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Community Organized Household Water Increases Not Only Rural incomes, but Also Men's Work

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Summary. — This paper explores community-organized, household water supply in seven communities in western Kenya. We compare water use, labor use, income and the conditions for collective action in three sets of communities: two have protected springs and piped homestead connections; two have protected springs but no homestead connection; and three draw potentially contaminated water from unprotected springs.
We find that piped water reduces the work of women and girls, and facilitates home garden and livestock production. Together these changes lead to increased household incomes. Women recognize clear time-benefits. Men, however, experience extra work.
No overall pattern emerges regarding the preconditions for collective action.

Key words — gender, collective action, water management, impact assessment, Lake Victoria, Kenya

1. INTRODUCTION

Some 1 billion people worldwide lack access to safe drinking water. In rural Kenya, only 10% of people have access to household connections and 45% have access to improved water supplies [1] (WHO/UNICEF Joint Monitoring Program, 2004). Household or domestic water supplies in rural areas serve the needs of livestock and kitchen gardens as well as drinking, cooking, washing and cleaning (Were, Roy, & Swallow, 2008). Improved access to safe drinking water, and in particular household water connections, brings wide-ranging benefits for the household and may mitigate poverty (e.g., Moriarty, Butterworth, & van Koppen, 2004).

Kenya's 1974 National Water Master Plan aimed to provide potable water, at reasonable distances, to all households by the year 2000. By 2000, however, over 23 million rural Kenyans still used less safe water sources. About 10% of those obtained water from small water systems operated by self-help groups. The benefits of household water supply still elude most of the rural population (Mumma, 2007, pp. 158–159). The Water Act of 2002 brought reforms of the water sector intended to redress this situation.

The Nyando basin of western Kenya illustrates the challenges and potential benefits of improving domestic water supplies in rural Africa. The basin covers approximately 3,500 square kilometers and is home to approximately 611,000 people, almost all of whom live in rural areas. The most common sources of domestic water are rivers/streams, piped water systems, wells, springs, boreholes, and ponds. Springs, common in the upper catchment, are a preferred water source and are generally regarded as sources of relatively safe water (Onyango, Swallow, Roy, & Meinzen-Dick, 2007; Kremer, Leino, Miguel, & Zwane, 2009).

Participatory planning activities undertaken in the Nyando basin during 2000–3 showed that improved water and sanitation is a key priority for many rural communities. In Kericho district, in the higher part of the basin, six of 10 communities identified water management as one of their top five priorities, with three communities identifying water management as their second highest priority (further analysis of data in Swallow, 2005).

In response, a series of studies were undertaken in the Nyando basin on domestic water management, rural livelihoods and collective action. A study of poverty-water dynamics in 14 communities from across the Nyando basin identified a community (Kiptagen) in which two separate groups had self-organized for improved spring protection, piping and

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homestead water connections. A follow-up case study of water management in Kiptagen (Roy, Crow, & Swallow, 2005; Were *et al.*, 2008), suggested large positive impacts of improved water supply through gravity-fed water systems, as well as substantial challenges for the collective action necessary for protection and piping to be effective (Were *et al.*, 2008). Those case study results further showed strong gender differentiation in roles, with women bearing most responsibility for household water supply, but having limited ability to mobilize collective action for protection or piping. While the technology of spring protection is simple, it requires significant investments of labor, money and collective decision-making.

A geo-referenced census of springs was undertaken in the upper Nyando area of Kericho district to ascertain the prevalence of different types of management, including self-organized piped water systems similar to the one found in the Kiptagen case study. Seven spring communities identified through the census were selected for the more detailed analysis reported in this paper. Three of the seven have not protected their springs, two have protected their springs and two have both protected their springs and built storage and pipe networks to deliver spring water to the homesteads of group members. A small number of communities have been able to undertake the collective work required to build spring protection and household water delivery. Most have not. Therein lies the problem of collective action motivating this paper. Why are some communities able to build institutions, accumulate money, and undertake the work of building better water supply systems, while others endure the hardships of walking long distances to unprotected springs that are often shared with livestock?

This paper explores two questions. First, what benefits are associated with spring protection and piping of water supply? Second, are there common characteristics and histories for communities in the three groups: (i) unprotected springs, (ii) protected springs, and (iii) protected and piped springs?

Section 2 of this paper describes the background to the study, the study area, and the study design. Differences in water use between the three spring communities are described in Section 3, and differences in income, which appear to derive from homestead water access, are identified. Section 4 examines the time allocation of women and men. Section 5 compares the contexts for collective action in each of the three spring management groups. We draw some conclusions in Section 6.

2. BACKGROUND

(a) *Review of the connections between water, gender, and collective action*

Collective action to improve rural household water provision faces complex, interacting obstacles from gender divisions of labor and income, the gender division of public and private action, and gendered perceptions of work, in addition to commonly recognized constraints on collective action, and past histories of unsuccessful action. Here we summarize some relevant insights from literatures on collective action, women and water supply, and women's burden of work. In Section 5, we describe findings from our ethnographic research on water supply projects in Kericho district of Kenya that informed the design of the research reported in this paper.

We have drawn four sets of insights from related literatures.

(1) Women in rural Africa often face 'time poverty' (Blackden and Woden, 2006).

(2) There is a consensus about the conditions for successful collective action in rural areas (Baland and Plateau, 1994; Bakker, 2008; Hilhorst & Wennink, 2010).

(3) A recent multi-country study of community-managed rural water supply systems (Whittington, Davis, *et al.*, 2009) recognizes the importance of women's involvement.

(4) A review of research on gender and collective action (Pandolfelli, Meinzen-Dick, & Dohrn, 2008) identifies hypotheses about initial conditions, resources and motivations for gender-oriented analysis of collective action.

Women do most of the work of collecting water in Kenya as elsewhere in Africa. Research on women's time allocation in sub-Saharan Africa (Blackden and Woden, 2006) has identified "time poverty" as a constraint to development, with "women working especially long hours due in part to a lack of access to basic infrastructure services such as water and electricity, but also due to the rising demands of the 'care economy'" (Blackden and Woden, 2006, pp. 91–92). Time poverty is the idea that individuals do not have enough time for rest after completing their work tasks. Several studies have shown that women work longer hours than men (Ilahi, 2000). A key outcome of access to piped water in the homestead may be that women are liberated from the time-consuming work of collecting water. We provide data in Section 4 on the impact of this timesaving.

Studies of collective action have established a preliminary consensus about the conditions for successful management of common property resources (Baland and Plateau, 1994, p. 298): small user groups can collaborate more easily, crucial decisions are taken publicly, and good record keeping and accountability matter (Baland and Plateau, 1994, p. 298). A parallel literature on community-owned water supply in towns (Bakker, 2008) suggests a consensus with considerable overlap. Collective water management systems are more successful when: they cover a small geographic area with defined boundaries, there are low levels of mobility, there is a small community with high social capital, and the water is used for both productive and domestic purposes (Bakker, 2008, p. 241). The literature on collective action and women's livelihoods (Hilhorst & Wennink, 2010) comes to similar conclusions about important group characteristics and institutional arrangements.

