappropriate for women. Similar reports were documented in Nigeria in the case of a pedal-operated, bicycle-mounted rice thresher that women rejected for being culturally unacceptable (Quisumbing and Pandolfelli 2010). New technologies need to take into account such gender differences and consider both men's and women's perceptions in the design. Manual pumps, for example, have been introduced for irrigation and been successful in many countries but have faced adoption hurdles in other countries. Women in several regions of India, for example, adopted treadle pumps under a project partially funded by USAID and implemented by International Development Enterprises (India). The newly irrigated fields increased yields, and women's incomes and sense of empowerment both rose. Similar pumps were introduced in several countries in Africa south of the Sahara under other programs, but their adoption by women was more mixed. Anecdotal reports from Zimbabwe noted that some women "felt exposed" when operating these above-ground models, and others reported fatigue. In addition, the initial and operational cost was deemed too high for the use of these pumps by women in vegetable gardens intended for home consumption rather than for market.

Ownership and Use of the KickStart Pump and Other Assets

In Tanzania, a majority of participants stated that men and women decided whether to buy a pump jointly. In cases where they disagreed, the husband made the final decision. In some cases, however, men simply bought pumps and brought them home. "My husband just brought the pump one evening when he was coming back from Njombe," said a woman FGD participant in Tanzania.

A few women, especially from female-headed households, bought pumps. Joint decisionmaking between husband and wife in the purchase of the pumps was found to be more common in Iringa Region than in Tabora Region, which was classified as a region with higher levels of gender stereotyping. When a group of farmers owned the pump, all the members of the group made the decision to purchase the pump irrespective of whether it was a women-only or mixed group.

From the FGDs, we learned that women knew less about the pumps than did men, due to several factors, including lower levels of education, less mobility, and unequal access to information. The main sources of information on the pumps for both men and women were NGOs that distributed pumps to farmers, agricultural shows, field days, and demonstrations. Men specially mentioned radio, television, and leaflets distributed by KickStart as important sources of information, whereas women mentioned their husbands or other farmers such as neighbors as an important source of information. According to Waris, Singh, and Chauhan (2010) women rarely use the mass media as a source of information because they are often too busy with both productive and reproductive activities to listen to the radio. A common practice in rural Tanzania is for men to carry the radio with them as they move around the homestead and village, and women rarely get the chance to listen to radio programs. In addition, it has been documented that persons who are already marginalized by limited access to resources, by being located in remote rural

areas, or by their gender are more likely to experience unequal access to information (Fletschner and Mesbah 2011). Further, family responsibilities and larger workload, economic disempowerment (Primo and Khan 2003), and cultural norms (Fletschner and Mesbah 2011) limit rural women’s ability to receive, seek, and use information.

The qualitative work confirmed the sales data, indicating that men dominated ownership of pumps, as well as the majority of other household assets. Both men and women reported that men owned most “big” assets such as land, houses, electronic equipment, bicycles, and livestock. Women on the other hand typically owned “smaller” assets such as utensils, clothes, poultry, and mobile phones. Fewer assets were reported as jointly owned and typically included assets used by the entire household, such as furniture, businesses, farm tools, and sometimes business accounts. Mobile phones were the only asset type owned by both men and women within the same household individually. We noted no pronounced difference in ownership of these assets between the more urban and the rural sites. Table 5.1 provides a summary of commonly owned assets by men and women, or by the household jointly. There were no major differences in these trends between Kenya and Tanzania.

Table 5.1 Assets commonly owned by men, by women, and jointly

Assets commonly owned by men	Assets commonly owned by women	Assets commonly owned jointly	Assets owned by men and women individually within same household
Cattle, land, car, bicycle, motorcycle, house, television, radio, furniture, mobile phone, motor pump, crops, farm tools (ox-plough, hand hoes), business, trees for timber, sewing machine, bank account	Poultry, utensils, clothes, mobile phone, furniture, sewing machine	Land, bank account, furniture, business, utensils, house, farm tools	Mobile phone

Source: Focus group discussion data (2011).

Note: Some assets were placed in more than one category by different groups. For example, in some groups, bank accounts were mentioned as commonly owned by men, whereas other groups indicated they were commonly joint owned.

In exploring the concept of joint ownership with FGD participants, it emerges that jointly owned assets are those assets that have been either purchased or obtained with the efforts of both the man and the woman. In addition, neither party can dispose of the asset without the consent of the other. In some settings it was problematic defining assets women owned, as many female participants expressed that the only assets they owned solely were their own clothes. It emerged from the discussions that, even when a woman had purchased an asset or brought it into the marriage, a man could often dispose of the asset without her consent. In central Kenya, women indicated they could take action against their husbands to claim back the asset. One woman FGD participant in Kenya said, “If a man sells something the wife bought and did not want to be sold, she can report him to the chief [local administration] and have the item confiscated and returned to her.”

For women-owned assets such as utensils, women explained their claim over such assets in the sense that their husband could not bring into the house a co-wife to use the current wife’s assets or give them out or dispose of them without consulting her. In the event of the death of the wife, her sisters are traditionally entitled to all the household utensils she has been using. In Tanzania, women indicated they knew their rights and would fight for them if need be. “Even if my husband divorces me, there is no way I can leave the house because I have nowhere else to go since we worked together to construct the house,” said one woman FGD participant in Tanzania. Another said, “If my husband divorces me, I will fight for it [house]. I know my rights.”

In terms of the KickStart pumps specifically, respondents indicated that the pumps were mainly used to irrigate their own land. In addition, some farmers in Kenya leased out their pumps at a fee or lent them free of charge to their neighbors and friends. The reason given for lending pumps free of charge by women from central Kenya was to help the borrowers benefit from pump use and encourage them to buy

their own. Women from central Kenya also reported that men, who in most cases were the custodians of the pumps within the household, rarely lent pumps to women because “men do not like women to progress.” In contrast, renting out pumps for a fee was practiced more in western Kenya. Three male participants from western Kenya reported that they lent pumps for 100, 200, and 500 Kenyan shillings per day (100 Kenyan shillings = approximately \$1.20). One Kenyan man said, “I lent out my pump to a neighbor to fill his fish pond and he paid me 2,000 shillings [\$23] for the one week that he used it.”

Some participants also reported lending pumps for payment in kind—either the borrower’s labor or a share of the irrigated produce. These findings are similar to those from an impact assessment study by ApproTEC (1999) in Kenya. The pumps were also used for other purposes such as watering livestock and use in the household.

Although we saw no indication of men and women having their own separate plots, a clear division of labor appeared in pump use and irrigation activities. The main tasks were laying out pumps, pedaling the pump, and actual watering of the crops. Pipes were often laid out by both men and women and, in some cases, both girls and boys would join this activity during the school holidays. Pedaling the pump was considered one of the more difficult tasks and was often done by men.

In some cases, children joined in the pedaling as they thought of it as a fun activity, with children from neighboring homes often volunteering to pedal. There was a prevalent belief that men were stronger and should operate the pump. Women reported having difficulties using the treadle pumps, which were hard to operate. As previously mentioned, some women found the up-and-down treadle movement culturally inappropriate. It was also believed that women took longer to irrigate the same piece of land than men (one to two hours for men compared to three hours for women for an acre of land). This as discussed by women was because women took too many breaks to tend to other activities in the household including child care. A study on irrigated farming in Turkey reported similar findings whereby women were expected to participate in the irrigated production while continuing with their reproductive obligations of domestic tasks to ensure the well-being of the household (Behrooz 1992).