A recent multi-country study (Whittington *et al*., 2009, p. 714) concludes that demand-driven, community managed rural water supply "has come a long way towards unraveling the puzzle of how to best design and implement rural water supply programs in developing countries." This study suggests that demand-driven project planning should "give women a larger role in decision-making than has historically been the norm. . .because they were the ones who best knew these local realities and were primary beneficiaries of the projects" (Whittington *et al*., 2009, p. 698).

A comprehensive review of gender and collective action concludes that "gender is largely absent from the literature on collective action for public goods provision" (Pandolfelli *et al*., 2008, p. 10). This review suggests a framework for analysis, drawing on the work of Ostrom and others, and a series of hypotheses about gender and collective action. The initial conditions that Pandolfelli *et al*. (2008) think may be important for collective action include male/female asset endowments and vulnerabilities, particularly differences in property rights, physical and financial capital, social capital, and women's bargaining power. These are difficult issues to explore except through small-scale ethnography. Our data analysis does not consider all of these factors. In Section 5 we restrict attention to the effects of assets, incomes, poverty and social capital (education).[2] Our initial analysis of limited data on male/female differences between spring communities was inconclusive (Crow, Swallow, & Asamba, 2009. p. 3.2 (iii)).

(b) *Study context*

The upper Nyando basin in Kericho district (Fig. 1) is primarily populated by people of the Kipsigis Kalenjin ethnic group. Population density varies from about 100 to 400 persons per square kilometer. During the colonial period (about 1900–65), land in the area was divided between Trust Lands occupied by local populations and leaseholds occupied by European settlers. After independence in 1964, trust lands were adjudicated to individual families, while most leasehold lands became government-sponsored settlement schemes or were purchased by land-buying companies, sub-divided and sold as individual leaseholds. Areas sub-divided by land-buying companies tend to have clusters of different ethnic groups located next to each other, with high levels of inter-ethnic conflict (Onyango *et al.*, 2007).

All springs in the adjudicated area are located on private land, with no formal public access routes to the springs. Although Kalenjin custom allows community members to obtain water from springs located on private land, access to springs is becoming more restricted as more farms are subdivided and fences erected (Onyango *et al.*, 2007).

Spring management in the former leasehold areas is generally more variable than in the adjudicated areas. Some of the colonial farmers who previously occupied those lands invested significant amounts of resources into spring protection, assets which are still relatively intact in some cases. In settlement scheme areas, government planners sometimes set aside spring areas for use and management by local communities. In areas purchased and sub-divided by land-buying companies, there was little or no planning for springs and thus most are located on private plots.

Agriculture is a primary source of livelihood in the study area, with most households cultivating maize and rearing livestock, and fewer households cultivating tea, other cash crops, and horticultural crops. Other important sources of income are casual labor and small business (Onyango, 2009). As of 2006, the major land cover types in the study area were grazing land, forest and bush land, maize production, sugar cane, tea, and woodlots (Swallow *et al.*, 2009). Poverty levels in the study area are about average for rural Kenya, with between 30% and 70% of the rural populations living below the national poverty line as of 1999 (World Resources Institute, 2007).

(c) *Study design*

A mixed-method approach was taken to address the two main research questions. Quantitative survey methods were primarily used to ascertain the prevalence of different spring management regimes in the study area, identify villages for in-depth study, and quantify the impacts of improved water supplies. Qualitative methods were primarily used to study the histories and characteristics of communities in the three groups of springs: (i) unprotected; (ii) protected by not piped; and (iii) protected and piped.

A spring census was conducted in a 650 square kilometer area of the upper Nyando basin in 2004–5 to identify the range

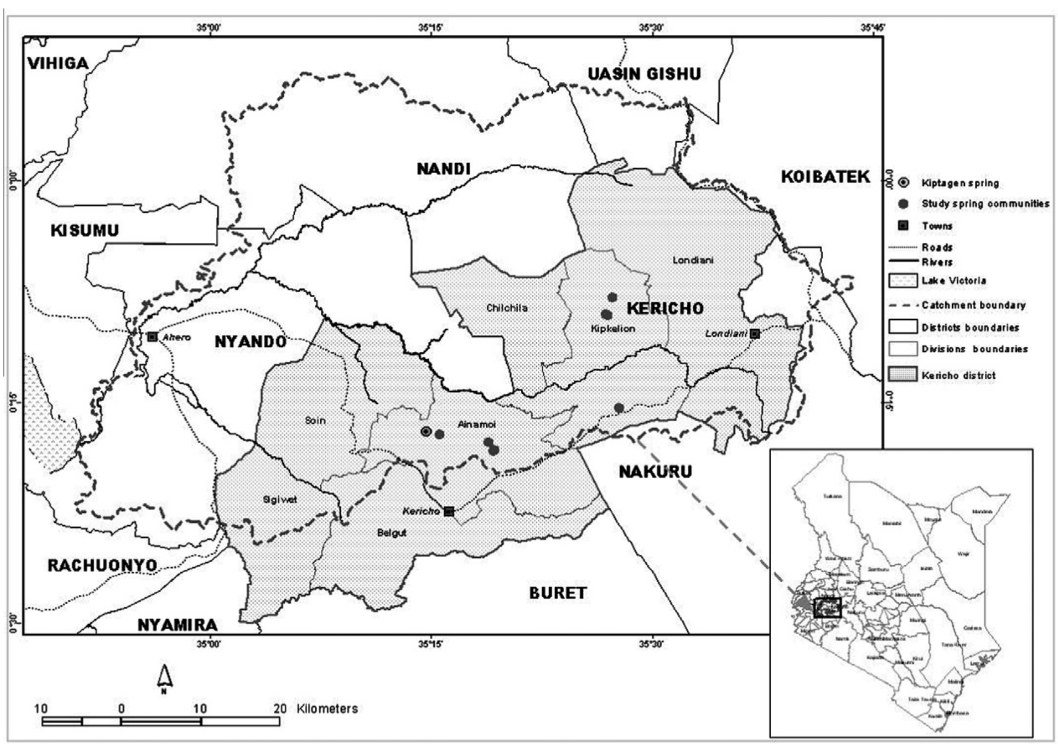

Fig. 1. *Map of spring communities and study area.*

of spring communities and their levels of collective action. All year-round springs in the area were visited, geographically located with a GPS unit, and a short key informant interview used to identify the number of users, protection status, water quality, and management of the spring (Bundotitch, 2005, unpublished report). The census was then used as a sampling frame for the selection of a small sample of different types of spring groups. Focus groups were employed to investigate questions about the origins and management of water committees and projects in the selected communities. Quantitative surveys of purposively sampled households in the selected communities enabled us to get quantitative data on water use and household characteristics.

The census found 137 springs that were the primary source of water for about 100,000 people in 15,920 households, 25 schools, 10 health facilities, 7 churches, 13 businesses, 8 cattle dips, a monastery, a college, and a railway station. Each spring was used by an average of 112 households, with the number of households per spring ranging from 1 to 1500.

The census showed that most of the springs (91 of 137) were unprotected, yielding water supplies considered unsafe for humans. Thirty-two of the springs had been protected with assistance from external organizations, notably the Swedish International Development Agency. Of the 32 springs protected with external support, 18 carry piped water directly to people's homesteads. In addition, 19 groups had – on their own initiative, with their own finance, and with their own management systems – made the investments necessary to protect their springs. Eight of those groups had protected their springs and piped the water to members' homesteads, serving the needs of 912 individual homesteads with approximately 5,900 people (Crow *et al.*, 2009).

Seven spring communities were purposively selected for more detailed analysis. These springs were selected from a restricted list of springs, excluding those that had received substantial external assistance and springs serving very large or very small numbers of households. Table 1 below lists the springs and details of the households sampled in the seven communities.

The spring census covered seven administrative districts of Kericho District. In two administrative divisions, Ainamoi and Kipkelion, we selected one unprotected spring, one protected-not piped spring, and one spring with protection and piping. We added an additional spring, Borowet, which was the only one of the 137 springs that had been protected and piped mostly through the initiative of female residents of the village. The survey was thus implemented in the seven spring communities. While implementing the survey in those communities, however, we found that the system for piping water to individual homesteads had failed in one community, Kasheen, We also found that Nyinyitiet spring was not effectively protected. We thus reclassified Kasheen as protected, but not piped, and Nyinyitiet as unprotected.

Household and key informant interviews were undertaken by a team with local knowledge, including speakers of Kipsigis, the most common language of the area. For each of the seven selected springs, the team mobilized community members to characterize the most common livelihood strategies and draw a map of the community, which located all households and water sources. A sample of 15 households was selected in each community. Purposive sampling was used to include group members from male-headed and female-headed households, widows and widowers, spring committee members, spring group members, and opinion leaders. In those communities (Simotwet and Borowet) with piped water supply to some households, an additional five nonpiped households were sampled. Where institutions, schools and a monastery also received piped water, those institutions were included as additional survey respondents. A total of 119 households were interviewed in the 7 villages, including 41 in communities with protected and piped supplies, 30 that used water from protected springs, and 45 that used water from unprotected springs. [3]

In addition to the household interviews, 37 key informants were interviewed, including 10 district heads of government departments, the Area Chiefs, the chairpersons, secretaries and treasurers of the water points, and the head teachers of two secondary schools.

The household and key informant interviews focused on answering the two questions listed above: (1) What are the benefits (and costs) of improved water supply? and (2) What are the characteristics and histories of communities that were successful and unsuccessful in improving their community water supplies? Conclusions on the impacts of improved water supply are derived through two types of comparisons: (1) with/without comparisons between households obtaining water from different types of springs – unprotected, protected and not piped, and protected and piped; and (2) before/after comparisons for households with protected and piped water. The before/after data is based on respondents' recall.

3. WATER USE AND THE BENEFITS OF PIPED WATER

There are little systematic and reliable data on rural sources of water, how much water is used for different purposes and how long it takes to collect water (Blackden and Woden, 2006). There is, however, a growing literature on the multiple uses and diverse benefits of improved access to household water (Andujar, 2005; Bakker, Barker, Meinzen-Dick, & Konradsen, 1999; James *et al.*, 2002; Moriarty *et al.*, 2004;

Table 1. *Characteristics of the seven spring groups*

Spring Group	Spring	Number of households drawing water from the spring	Number of households interviewed	Mean household income (Ksh/year)	Ethnic groups
Group1 not protected	Moiyowet	600	15	24,986	Kipsigis
	Kipsotet	200	15	142,613	Kipsigis
	Nyinyitiet	200	15	20,880	Kipsigis
Group 2 protected not piped	Togombei	140	15	45,398	Kipsigis
	Kasheen	150	18	78,953	Kikuyu, Kisii, Kipsigis
Group 3 protected and pipe	Simotwet	56	20	33,965	Kipsigis
	Borowet	73	21	42,857	Kipsigis

Source: Authors.

Were *et al.*, 2008). The consensus of these studies is that access to improved water generates a range of benefits. These include improved health, time savings, expenditure savings, improved well-being (reduced stress from pressure of work), enhanced capacity for community organization, improved productivity and income, investment, food security and nutrition (Moriarty *et al.*, 2004, Box 1).

In this section we explore changes in water use, time spent collecting water, and income associated with access to piped water. Section 4 examines changes in women's allocation of time to different tasks associated with access to piped water.

(a) *Water collection and use*

(i) *Quantities used for different activities*

Household water needs are often conceptualized as basic needs for drinking, washing and cooking, totaling about 25–50 L/capita/day (World Water Council, 2006, p. 3). Moriarty *et al.* (2004, p. 16) argue that the needs of rural households for water for productive uses mean that a larger quantity of water, in the range 100–200 L/capita/day is required.

Households in our study use close to the minimum standard suggested by the World Water Council, considerably less than the amounts suggested by Moriarty *et al.* (2004: Fig. 3.1). Those without access to piped water use an average of about 35 L/capita/day (200 L/household/day); while households with piped water use an average of about 50 L/capita/day (300 L/household/day). The additional water is mostly used in kitchen gardens and for watering livestock. The bulk of water used in these communities is carried in 20-L jerry cans. Household members interviewed in this and other surveys we have undertaken know the capacity of the jerry cans and other containers they use, and have a clear recall of the numbers of trips they make to carry water. We propose therefore, that estimates of water use and changes in water use are reliable, with a margin of error of perhaps 20–30%.

In the spring communities without piped water, the largest amount of water is used for livestock (home watering of goats and cattle), followed by washing of clothes and utensils, bathing, cooking and finally drinking (livestock use here excludes cattle drinking water at a spring or other water point). Fig. 2 shows that households with piped water use much more water for kitchen gardens than the other spring groups.

(b) *Sources of water and how they change with access to piped water*

Water is obtained from a range of sources in these communities including rivers, boreholes, roof collection and springs. The pattern of wet and dry season sources for the three protected but not piped communities is shown in Fig. 3. In both the wet and dry season, protected or nonprotected springs provide the main source of water. Roof collection provides an additional source of water in the wet season, and one of the seven communities has a borehole.

A comparison, in Fig. 4, of the quantities of water used before and after introduction of piped water suggests that piped water is treated as an additional source of water, nearly doubling the amount of water used by the household, with existing sources continuing to be used. Fig. 5 shows the volume of water obtained in the wet season from different sources before and after access to piped water.

For both wet and dry seasons, the use of river water is significantly reduced by access to piped water, while use of spring and borehole sources change only slightly. The diverse needs of households for water, particularly for livestock watering, may explain why households continue to use a range of water sources.