FGD participants reported some constraints to pump use. These were mostly technical in nature—for example, lack of skills to maintain the pump and its suction cups; wearing out of the rubber bands; unavailability of spare parts in the local shops; limitation of the pumps in terms of water depth and distances; high cost of hose pipes that were sold separately from the pump; insufficient length of the suction pipe; and inability of the pump to retain pressure during the short breaks taken by the farmers when pumping. Some women reported difficulty because of the necessity for two people to operate the pump, which was a challenge especially for female-headed households. Although they could hire male labor, female heads of households reported that the male laborers tended to overcharge them and at times were unavailable.

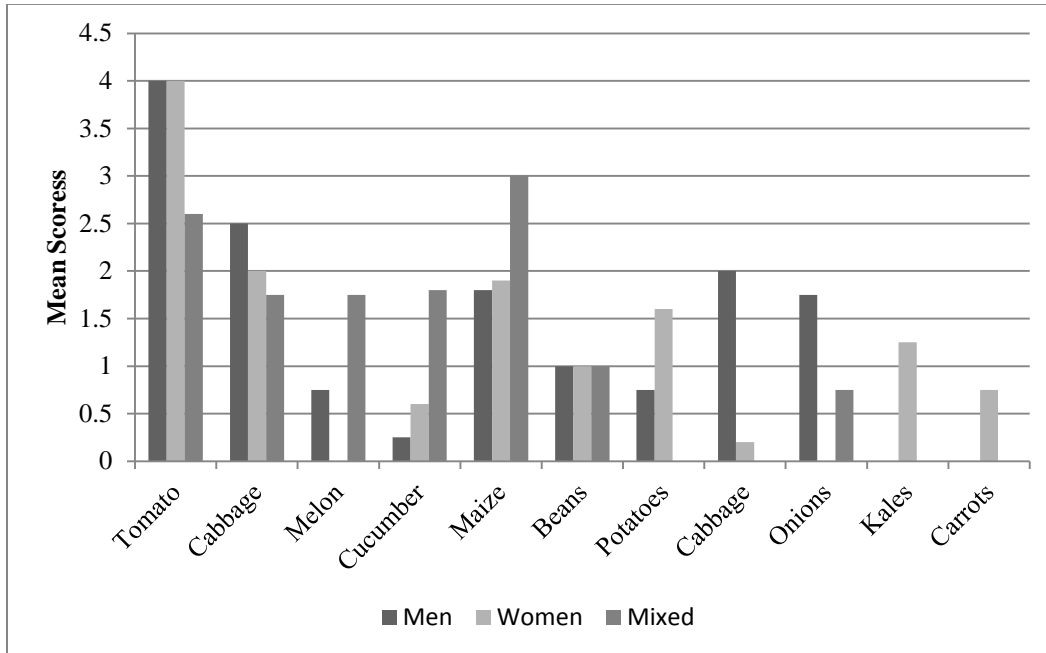
Intrahousehold Decisionmaking on Crop Choice and Use of Income

Clear differences were seen in terms of which crops women and men preferred to irrigate and about what they felt they could make decisions. Criteria used to choose what crops to grow under irrigation included crops with potential for both home consumption and sale, availability of a ready market, even at the farmgate, and the ability to grow with minimal labor and external inputs.

In Tanzania, the top five preferences for men were tomatoes, cabbage, Chinese cabbage, onions, and green maize (Figure 5.1). Women chose tomatoes, cabbage, potatoes, kale, and maize. The main difference for women was in the choice of kale, a leafy vegetable common in the diets of rural households. Tomatoes were a high-income crop, often with established buyers. When asked if they could choose only one crop to irrigate, which it would be, men chose tomatoes but women often chose a leafy vegetable such as kale or amaranth. Men argued that the income from tomatoes could be used to purchase all the other food requirements for the household. A reason for the women’s preferences was that the leafy vegetables such as kale, pumpkin leaves, and amaranth could be sold and eaten at home, and when sold, could be sold in small enough quantities and more regularly. The amounts of money from the regular sales were also small and women could maintain control of this money. This of course has

implications for women’s ability to then accumulate large amounts of money to invest in other assets. Some studies have found similar results with men preferring cash crops and women preferring to grow food crops (Sachs 1996; National Agricultural and Livestock Extension Program 2009).

Figure 5.1 Irrigated crops preferred by men and women in Tanzania

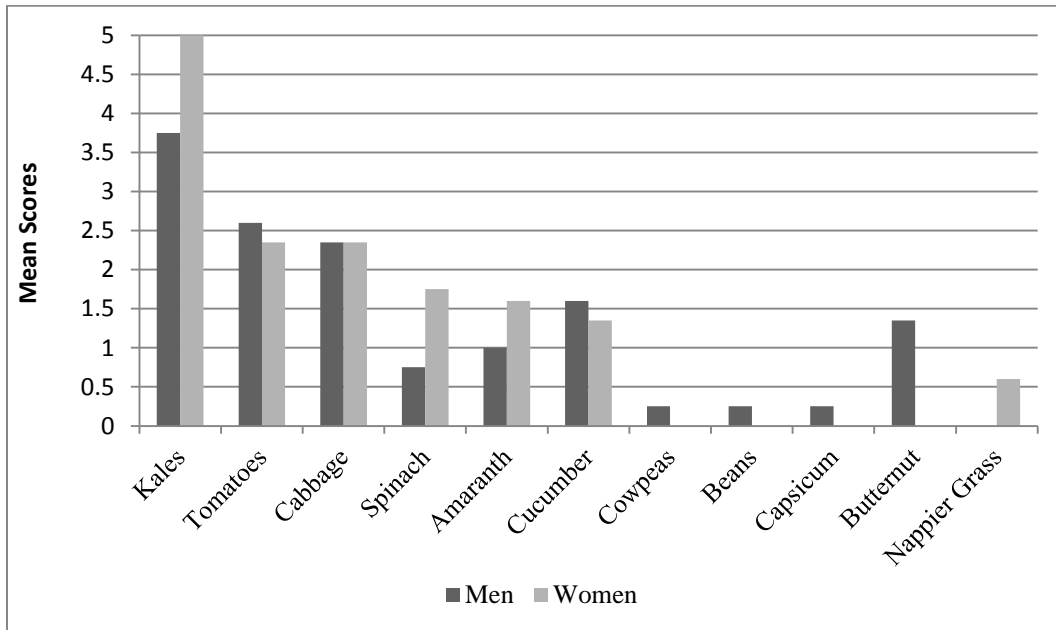


Source: Focus group discussion data (2011).

In Kenya, among the factors discussants said determined the kind of crops to be irrigated were these: local market demand, which was highest for all crops during the dry season; availability of inputs and ability to manage the crop (kale and local vegetables were easier to manage than other crops because they required minimal inputs); the time it took for a crop to mature (kale and local vegetables took a short time); length of the harvesting period (kale, spinach, and local vegetables were harvested over a long time); ability to fetch high income (maize, tomatoes, and cabbage, particularly in the off-season); perishability of the produce (onions and butternut squash stored longest); and preference for home consumption (vegetables).

Men and women had different crop preferences, which were influenced by factors such as location of farm, crop use, the commercial value attached to a crop, marketability, the cost of production, and the existing gender division of labor. When asked to score between 0 and 5 for the most preferred and least preferred crops (5 being the most preferred) men’s top five preferences were kale, tomatoes, cabbage, cucumber, and butternut squash, whereas women preferred kale, cabbage, tomatoes, amaranth, and spinach. Whereas both men and women had kale as a first priority, women gave kale a higher score than did men. Three of women’s top five preferred crops were leafy vegetables. Women preferred leafy vegetables such as kale, local vegetables, and spinach that were harvested over a long period, were normally sold at farmgate in small quantities, and also contributed greatly to household food security. Women usually had control over income from the sale of these crops, which enabled them to meet the daily household purchases and to meet their weekly contributions in the merry-go-round (social) groups. Men, on the other hand, preferred high-value crops such as tomatoes, onions, banana, cabbage, and green maize, as they were harvested and marketed at once in large quantities and produced more income (Figure 5.2).

Figure 5.2 Irrigated crops preferred by men and women in Kenya



Source: Focus group discussion data (2011).

There was a consensus in both countries that men planned and often discussed with their spouses what crops to grow and irrigate; however, in the event of a disagreement, men made the final decision. A recourse for women was the threat to withdraw labor from the specific crops or plots if not involved in the decisionmaking or the management of the cash from the particular irrigated crop. Women who had their own plots often made the decisions on what crops to grow and irrigate in those plots. Women also had autonomy in decisionmaking when operating household plots where the husband was working or living away from the homestead. It must be noted, however, that decisionmaking is a complex phenomenon that manifests as autonomy and partnership, both of which could represent cooperation or conflict (Kabeer 2001), and it is often difficult to determine whether a decision made jointly or in consultation represents cooperation or coercion. In some cases, what often passes as joint decisionmaking may in fact be coercion.

In Kenya, both women and men planted and weeded all priority crops together. Women harvested leafy vegetables (kale, spinach, and black nightshade) and men harvested tomatoes. In western Kenya, men conducted all activities in tomato production. Tomato is a high-value crop and is harvested in large quantities within a shorter period as compared to leafy vegetables. Although men and women manifested clear preferences for crops, it was more common to find women working on crops prioritized by men than men working on crops prioritized by women. For example, it was more common to find women working on tomato plots than men working on plots planted with leafy vegetables.

Although men, women, and children weeded and harvested crops jointly, men usually conducted all the sales alone. “Women provide more labor than men in horticultural fields, but the crops are often sold by men for cash,” said one male FGD participant in Tanzania. Some of the products were taken to the market using bicycles, which women could not ride because they found cycling a loaded bicycle difficult. When bulk buyers purchased produce at the farmgate and the husband was away, women were allowed to sell only if the selling price had been agreed upon with the husband. Men participants especially in Tanzania defended this difference in market participation, indicating women had poorer negotiation skills than men and could be taken advantage of easily by middlemen.

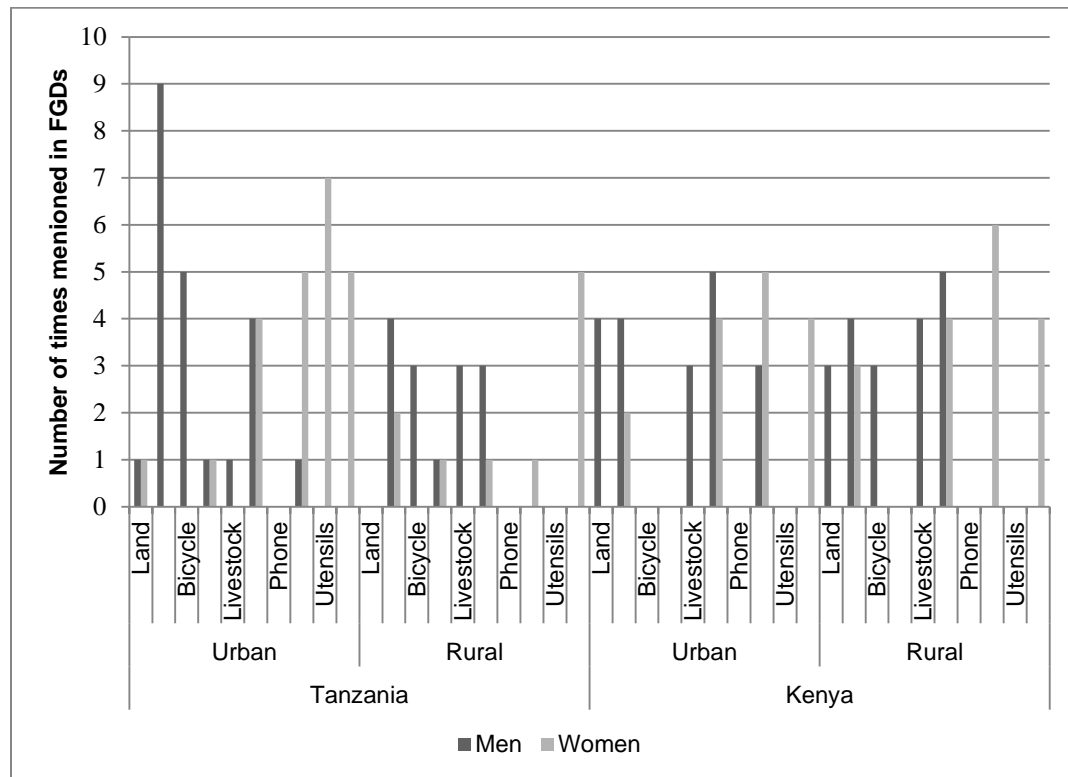
Four main scenarios on handling money earned from irrigated crop sales were described. In the first, men kept the money, but decisions on how to spend it were made jointly. In this case, there was often consultation on how the money was used. There were, however, instances where men kept the money and used it on purchases or activities that were not agreed on with the spouse. This was very common in cases where sales took place in major towns or away from the home. The second scenario was frequently presented by households in which one of the adults (usually the male adult) had an account in a bank. In this case, the money was often deposited in the account and decisions were made jointly on major expenditures such as payment of school fees, purchases of large assets, and the disposition of money required to pay medical bills. Even in this case, women said that men often made the final decision. Men also reported often giving the money from sales to their spouses for safekeeping. This was often the case where men felt they would waste the money if they kept it themselves. But the woman in this case could not spend the money without asking her husband's permission and would often get into trouble if she did. In the fourth scenario, women often sold leafy vegetables or other crops, often at the farmgate or in local markets, and made decisions autonomously on how to spend the money. This was mainly because these were often small amounts and there was a perception that leafy vegetables were a crop for women anyway that did not get much attention from traders. Studies on sales of milk have shown that when milk is sold at the farmgate, women are more likely to manage the income as they are the ones that do the actual sale transaction, and the sales are often small (Njuki et al. 2011).

Surprisingly, women's pump ownership did not seem to influence the decisions about which crops would be irrigated and who would manage the income from such crops. What seems more critical is the type of crop, whether it is harvested and sold in small or large quantities, and whether for cash only or for cash and food. It must be noted, however, that due to the small number of women who had bought pumps or indicated they owned pumps (usually one or two in every FGD), the results about the influence of pump ownership on decisionmaking on either crop choice or management of income were not conclusive.

Impacts of KickStart Pumps on Household and Individual Well-Being

To inform pathways and dynamics of change within households due to ownership and use of pumps, we first examine preferences and priorities of expenditure within the household. Figure 5.3 shows results of emphasis placed on various expenditure and investment priorities by men and women in Tanzania and Kenya. Men and women in single-sex groups and mixed groups were asked to mention the priority assets that they purchase with income earned from irrigation activities. During the analysis, we tallied the number of groups where each asset was mentioned by men and women.

Figure 5.3 Expenditure and investment priorities for men and women in Tanzania and Kenya



Source: Focus group discussion data (2011).

Priority expenditures revealed both differences and similarities between men and women and between sites. In Tanzanian sites closer to urban areas, the priorities most commonly mentioned by men were purchase of a house, purchase of a bicycle or motorcycle, and education. In the more rural villages, livestock was also commonly mentioned. In contrast, the most common investment priorities according to women were utensils, clothes, food, and education. Clothes and utensils were never mentioned by men in Tanzania. Both women and men mentioned business and land as common investment priorities. In Kenya, investment priorities common to both men and women were education, food, and house improvements.