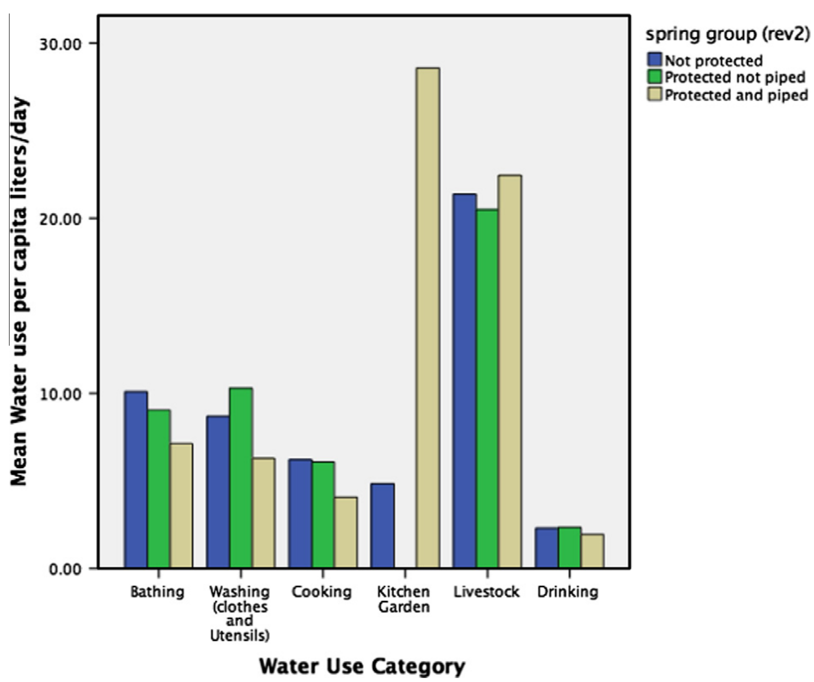

Fig. 2. *Quantity of water used by purpose, wet season.*

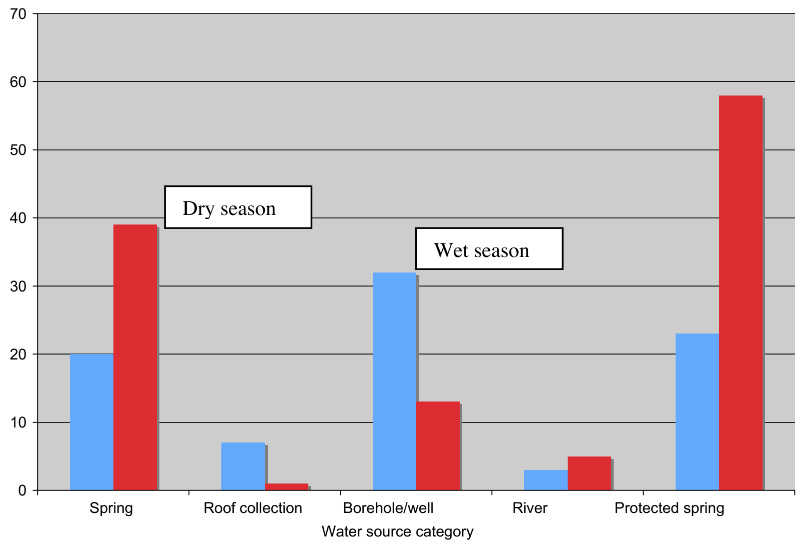

Fig. 3. *Quantity of water use by source, protected but not piped springs.*

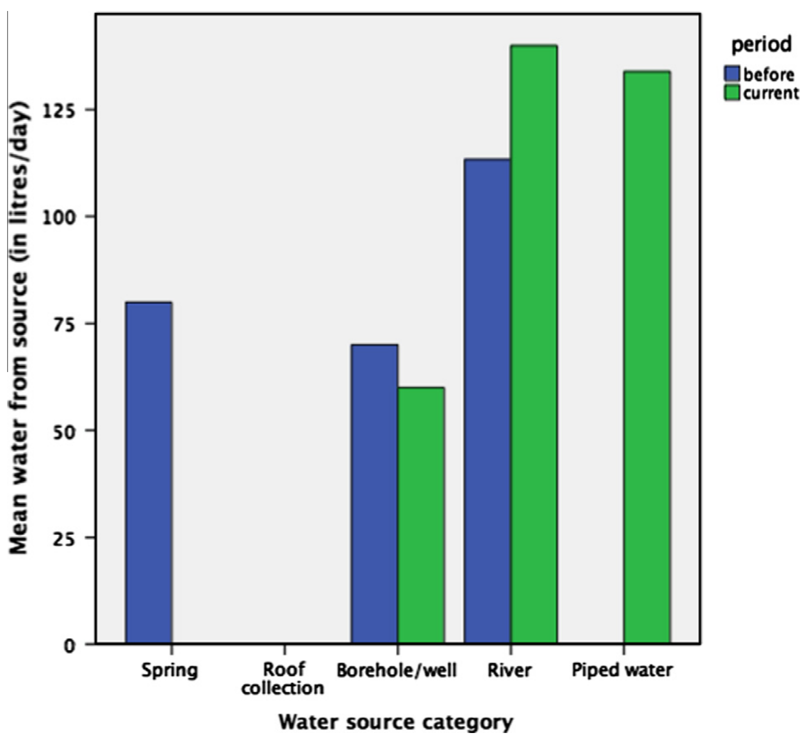

Fig. 4. *Quantity of water use by source, protected and piped springs, wet season.*

(c) *Labor required for collecting water*

Most households in these seven communities spend 1 h or less collecting water each day. Some households, however, spend as much as 4 h per day collecting water. Fig. 6 shows the number of households spending different amounts of time collecting water each day. These data are derived from the household survey. Respondents were asked (at the end of the dry season) "how much time do you spend collecting water each day?"

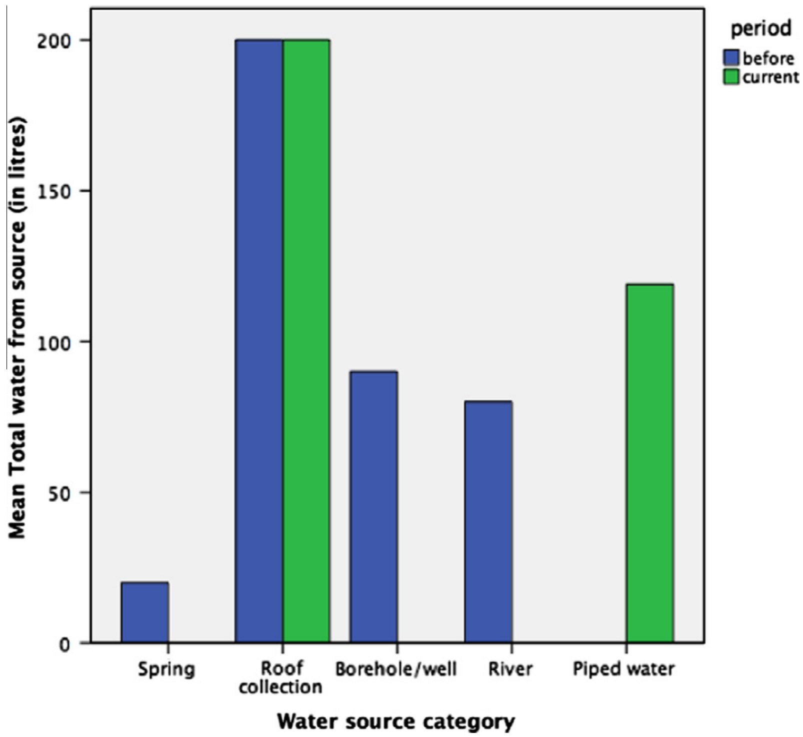

Fig. 5. *Quantity of water use by source, protected and piped springs, dry season.*