In both countries, men prioritized land, livestock, and bicycles and women prioritized food and clothes for the family. Such investment priorities may reflect roles assigned to women as the producers and providers of food and caregivers of their families. For women, they could also be a reflection of the smaller amount of money they have control over as reflected in the types of crops that they manage. For men, this was also associated with their cultural and traditional roles. “Culturally, men are expected to build houses, sometimes even before they marry. It is their responsibility,” said one man FGD participant in Tanzania. According to a woman participant in Tanzania, “In our culture, women are not under any obligation to the society to make big family priority investments. They [women] are responsible for feeding the family and household welfare. For example they have to ensure that children and the husband are well fed and clothed.”

Men and women appeared to hold misconceptions of the other’s investment priorities. For example, when asked what women’s investment priorities are, most of the men in Tanzania indicated clothes. Women discussants, on the other hand, mentioned clothes as a second or third priority. Although men spend money on important family investments, sometimes this portrayal of women by men could lead to the exploitation of women by men, whereby men spend the money on behalf of the family with the pretext that women spend money on things that are not of priority to the family.

Despite the prioritization of education by both men and women, in Tanzania their views differed on whose education was more important—that of girls or boys. This was evident not only between men and women, but also between young and older men. Women participants in almost all villages visited reported that both boys and girls have equal chances for education. Even in times of financial constraints, they would rather apply for loans to ensure that both girls and boys are sent to school. On the other hand, men said that primary education is free in Tanzania, and parents are obliged to take all children to school. However, if they had financial constraints and had to choose who to take further to secondary school, they would opt to pay for the boys only. According to one man FGD participant in Tanzania, “Girls sometimes become pregnant and not complete their secondary education. And anyway, there is no need for investing on someone [girls] who will finally get married to another family.”

Young men insisted that gender discrimination in education has no place in contemporary society. Despite some of the reservations about sending girls to secondary school, the majority of discussants across the three regions agreed that all children should have equal access to education.

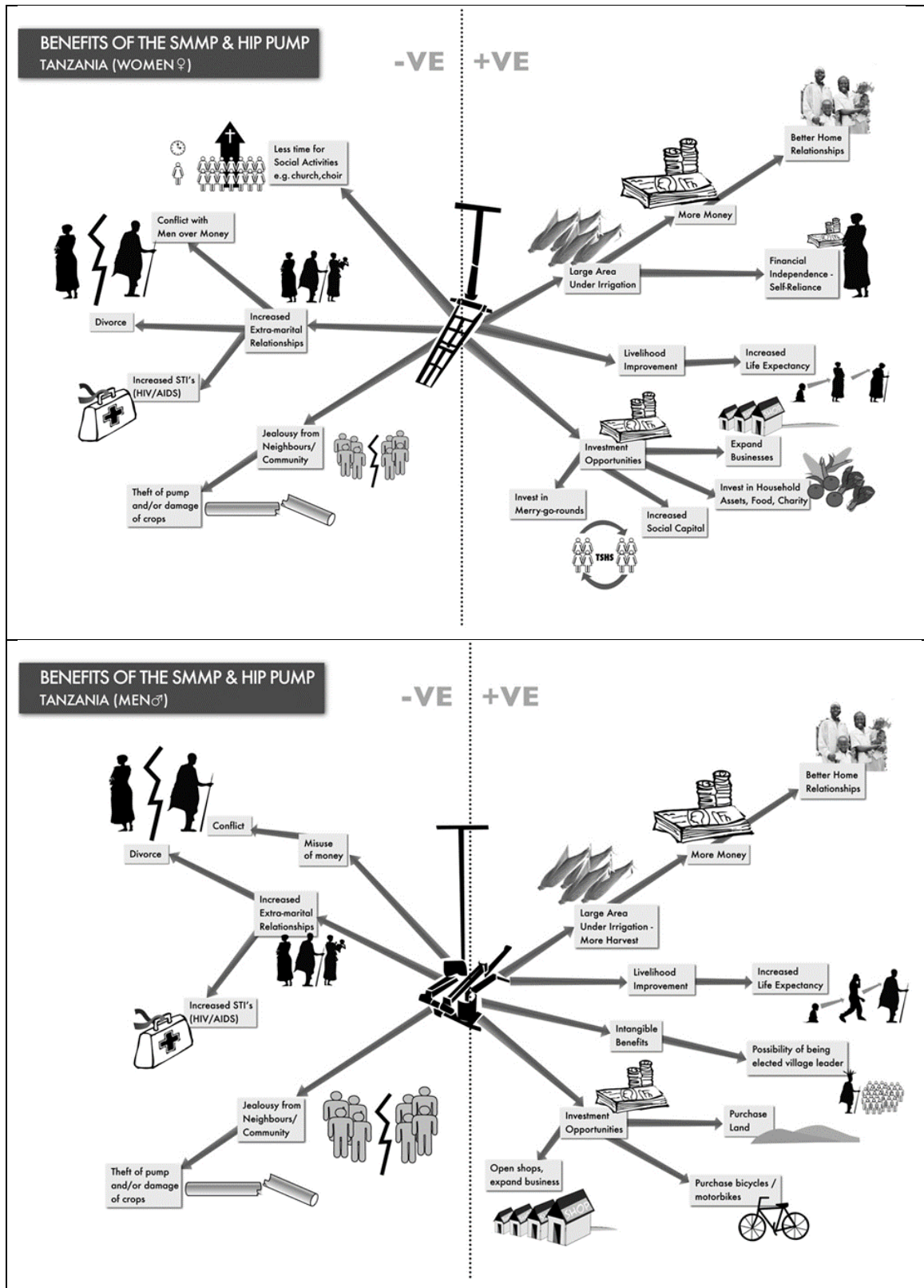
To map the impacts and impact pathways of the pumps, participatory impact diagrams (PIDs) were developed with men and women (Figures 5.4 and 5.5 for Tanzania and Kenya). The impact diagram starts with a diagram of the pump at the center. On the right side of the diagram, all positive impacts and their causal flow are drawn or written up. Probing questions asking “What has this change led to?” give rise to the next change, creating a flow diagram of immediate changes and longer-term changes. The same is done on the left side of the diagram for the negative impacts.

Participants identified an increase in the area of land under irrigation as a major outcome of owning a KickStart pump. Good yields motivated farmers to cultivate larger plots than if they had depended on rainfall for crop production. As shown in the PIDs, owning the KickStart pump resulted in the general improvement in household well-being in terms of more income, better food security, and improved health status among men, women, and children. Improved well-being was explained to have led to good relationships and more love within families. Other positive outcomes included accumulating other assets such as motorcycles and bicycles for hire.

The misuse of money by men, mainly on alcohol and on extramarital relationships, the latter referred to as *nyumba ndogo* (mistresses), was reported by female FGD participants. A small section of men indicated that the increase in income from the pumps led to more loitering and drinking of the local beer. This was, however, mentioned in only a few FGDs. Other negative impacts mentioned were that some jealous neighbors or community members could maliciously destroy crops in the fields or steal the pump.

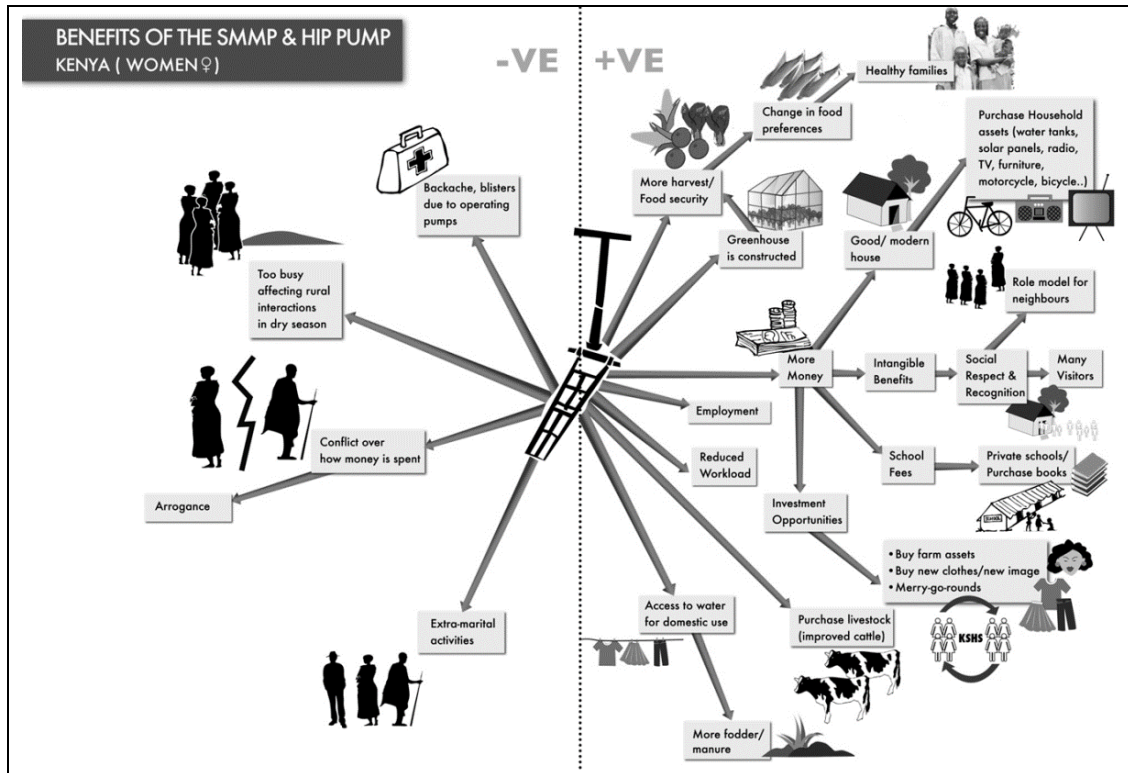
In addition, a number of trade-offs as a result of buying and using the MoneyMaker Plus were documented. For men the main change was that they stopped selling their labor to other farms. Men concentrated on horticultural production, which assured them of reliable and higher income. They also used their additional income to start other businesses, which left little time for leisure activities. The main trade-off for women was that they no longer had time for social activities such as group meetings and church activities such as choir practice. Women reported stopping petty businesses they used to have before they purchased the pump. Women reported that they no longer had time for leisure and had to wake up very early. Playing time for children was also said to be reduced as they participated in irrigation activities.

Figure 5.4 Benefits of KickStart pumps experienced by men and women in Tanzania



Source: Focus group discussion data (2011).
 Note: SMMP = Super MoneyMaker Plus pump.

Figure 5.5 Benefits of KickStart pumps experienced by men and women in Kenya



Source: Focus group discussion data (2011).
 Note: SMMP = Super MoneyMaker Plus pump.

In Kenya, the following benefits were associated with the pumps: reduced labor for fetching water by women; an ability to grow a variety of off-season crops leading to achievement of household food security and increased income from crop sales; reduced idleness and time wasting in social gatherings and alcohol drinking for men; recognition by agricultural extension agents; and an increase in self-esteem and family cohesion. Pump owners reported growing the same crops before and after buying pumps, but the quantity produced increased. Without the pump, only small portions of land were irrigated using a bucket, but after buying a pump, the area under irrigation increased to about 0.25 to 0.5 acre. Prior to buying the pump, most of the produce was used for home consumption with only minimal sales of surplus, primarily by women. With the pump, and hence increased produce, men became involved in the sale of produce as they supplied vegetables to local institutions and markets using bicycles. The irrigated crops contributed greatly toward enhancing access to food and income and improved welfare not just to the household that owned the pump but also to the community, which had access to more food.

The income from sales of irrigated crops was invested or used in various ways, including purchase of assets such as land and commercial plots and building rental houses; payment of school fees; ensuring household food security; purchase of household assets such as utensils, water tanks, sewing machines, televisions, and furniture; and purchase of other assorted items such as farm implements, bicycles, motorbikes, water tanks, greenhouses, drip irrigation equipment, and clothes. Other businesses were established as a result of the income accrued from farming and other pump-related activities—for example, restaurants, cereals trading, and a quarry business. Women reported reduced drudgery in fetching water for domestic and livestock uses. This was especially true for households that used to draw water from wells with buckets and rope before the purchase of the pump. Additionally, women’s access to social capital increased because income from the sale of irrigated produce enabled them to join and contribute to women groups and merry-go-rounds. The little cash from farmgate sales also enabled

women to make basic personal and household purchases without asking their husbands for money, and this reportedly led to a decrease in household conflicts.

In addition to tangible benefits, KickStart farmers reported acquiring a positive perception of themselves and being seen positively by others. Women described themselves as feeling respected, feeling self-sufficient, being an advanced farmer, being a role model, being food secure, and having a sense of insecurity when they had much money particularly after bulk sales. Men reported feeling proud and being an employer, rich, a leader, respectable, an able person, a hard worker, an adviser, and a good provider. “My neighbors occasionally buy for me beer at the bar as they recognize me as an achiever,” said one male FGD participant in Kenya.

The drinking of beer was, however, seen as a negative outcome of the pump. The community also displayed some negative perceptions. Some participants reported having experienced jealousy from neighbors, and the increased workload, especially for women, meant they had less time for social activities—they reduced the number of groups they belonged to and reduced domestic activities such as ironing clothes. Men forewent social evening activities, reduced time spent off the farm drinking beer, and reduced prolonged visits.

Assessment of the Mobile Layaway Service in Kenya

In 2012, KickStart rolled out its Mobile Layaway program, or *Tone Kwa Tone* (“Drop by Drop” in Swahili), across all of Kenya. The Mobile Layaway is an innovative micro-saving service that enables farmers to save to purchase a pump by making micropayments toward pump ownership through their mobile phone. The assumption by KickStart is that lack of money is a major constraint to farmers and especially women purchasing the pumps. The pilot in Kenya has shown increased pump adoption among women and a poorer segment of farmers in comparison to routine sales data. At the time of this study, more than 250 farmers had taken advantage of the program.

Twelve people, seven women and five men, who had used the service were purposively selected according to KickStart records and their availability and willingness to be interviewed. All the women had chosen the service for lack of cash to purchase the pumps. All the women belonged to a self-help group through which they purchased the pumps. The purpose of the self-help group was to pool resources, such as money through monthly contributions, and help themselves improve their livelihoods. The agreement in the group was that every member should make periodic contributions so that all the group members would eventually own a pump as individuals.

The main source of information about the layaway service was a KickStart representative with eight out of the 12 farmers having obtained information in this way. Other sources were media and advertisements at local input shops. For women, members of the groups were an important source of information on the service. All the seven women in the study indicated they would not have bought pumps if there had not been a layaway service. Of the five men, two indicated they would not have bought the pump without the layaway service and the others felt it would have taken them a very long time before they bought the pump.

Although the layaway service was highly rated for enabling cash-constrained men and women farmers to purchase pumps, farmers felt it could be improved by including the whole kit in the service (hose pipes and water tanks) as well as training for users of the pumps. The awareness of the existence of the service was low, and farmers interviewed felt information on the service should be more widely disseminated through more media campaigns and that the service should be widely available through all the pump distributors.