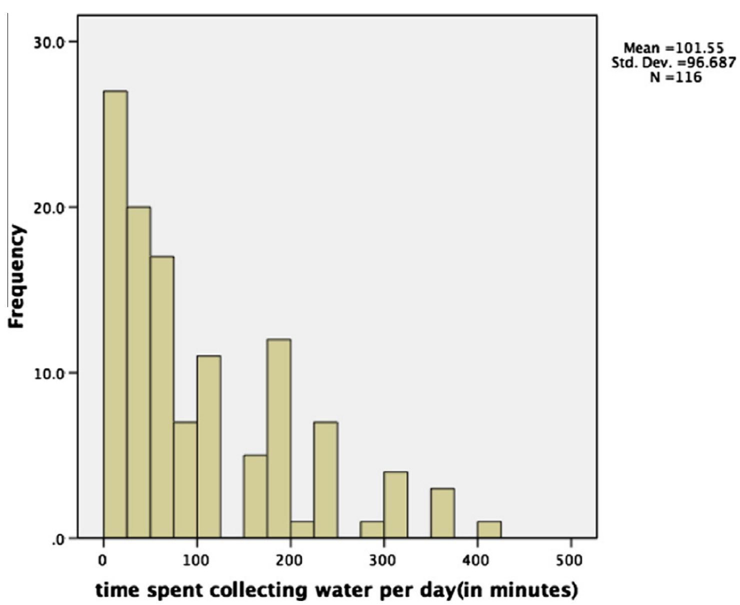

Fig. 6. *Distribution of times to collect water by numbers of households.*

Households that have piped water spend significantly less time collecting water. Fig. 7 shows the range of times spent collecting water for households in each spring group. Households with piped water supply spent an average of 85 min less per day collecting water than households that did not have piped water.

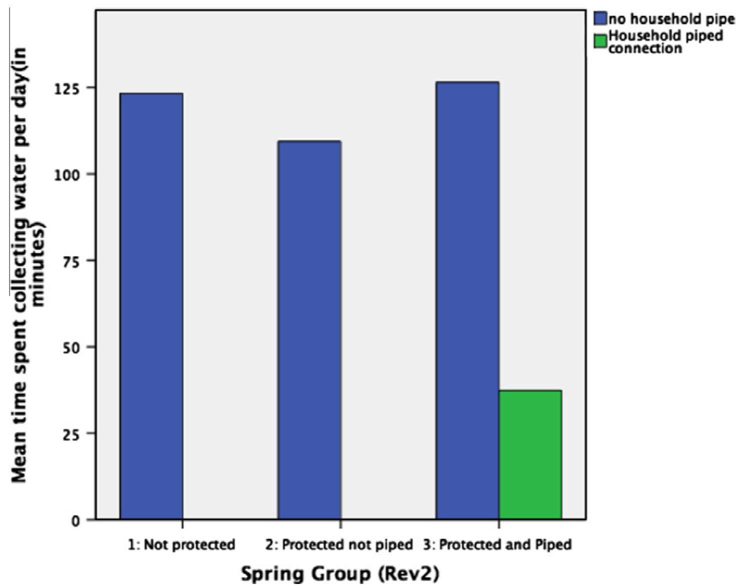

Fig. 7. *Time collecting water by spring community.*

(d) *Incomes of piped and nonpiped households*

Previous studies (e.g., James, 2002) suggest that time saved in water collection can be converted into income generating activities. The evidence from the Nyando springs is not conclusive, but does suggest that additional household water and time saved from water collection are associated with additional household income, particularly from fruit, vegetable and livestock production. We present two types of evidence, both of which are derived from data provided by households living in the two communities that have piped water connections (Simotwet and Borowet). First, we compare the income of households with and without piped water connections. Second, for households with piped water, we present income estimates based on their recall of the additional income they get from having piped water. [4]

Households with piped water sources report 35% higher incomes than households without. The direction of causation in

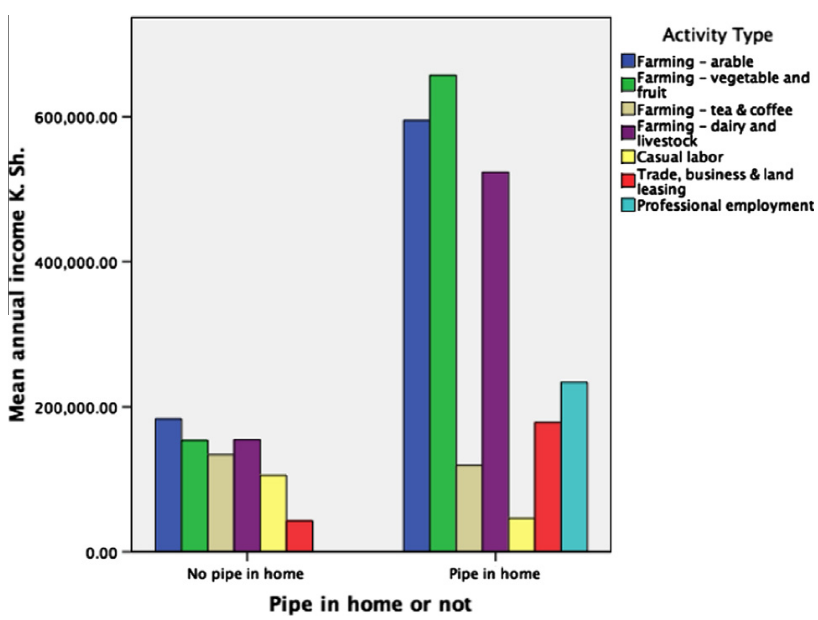

Fig. 8. *Mean income of households by activity, piped and nonpiped households, Borowet and Simotwet.*

these numbers is difficult to establish with the available data: did more affluent households get piped connections or did piped connections make households more affluent? We believe that the latter situation held, but cannot conclusively rule out the former situation. The main source of the additional income, kitchen garden production, however, gives credence to the proposition that piped water led to the increased incomes. This study and others have shown that households with piped water tend to use additional water to irrigate kitchen gardens.