The layaway service also still requires farmers to accumulate the full purchase price before they can use the pump. Farmers interviewed felt this was a major disadvantage and recommended alternative services such as rent-to-own (where farmers start paying off the pump, get the pump, and pay as they use), cash credit, or equipment credit (similar to rent-to-own).

6. CONCLUSIONS

The findings from the qualitative study suggest that the introduction of treadle pumps is transforming subsistence farming into more commercial farming. KickStart's mission is to improve farmers' livelihood through enabling them to grow high-value horticultural crops using simple and affordable pumps for irrigation. Its market-based approach to disseminating low-cost pumps has transformed some smallholder farmers from mainly subsistence farmers to market-oriented horticulture farmers.

The approach, however, has not led to gender-equitable ownership of pumps, as women account for only about 10 percent of the pump buyers across the two countries. Women have less access to information regarding the pumps and often rely on their husbands and neighbors for such information. They also have lesser access to cash. This implies that if a market-based approach is to reach and benefit women, it needs to be accompanied by specific strategies that address women's information and financial constraints and that enable them to access the assets. Technology design should take into account women's needs and should start with addressing their labor constraints. The need to have two people to operate the pump at any one time was a major constraint to its use—especially by female-headed households—and the mode of operating the pump was found culturally inappropriate for women in some areas. Gender issues related to technology must be considered in the design of the equipment; it is important to analyze how a technology affects its end user, and to keep adjusting it for the user's benefit. A good understanding of the gender dimensions of farming in a particular context can inform the development of technologies based on user specifications, and it can help technology disseminators use channels and approaches that reach both men and women.

The study demonstrates that women's ownership, or non-ownership, of the pump is not the main determinant of whether they make decisions on the crops to be irrigated or the management of income from the crops. Determinations about which crops to be irrigated are made according to the scope of marketing and the potential to serve the multiple functions of food security and income generation. Although a convergence of these criteria is noted for men and women, the crop choices still differ: men prefer crops they can harvest frequently and sell in bulk, such as tomatoes, whereas women prefer crops harvested over long periods of time and often sold in small quantities, often at farmgate or local markets, such as leafy vegetables. What crops are grown and where they are sold, however, does influence whether women make decisions on use of income from the sale of such crops. Further studies incorporating more women who own pumps are suggested to investigate further the benefits of women owning the pump with respect to their decisionmaking, bargaining power, and even expenditure of income from the irrigated crops.

Although laws in both study countries permit asset ownership by women, in many countries customary laws and beliefs discriminate against women in terms of asset ownership and control. The current study demonstrated that there are groups of assets over which men and women clearly claim ownership. There is also some recourse for women in cases where a man disposes of either a jointly owned or woman-owned asset. However, this does depend on women's knowledge of what their rights to the assets are and what recourse they have, something that, in this study, differed greatly between the rural sites with strong gender stereotypes and sites with close proximity to urban centers with weaker gender stereotypes.

Decisions about crop choice as well as major income decisions were mainly in the hands of men irrespective of whether women owned the pumps or not. There was a lot of reported joint decisionmaking, with the indication that men would often make the final decision in case there was a disagreement. One area for further study is exploring the real meaning of *joint decisionmaking* for different types of assets. There were cases where both men and women said decisions were made jointly, but on further probing, it was discovered men would actually make the final decision even when women disagreed. This implies that joint decisionmaking could be placed on a continuum from conflict and coercion to actual cooperation. A methodological exploration of how this can be contextualized in data collection would contribute greatly to the literature on gender and intrahousehold decisionmaking.

The study also demonstrates what other technology evaluation studies have documented: that well-intentioned technology interventions can have both positive and negative impacts. Although pumps increased the area under cultivation and incomes, they had negative social impacts for some households where women's labor increased after buying a pump, often without their benefiting from the income generated by the pump. This led to other consequences, such as the erosion of their social connections with the community or other women.

The study also found misconceptions regarding several issues that, although seemingly outside the scope of this sort of technology intervention, do have implications for whether such an intervention achieves development outcomes. These include misconceptions about women's capacity (for example, women cannot negotiate with traders), women's ownership of assets, and investments in the education of boys and girls, among others.

REFERENCES

- AGWater Solutions. 2011. *Water Lifting Technology in Tanzania. Agricultural Water Management Learning and Discussion Brief*. Accessed September 3, 2013. <http://awm-solutions.iwmi.org/Data/Sites/3/Documents/PDF/publication-outputs/learning-and-discussion-briefs/waterliftingintanzania.pdf>.
- Appleton, B., and I. Smits. 2003. *The Gender and Water Development Report 2003: Gender Perspectives on Policies in the Water Sector*. Loughborough University, Leicestershire, UK. Accessed September 2, 2013. www.unwater.org/downloads/Gender_Perspectives_Policies.pdf.
- ApproTEC. 1999. *Super MoneyMaker Pressure Pedal Pump Impact Assessment in Utilization, Job Creation, and Income Generation: Monitoring Visit Conducted in Central, Eastern, Rift Valley, and Nyanza Provinces of Kenya*. Nairobi, Kenya.
- Arora-Jonsson, S. 2011. "Virtue and Vulnerability: Discourses on Women, Gender, and Climate Change." *Global Environmental Change* 21 (2): 744–751. doi:10.1016/j.gloenvcha.2011.01.005.
- Bastidas, E. P. 1999. *Gender Issues and Women's Participation in Irrigated Agriculture: The Case of Two Private Irrigation Canals in Carchi, Ecuador*. Research Report 31. International Water Management Institute (IWMI): Colombo, Sri Lanka.
- Behrooz, B. M. 1992. "Relations in Agriculture: Women in Turkey." *Economic Development and Change* 40 (3): 567–586.
- Carney, J. 1993. "Converting the Wetlands, Engendering the Environment: The Intersection of Gender with Agrarian Change in The Gambia." *Economic Geography* 69 (4): 329–348.
- Chabayanzara, E., and S. A. Breth. 1994. "Smallholder Irrigation Development: Impact on Productivity, Food Production, Income, and Employment." In *Issues in African Rural Development 2*, edited by S. A. Breth, 185–198. Winrock International Institute for Agricultural Development: Arlington, VA.
- Chancellor, F., and D. O'Neill. 2000. "The Role of Treadle Pumps in Changing the Working and Economic Environment of Women Irrigators: Some Considerations from Africa with Particular Reference to Zambia." In *6th International Micro-Irrigation Congress (Micro 2000), Cape Town, South Africa, 22–27 October 2000*, 1–14. International Commission on Irrigation and Drainage. Accessed June 3, 2013. www.cabdirect.org/abstracts/20013065620.html.
- Cuellarl, M., Hedlund, H., Mbai, J., and Mwangi, J. 2006. *The National Agriculture and Livestock Extension Programme (NALEP) Phase I Impact Assessment*. SIDA Evaluation Report 06/31. Swedish International Development Agency: Stockholm, Sweden.
- De Pauw, E. 1985. *Soils, Physiography, and Agroecological Zones of Tanzania*. Crop Monitoring and Early Warning Systems Project, Ministry of Agriculture and Livestock Development. Dar es Salaam, Tanzania: Government Press.
- Deere, C. D., and C. Doss. 2006. "Introduction: The Gender Asset Gap: What Do We Know and Why Does It Matter?" *Feminist Economics* 12 (1and 2): 1–50.
- Descheemaeker, K., T. Tilahun Amede, and A. Hailelassie. 2010. "Improving Water Productivity in Mixed Crop-Livestock Farming Systems of Sub-Saharan Africa." *Agricultural Water Management* 97 (5): 579–586. doi:10.1016/j.agwat.2009.11.012.
- Dhawan, B. D., and H. S. Datta. 1992. "Impact of Irrigation on Multiple Cropping." *Economic and Political Weekly* 27 (13): A15–A18. Accessed August 26, 2013. www.jstor.org/stable/4397728.
- FAO (Food and Agriculture Organization of the United Nations). 2011. *Climate Change, Water, and Food Security*. FAO Water Report 36. Springer. doi:10.1007/s00271-011-0305-1.
- Fletschner, D., and D. Mesbah. 2011. "Gender Disparity in Access to Information: Do Spouses Share What They Know?" *World Development* 39 (8): 1422–1433. doi:10.1016/j.worlddev.2010.12.014.

- Giordano, M., C. de Fraiture, E. Weight, and J. van der Blik, editors. 2012. *Water for Wealth and Food Security: Synthesis Report of the AgWater Solutions Project*. Colombo, Sri Lanka: International Water Management Institute. doi:10.5337/2012.207.
- Hausmann, R., Tyson, L. D., and Zahidi, S. 2010. *The Global Gender Gap Report*. Geneva: World Economic Forum. Accessed June 2, 2013. <http://afri-gap.gaportal.org/resources/detail/the-global-gender-gap-report-2010>.
- Hussain, I., and M. A. Hanjra. 2004. "Irrigation and Poverty Alleviation: A Review of the Empirical Evidence." *Irrigation and Drainage* 53 (1): 1–15. Accessed September 1, 2013. <http://onlinelibrary.wiley.com.ezp2.lib.umn.edu/doi/10.1002/ird.114/pdf>.
- IWMI (International Water Management Institute). 2002. *Annual Report 2001–2002*. Colombo, Sri Lanka. Accessed September 3, 2013. www.iwmi.cgiar.org/About_IWMI/Strategic_Documents/Annual_Reports/2001_2002/AnnualReport20012002.pdf.
- Kabeer, N. 2001. "Conflicts over Credit: Re-Evaluating the Empowerment Potential of Loans to Women in Bangladesh." *World Development* 29 (1): 63–84.
- Kamwamba-Mtethiwa, J., R. Namara, C. De Fraiture, J. Mangisoni, and E. Owusu. 2012. "Treadle Pump Irrigation in Malawi: Adoption, Gender, and Benefits." *Irrigation and Drainage* 61 (5): 583–595. doi:10.1002/ird.1665.
- KickStart. 2012. "About Us." Accessed May 25, 2013. www.kickstart.org/about-us/.
- Kulkarni, S. 2012. *Redefining Irrigation as If Gender Mattered. IWMI-TATA Water Policy Program*: Battaramula, Sri Lanka.
- Meinzen-Dick, R., N. Johnson, A. Quisumbing, J. Njuki, J. Berrman, D. Rubin, A. Peterman, et al. 2011. *Gender, Assets, and Agricultural Development Programs*. International Food Policy Research Institute: Washington, DC.
- Environmental Resource Management. 2011. *Environmental and Social Impact Assessment Study Report for the Proposed Kilimambogo–Thika–Githambo–Kiganjo (Nyeri) and Thika–Kiganjo (Gatundu) Transmission Lines and Associated Substations Projects*. Final Report: Reference 0124250. Nairobi: Kenya Power and Lighting Company.
- Ministry of Water and Irrigation. 2010. *Water Sector Status Report*. Dar es Salaam: United Republic of Tanzania
- Municipal Council of Thika. 2008. *Municipal Council of Thika Strategic Plan: 2008–2012*. Nairobi, Kenya: Government of Kenya.
- NEMA (National Environmental Management Authority). 2011a. *District Environmental Action Plan: 2006–2011: Muranga District Environmental Action*. Nairobi: NEMA.
- _____. 2011b. *Provincial Environment Action Plan 2007–2011: Western Province Fisheries*. Nairobi: NEMA.
- Neumayer, E., and T. Plumper. 2007. "The Gendered Nature of Natural Disasters: The Impact of Catastrophic Events on the Gender Gap in Life Expectancy, 1981–2002." *Annals of the Association of American Geographers* 97 (3): 551–566.
- Njuki, J., S. Kaaria, A. Chamunorwa, and W. Chiuri. 2011. "Linking Smallholder Farmers to Markets: Gender and Intra-household Dynamics: Does the Choice of Commodity Matter?" *European Journal of Development Research* 23:426–443.
- Nkonya, E., L. Lannotti, B. Sakwa, B. Wielgosz, V. Gadhi, E. Kato, A. Petermann, et al. 2011. "Baseline Study of KickStart Treadle Pumps in East Africa." IFPRI mimeo.
- Parry, M. L. (Ed.). 2007. *Climate Change 2007: Impacts, Adaptation and Vulnerability: Working Group II Contribution to the Fourth Assessment Report of the IPCC Intergovernmental Panel on Climate Change (Vol. 4)*. Cambridge University Press.

- Powell, E. T., and M. Renner. 2003. *Analyzing Qualitative Data*. Madison, Wisconsin, US: Program Development and Evaluation, University of Wisconsin-Extension.
- Primo, N., and A. W. Khan. 2003. *Gender Issues in the Information Society* (page 24). Paris: UNESCO.
- Quisumbing, A. R. 2003. *Household Decisions, Gender, and Development: A Synthesis of Recent Research*. Washington, DC: International Food Policy Research Institute.
- Quisumbing, A., and L. Pandolfelli. 2010. "Promising Approaches to Address the Needs of Poor Female Farmers: Resources, Constraints, and Interventions." *World Development* 38 (4): 581–592.
- Rathgeber, E. 2003. *Dry Taps . . . Gender and Poverty in Water Resource Management*. Rome. Accessed September 1, 2013. http://news.eambiental.org/h2o/images/stories/agua_frontpage/agua_y_mujer/gender_poverty_water.pdf.
- Reardon, T., and J. E. Taylor. 1996. "Agroclimatic Shock, Income Inequality, and Poverty: Evidence from Burkina Faso." *World Development* 24 (5): 901–914. Accessed September 2, 2013. www.sciencedirect.com.ezp1.lib.umn.edu/science/article/pii/0305750X96000095.
- Rockstrom, J. 2000. "Water Resource Management in Smallholder Farms in Eastern and Southern Africa: An Overview." *Physics and Chemistry of the Earth (B)* 25 (3): 275–283.
- Sachs, C. 1996. *Gendered Fields: Rural Women, Agriculture, and Environment*. Boulder: Westview Press.
- Schmidhuber, J., and F. N. Tubiello. 2007. "Global Food Security under Climate Change." *Proceedings of the National Academy of Sciences of the United States of America* 104 (50): 19703–19708. doi:10.1073/pnas.0701976104.
- Scoones, I. 1998. *Sustainable Rural Livelihoods: A Framework for Analysis*. Accessed September 2, 2013. www.mendeley.com/research/sustainable-rural-livelihoods-framework-analysis/.
- Shemsanga, C., Omambia, A. N., and Gu, Y. (2010). The Cost of Climate Change in Tanzania: Impacts and Adaptations. *Journal of American Science* 6(3): 182-196. ISSN:1545-1003. www.sciencepub.net/american/am0603/24_2189_climate_am0603_182_196.pdf
- Sijali, I. V., and M. G. Mwago. 2011. "MoneyMaker Pumps: Creating Wealth in Sub-Saharan Africa." In *Yes Africa Can: Success Stories from a Dynamic Continent*, edited by P. C. Pole and A. Manka, 319–336. Washington, DC: World Bank.
- Silva, G. L. (1989). *Potential for Improving Rice Production in Tabora Region, Tanzania and Implications for Village Planning*. Overseas Development Natural Resources Institute Bulletin No. 29, vi + 58 pp.
- Stimie, C., and F. Chancellor. 1999. "South African Women's Part in Rehabilitation and Design of Irrigation Projects." *GRID: IPTRID Network Magazine*, no. 13: 6–7.
- Thomas, D. S. G., and C. Twyman. 2005. "Equity and Justice in Climate Change Adaptation amongst Natural-Resource-Dependent Societies." *Global Environmental Change* 15 (2): 115–124. doi:10.1016/j.gloenvcha.2004.10.001.
- Thornton, P. K., J. van de Steeg, A. Notenbaert, and M. Herrero. 2009. "The Impacts of Climate Change on Livestock and Livestock Systems in Developing Countries: A Review of What We Know and What We Need to Know." *Agricultural Systems* 101 (3): 113–127. doi:10.1016/j.agsy.2009.05.002.
- Tol, R. S., T. E. Downing, O. J. Kuik, and J. B. Smith. 2004. "Distributional Aspects of Climate Change Impacts." *Global Environmental Change* 14 (3): 259–272. doi:10.1016/j.gloenvcha.2004.04.007.
- United Republic of Tanzania. 2001. *The Village Land Act of 1999*. Dar es Salaam, Tanzania: Government Printers.
- Van Koppen, B. 1998. "Water Rights and Poverty Alleviation: Inclusion and Exclusion of Resource Poor Women and Men as Right Holders in Externally Supported Irrigation Development." In *Proceedings of the Workshop on Gender and Water*, 107–134. Colombo, Sri Lanka: International Water Management Institute.
- _____. 2002. *Gender Performance Indicator for Irrigation: Concepts, Tools, and Applications*. Research Report 59. Colombo, Sri Lanka: International Water Management Institute.