Fig. 8 shows the composition of income by type of activity for the two communities with protected and piped water. Income from vegetable and fruit farming and dairy and livestock activities were higher for piped households than for nonpiped households. These two activities are likely to have been improved by the ready availability of water at the homestead. The mean difference between the incomes from vegetable, fruit and livestock farming for households with and without homestead connections is statistically significant at the 10% level ($t = 1.53$).

Fig. 9 shows the additional annual income reported by households with piped water "due to changes in the water source". These households estimate that they have been able to increase their dairy and livestock incomes substantially (35% of income from that activity in Simotwet and 9% in Borowet) as a result of having piped water connections. Simotwet households report a 20% increase in income from vegetable and fruit production. Borowet households report a 3% increase in vegetable and fruit and an 8% increase in tea and coffee income. These activities, carried out mostly within the homestead, are likely to have benefited from additional supplies of water in the homestead.

In sum, households with piped water spend less time collecting water, and they get more income from diversified farming activities. In the next section, we examine changes in women's activities and time allocation as a result of having piped water.

4. THE INFLUENCE OF PIPED WATER ON WOMEN'S AND MEN'S ACTIVITIES

(a) *Time allocation of women and men*

Women in general, bear a heavier burden of work; they contribute a major share to the family income, and in addition are responsible for child-rearing and most household chores including fetching water and fuel wood. Daily activity profiles (Tables 2 and 3), estimated from separate focus group discussions with women and men (6–12 women and 4–16 men, meeting separately, in each village), suggest that an average woman's work day is 6½ h longer than that of the average man, which reduces their opportunity for rest, leisure and other activities. Women work, on average, for about 16½ h per day, while men in the same area work about 10 h per day.

Our study compares seven spring communities as a cross section. So, comparison across the columns of Table 3 may be confounded by differences between the communities that are unrelated to household water access. A comparison before and after the introduction of homestead water access would provide more robust estimates of the impacts of improved water access on time allocation. Nevertheless, these time estimates are suggestive. Access to homestead water seems to allow women in communities with piped water supplies to spend less time collecting water and more time sleeping, compared with women in communities without piped water supplies.

Compared to men in communities without piped water, men in communities with piped water supplies spend more time selling milk, socializing, and working on the water project. In this group, men spent less time farming and fencing. This may reflect a change of emphasis toward intensive livestock and home garden cultivation. Overall, men in communities with piped water supplies spent less time in leisure and sleeping.

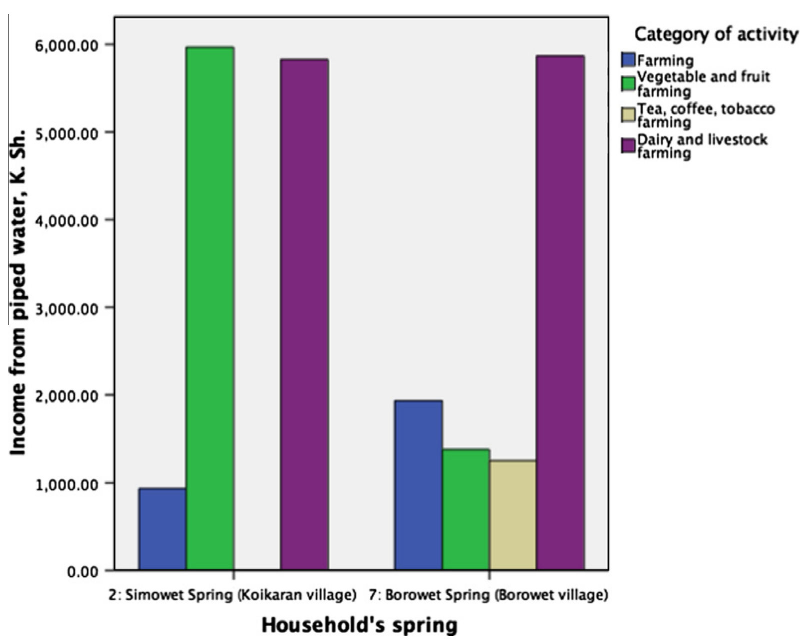

Fig. 9. *Additional Annual income for households with homestead piped water.*

Table 2. *Typical woman's daily schedule – hours*

	Group 1 nonprotected Mean h/day	Group 2 protected but not piped Mean h/day	Group 3 protected and piped Mean h/day
Prepare breakfast and children for school	1.83	2.00	2.00
Fetching water for the day	3.50	4.00	2.00
Prepare meals – looking for vegetables and cooking	2.83	2.50	2.75
Farming	2.67	3.50	3.50
Fetching firewood	2.33	2.00	3.00
Washing, cleaning and child care	3.17	3.00	2.75
Milking	1.00	–	–
Sleep	7.33	7.00	8.00
Leisure	–	–	–
Hours of productive work	16.67	17.00	16.00

Source: Focus group discussions.

Table 3. *Typical man's daily schedule – hours*

	Group 1 nonprotected Mean h/day	Group 2 protected but not piped Mean h/day	Group 3 Protected and piped Mean h/day
Milking	0.375	0.83	0.625
Transportation of milk/sale	1.25	1.33	2.5
Cutting Napier grass/grazing	0.5	2.17	0.75
Feeding cows	025	0	0.5
Cleaning cow shed	0.5	0	0.83
Plucking tea	0	2	1.5
Watering cows	1	1	1
Socializing/project work	0	1.3	4
Farming/fencing	4.5	4.67	2
Sleep	10.6	7.17	9.4
Leisure/meals	5	1.5	3
Hours of productive work	8.4	13.3	11.75

Source: Focus group discussions.

(b) *Implications of work changes*

Women say they derive benefits from the introduction of piped homestead water – less time collecting water, and possibly more time sleeping. Men, by contrast, estimate that they do extra work because of the water project, although they too get some benefits. If, as it seems to be the case, men are better represented and more vocal in community decision making processes, this uneven distribution of benefits by gender may be a serious obstacle to collective action for improved water management.

Women's time poverty is reduced by access to homestead water. Women in communities with access to homestead water also report that time saved from collecting water enables increased milk and vegetable production, and enables girls to spend more time on school work. In addition, women report reduced conflict with their husbands, increased household cleanliness and increased skills arising from the water project. Women's time allocation also suggests that women with homestead water access were able to sleep longer.

Men in communities with homestead water access reported working longer hours on socializing and project work and on the sale of milk, and they did not like their increased involvement in what they perceived as women's tasks.

If confirmed by other studies, this tentative finding that men work longer hours after the introduction of homestead water could provide an important element explaining why some communities do not undertake the work of introducing piped homestead water connections.

5. COMPARING THE CONTEXTS OF COLLECTIVE ACTION

Collective action in the seven spring communities included in this study has achieved three levels of accomplishment. All seven springs have water committees that oversee water allocation and spring management. Five springs have been protected – a small tank constructed around the water source to store water and protect the source from contamination. Two spring groups have also built a water storage tank and a network of pipes, and installed piped water connections to the homesteads of their members. All three levels of action – establishing a committee, protecting the water source, and laying pipes for water supply – constitute significant levels of social action. In this section we ask: are there identifiable social characteristics and common histories that predispose some communities to achieve the third, most desirable, level of homestead water supply? If we can identify these characteristics, then it may be possible to provide support that enables other spring communities to organize more effectively.