- Van Koppen, B., R. K. Nagar, and S. Vasavada. 2001. *Gender and Irrigation in India: The Women's Irrigation Group of Jambar, South Gujarat*. Colombo, Sri Lanka: International Water Management Institute.
- Waris, A., M. P. Singh, and K. N. K. Chauhan. 2010. "Rural Women's Utilization of Mass Media." In *International Conference on Communication for Development in the Information Age: Extending the Benefits of Technology for All*, Eds. Basavaprabhu Jirli (Editor in Chief), Diapk De, Ghadei, K., and Kendadmath, G.C.,. Department of Extension Education, Institute of Agricultural Sciences, Baranas Hindu University. Varanasi: India.
- Whitehead, A. 1998. *Gender, Poverty, and Intra-Household Relations in Sub Saharan Small Holder Households: Some Lessons from Two Case Examples*. Background Paper Prepared for SPA Report on Poverty and Gender in Sub-Saharan Africa. Washington DC: World Bank.
- World Bank. 2002. *Rural Strategy: Reaching the Rural Poor*. Washington, DC.
<http://inweb18.worldbank.org/ESSD/essdext.nsf/>.
- Zwarteveen, M. Z. 1998. "Identifying Gender Aspects of New Irrigation Management Policies." *Agriculture and Human Values* 15:301–312.

RECENT IFPRI DISCUSSION PAPERS

For earlier discussion papers, please go to www.ifpri.org/pubs/pubs.htm#dp.
All discussion papers can be downloaded free of charge.

1356. *The impact of shocks on gender-differentiated asset dynamics in Bangladesh*. Muntaha Rakib and Julia Anna Matz, 2014.
1355. *Tractor owner-operators in Nigeria: Insights from a small survey in Kaduna and Nasarawa States*. Hiroyuki Takeshima, Hyacinth Edeh, Akeem Lawal, and Moshud Isiaka, 2014.
1354. *Co-movement of major commodity price returns: A time-series assessment*. Francesca de Nicola, Pierangelo De Pace, and Manuel A. Hernandez, 2014.
1353. *Bargaining power and biofortification: The role of gender in adoption of orange sweet potato in Uganda*. Daniel O. Gilligan, Neha Kumar, Scott McNiven, J. V. Meenakshi, and Agnes Quisumbing, 2014.
1352. *Quality healthcare and health insurance retention: Evidence from a randomized experiment in the Kolkata Slums*. Clara Delavallade, 2014.
1351. *Sins of the fathers: The intergenerational legacy of the 1959–1961 Great Chinese Famine on children's cognitive development*. Chih Ming Tan, Zhibo Tan, and Xiaobo Zhang, 2014.
1350. *Direct seed marketing program in Ethiopia in 2013: An operational evaluation to guide seed-sector reform*. Todd Benson, David Spielman, and Leulseged Kasa, 2014.
1349. *Agriculture for development in Iraq?: Estimating the impacts of achieving the agricultural targets of the National Development Plan 2013–2017 on economic growth, incomes, and gender equality*. Azhr Al-Haboby, Clemens Breisinger, Dario Debowicz, Abdul Hussein El-Hakim, Jenna Ferguson, Roberto Telleria, and Teunis van Rhee, 2014.
1348. *An evaluation of the effectiveness of farmland protection policy in China*. Man Li, 2014.
1347. *Women's individual and joint property ownership: Effects on household decisionmaking*. Cheryl Doss, Sung Mi Kim, Jemimah Njuki, Emily Hillenbrand, and Maureen Miruka, 2014.
1346. *Can smallholder fruit and vegetable production systems improve household food security and nutritional status of women?: Evidence from rural Uganda*. Nassul Kabunga, Shibani Ghosh, and Jeffrey K. Griffiths, 2014.
1345. *Intellectual property rights, technology diffusion, and agricultural development: Cross-country evidence*. David J. Spielman and Xingliang Ma, 2014.
1344. *Market interdependence and volatility transmission among major crops*. Cornelis Gardebroek Manuel A. Hernandez, and Miguel Robles, 2014.
1343. *Importance of rice research and development in rice seed policies: Insights from Nigeria*. Hiroyuki Takeshima, 2014.
1342. *Can transfer programs be made more nutrition sensitive?* Harold Alderman, 2014.
1341. *The impact of cash and food transfers: Evidence from a randomized intervention in Niger*. John Hoddinott, Susanna Sandström, and Joanna Upton, 2014.
1340. *How does climate change alter agricultural strategies to support food security?* Philip Thornton and Leslie Lipper, 2014.
1339. *Public-sector agricultural research priorities for sustainable food security: Perspectives from plausible scenarios*. Gerald C. Nelson and Dominique van der Mensbrugge, 2014.
1338. *Migration, local off-farm employment, and agricultural production efficiency: Evidence from China*. Jin Yang, Hui Wang, Songqing Jin, Kevin Chen, Jeffrey Riedinger, and Peng Chao, 2014.
1337. *Farmers' preferences for climate-smart agriculture: An assessment in the Indo-Gangetic Plain*. Garima Taneja, Barun Deb Pal, Pramod K. Joshi, Pramod K. Aggarwal, N. K. Tyagi, 2014.
1336. *An empirical examination of the dynamics of varietal turnover in Indian wheat*. Vijesh V. Krishna, David J. Spielman, Prakashan C. Veetil, and Subash Ghimire, 2014.
1335. *Agricultural policy processes and the youth in Malawi*. Mariam A. T. J. Mapila, 2014.
1334. *Can cash transfers promote the local economy?: A case study for Cambodia*. Stephanie Levy and Sherman Robinson, 2014.

**INTERNATIONAL FOOD POLICY
RESEARCH INSTITUTE**

www.ifpri.org

IFPRI HEADQUARTERS

2033 K Street, NW
Washington, DC 20006-1002 USA
Tel.: +1-202-862-5600
Fax: +1-202-467-4439
Email: ifpri@cgiar.org