(a) *Ethnographic insights on water, gender and collective action*

Much of what we have understood about the connections between water, gender, and collective action comes from ethnographic or qualitative fieldwork (Roy *et al.*, 2005; Were, Swallow, and Roy, 2006) undertaken before or in parallel with the study reported in this paper.

In Kalenjin communities in Kenya, women's formal involvement in decision-making is limited by post-colonial divisions of labor that allocate public activities and income earning to men and the care of children and the home to women (Were *et al.*, 2008, p. 75).

Study of the origins of three water projects in Kericho District suggests that there is imitation of other water technology schemes and that "the overlap of men's interest to get water for livestock and tea seedlings with women's concern to get water for domestic tasks and women's plots may also have been very important" (Were *et al.*, 2008, p. 73, 76).

At the same time, few communities have undertaken water projects (91 springs were unprotected out of 137 surveyed, in the spring census described earlier). Reasons for failure to undertake projects may be as revealing as the identification of conditions associated with collective action.

Early field research (Roy *et al.*, 2005) suggested that constraints included insecure land tenure (discouraging construction of even simple water structures) and past experience with failed collective action. Thus, an agricultural officer reported,

"When people hear the term committee, they remember the road committee that failed them, they remember the cattle dip committee that failed them, they remember the health committee that failed them."

(Roy *et al.*, 2005, p. 6).

In addition, men's perceptions of women's work may also be an obstacle. The same agricultural officer reported a tantalizing brief comment: a man at a *baraza* (a public village meeting) had recently said, "When water is available at home, what will the women do? Go and sleep around?" The *baraza* subsequently decided not to build a water project. Of the 50 people present, only two were women (Roy *et al.*, 2005, pp. 5–6). Great weight cannot be placed on a brief comment and its possible connection to a community's decision not to embark upon water improvement. Nevertheless, it provides an indication of men's possible under-valuation of women's time, and of the dimension of sexuality that informs household bargaining (see also Page, 2005).

In one case, the roles of women in a water project only became apparent after several rounds of interviewing, spread over two years. Initial field research, often with project leaders who are mostly men, suggested that men had been the prime movers of the Chesilot water project near Kiptagen village and women had only taken collective action to establish an income generation project once the project was supplying water. Subsequent interviews, including more with women, suggested that the money that men invested in the project often came from their wives' earnings from sale of chickens and produce. During construction, while men did much of the work, women prepared meals, carried stones, and dug trenches (Roy *et al.*, 2005; Were *et al.*, 2008).

This research suggests that rural water supply projects are situated at a nexus of the relations between men and women. Much household water is used for women's work in and around the home, while decisions about water projects are at least formally made by men, and much of the work and finance of the projects centers upon men. We return to this question in the conclusion of this paper because, as we suggest in Section 4, rural water projects impose more work upon men.

(b) *The contexts of collective action*

What characteristics of the spring and spring community might predispose a community to take collective action? Following the review presented in Section 2, we consider: (i) landholding and renting, (ii) economic activities, income inequality and networks, (iii) education levels, (iv) history of conflict, and (v) size of the community and its topographic relation to the spring. We end this section by summarizing our findings on participation, transparency and accountability in the three groups of springs.

(i) *Landholding and renting*

We found no simple relationship between average landholding in a spring community and collective action. The unprotected spring communities, Kipsotet and Moiyowet, have the largest landholdings. The two piped and protected springs, Borowet and Simotwet are in the middle and at the bottom, respectively of the landholding range. The prevalence of land renting is surprisingly high in all study villages, ranging from 20% in Moiyowet to 75% in Simotwet. Despite this variation in the prevalence of land renting among households, however, there was no obvious relationship between the extent of land renting and spring protection. Also, the results show that the pattern of land renting, both in area rented in, and prevalence, was about the same in all size classes of land ownership. Land renting does not stand out as a response to landlessness or a means of excessive concentration of land control by the wealthy.

(ii) *Economic activities, income inequality and networks*

High incomes do not make spring communities more likely to undertake collective action to protect their water supply. Table 4 shows that one of the unprotected springs, Kipsotet, has the highest average incomes in this group of seven springs. Kipsotet, as noted in section three of this paper, has larger landholdings and more substantial external incomes than the other communities under study. The two spring communities with piped water have mean incomes in the low end of the range for these seven communities.

Income from crop farming is present in all seven spring communities, but its estimated contribution to total incomes is small. Farming is overshadowed by activities which, for some households, bring in much larger incomes: teaching, government and other professional jobs, and casual labor.

Table 4. *Mean total household incomes by spring community*

Spring group	Spring	Household income per year Mean K Sh 000s	Standard deviation K Sh 000s	Number of households
Group1 not protected	Moiyowet	25	15	15
	Kipsotet	143	190	15
	Nyinyitiet	21	21	15
Group 2 protected not piped	Togombei	45	69	15
	Kasheen	79	99	18
Group 3 protected and pipe	Simotwet	34	25	20
	Borowet	43	37	21

Crow *et al.* (2009) indicated the great diversity of income activities at all levels of income. Farming of all kinds (arable, tea and coffee, fruit and vegetable, and livestock) is particularly important among the poorest households. Professional employment and casual labor are major sources of income for the richest quintile of households. There is no clear pattern of livelihood activities associated with each group of spring communities.

When it comes to income inequality, Simotwet and Borowet, the two spring communities that have been able to organize to provide homestead piped water, are at the low end of the range of inequality. So, too, is one of the nonprotected spring communities, Moiyowet. Baland and Plateau's (1994: 302–312) survey of the common property literature suggests that inequality and heterogeneity do not necessarily reduce the likelihood of collective action on a common property resource.

What about occupational networks and collective action? Government, teaching and professional activities could be associated with collective action both because those occupations are likely to build networks and provide the capacity to organize. While this occupation group is important, particularly in the richest quintile of households, in one of the protected and piped communities (Borowet), it is not present in the other (Simotwet) and both non protected (Kipsotet) and protected spring communities (Kasheen, Togombei) have significant incomes from those occupations.

(iii) *Education levels by spring*

There is some degree of correspondence between education and collective action. Kipsotet, a nonprotected spring community, has the highest level of post-secondary education, and no respondents with no education. This community, as we have noted earlier, is an outlier in the seven communities with higher landholding, incomes and professional employment. If this community were set aside, then the two Group 3 piped communities have higher education levels than the other communities.

The two communities with piped water supplies, Simotwet and Borowet, have high levels of secondary education and low proportions of households with no education. Nyinyitiet and Togombei, which are protected but not piped, have the highest proportions of households with no education. If we ignore the case of Kipsotet, an anomaly in education as in most respects, then high levels of secondary education are associated with collective action.

(iv) *History of conflict*

The accounts of interviewees in one spring community suggest that ethnic conflict can set back the prospects of collective action for water provision.

Ethnic conflict in the community of Kasheen is the clearest example of conflict in the spring communities. Kasheen is the most ethnically diverse of the communities, with people of Kikuyu, Kisii, and Kipsigis tribes. Countrywide ethnic clashes in 1992 and 1997 led to many Kikuyu and Kisii people leaving the community. Some sold their land to Kipsigis who were more comfortable staying in the area. In the words of a teacher, "*The whole settlement was disrupted, cattle trough members, dispensary members and others left. The old establishment moved, a new one was coming in. It takes time to settle, interact well, and reach an amicable understanding with the people already here. Suspicion remains for those who were beaten. It took time before the newcomers were understood*" (Mabera, 2007).

In Kasheen there had been a communal cattle trough. It was destroyed during the clashes because "Animals were stolen, others were sold for fear that they would be stolen. So there was no need for the cattle trough. There was a lot of fear" (Mabera, 2007).

There has been conflict, sometimes expressed through sabotage, at other springs. At Nyinyitiet, there is conflict among women over who can obtain the limited supplies of water. In Borowet, there has been tension around the fouling of the spring landowners' water trough. Elsewhere, there are indications of tensions between members of spring groups and nonmembers.

(v) *Numbers of households and their topographic relation to the spring*

The two communities with piped water are distinguished by the small size of their membership and the fact that all of their homesteads are located downstream of the spring. There is a consensus that smaller groups organize collective action more readily (Baland and Plateau, 1994, pp. 298–299).

The task of providing piped water is easier for spring communities, such as Simotwet and Borowet, with smaller numbers of households, located downstream of the spring. Nonetheless, not all small catchments (see Kipsotet), nor all catchments with downstream households (see Kasheen), manage to arrange piped water.

A committee having a large proportion of its households upstream of the spring has additional technology to acquire and install. A pump is required and a larger storage tank is needed to store water for pumping. A larger community of households has the difficult task of organizing a larger group.

(vi) *Participation, transparency and accountability*

Good governance appears to matter for successful collective action. The two spring communities with piped water, Borowet and Simotwet, have higher levels of participation, more frequent meetings and more active water committees than the other villages. A detailed study of decentralized forest management in Tanzania (Lund and Treue, 2008) suggests that local management of resources creates a new arena for political struggle between interest groups at the village level. Similar tensions have been noted (above) in this study. Nonetheless, participation, a constitution, transparency and accountability do seem to be associated with more successful collective outcomes.

6. CONCLUSIONS

Case study analysis in Kiptagen Village conducted in 2005–6 suggested that protection and piping of water to individual homesteads can have dramatic impacts on several dimensions of household well-being (Were *et al.*, 2006). The spring census that was undertaken following that case study found that there are other groups in the upper Nyando basin which have been able to protect their springs, with a minority of those able to install piped water systems. If protected and piped water systems generate such large benefits, why were they the exception rather than the rule? There are at least three possible answers: (1) the Kiptagen case was an exception in terms of the types and level of benefits that resulted, (2) men perceive that the outcome of the project will not be to their advantage because their work time may rise even though women's work time is reduced, (3) the obstacles to collective action are so daunting that very few communities are able to surmount them.

This study does not support the first hypothesis, but does support the second and third. That is, the evidence reviewed in this study is consistent with the Kiptagen study in showing that households with household water connections are able to save a great deal of time (about 1.5 h per day of time savings for women and girls) which they are able to put to beneficial use – education for girls, garden production for women, and rest for women and girls. The extra water available to the household is useful for intensive dairy production and for watering home gardens. There is evidence of a 35% increase in income (possibly larger for poorer households), mostly from increased dairy and home garden production.

But it appears that men work longer hours in those communities where there is piped water. They spend less time on farming and fencing but this is more than offset by longer time spent in transport of milk, on social contacts, and water project work. As a result men in these communities appear to sleep less, though still longer hours than are reported by women.

There certainly are many constraints to the collective action necessary for establishing protected and piped water supply systems. Ethnic heterogeneity and conflict, such as seen in this area of Kenya in January 2008, can serve to reduce or stop collective water management.

While this study did not show income or wealth to be preconditions for collective action, education may have played a role. Also, formalized and efficient systems of water governance appear to be important. With minimal external support, the two community groups that were able to establish constitutions, generate good participation among members, and ensure some level of accountability and transparency in the governance systems, were able to build and maintain piped water systems.

Gender relations are clearly important for water management, with women and girls bearing most of the costs of collecting water and men generally needing to be involved in mobilizing the necessary finance and access to land to establish piped water systems. Focus groups note a large number of benefits of piped water for women, but more negative impacts for men.

We started this research with a hypothesis that differences in men's valuation of women's work collecting water could lie behind the ability of some communities to organize to improve household water access. Early results from fieldwork by Jessica Roy (Roy *et al.*, 2005) provided some anecdotal support for this idea. We were not able to provide robust evidence of such differences, but did generate some support for the hypothesis.

Given the very large potential benefit, improving homestead access to piped spring water should be an investment priority in the upper Nyando basin. Close to 90,000 people stand to benefit. The Water Service Trust Fund, which "*assists in financing the provision of water services to areas of Kenya which are without adequate water sources*" (http://www.wstfkenya.org/, accessed June 25, 2011) might consider giving priority to this area. It is plausible that some external finance would provide sufficient incentive to overcome men's perception of disadvantage. Yet financial and physical capital would only be part of the solution. Communities also need assistance to build the necessary social and human capital in order to encourage community governance. Perceived differences in benefits between men and women may be contained if both men and women are involved in investments and management structures.

NOTES

1. Improved access is defined as one of the following: household connection, public standpipe, borehole, protected dug well, protected spring, and rainwater collection.

2. The linear form of many journal articles – introduction, literature review, methods, analysis of data, conclusions – does not fit the iterative process of this study. Field exploration and research, using ethnographic and quantitative methods, stretched over six years. Several collaborations, graduate students and research assistants have been involved in the research. One result of this iterative process is that the hypotheses emerging from the current literature review do not mesh entirely with the foci of the data analysis.

3. Households were interviewed only once. Interviews were done by research assistants fluent in Kalenjin and Luo as well as Kiswahili. The data were recorded in English. Available household members were interviewed. Overall, 54% of respondents were female. Heads of all female-headed households were interviewed. In male-headed households, 60% of respondents were male and 40% female.

4. Income data is based on household estimates responding to two sets of questions. The first set is about the main productive and income generating activities of the household (Is it for subsistence or sale? What is the total income from the source per year? Who does the labor? Who decides how the money is spent?). The second set of questions are about changes in income resulting from changes in water source. Households gave estimates of annual income disaggregated by the type of activity. These estimates are subject to the uncertainties of recall but we believe disaggregated answers improve the quality of the data compared to simple estimates of total household income.

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