The costs and benefits of multiple uses of water: A case study from Oromia, Ethiopia

This summary is based on RiPPLE Working Paper 7: The costs and benefits of multiple uses of water: The case of Gorogutu woreda of East Hararghe zone, Oromiya Regional States, eastern Ethiopia available for download at: **www.rippleethiopia.org**

This study analyses the costs and benefits of going from a traditional situation towards multiple use water services (MUS) in three cases in East Hararghe zone (EHZ). The hypothesis is that, with relatively small additional costs, single use water services can be upgraded to provide MUS, which will generate relatively large additional benefits. These benefits are assumed to exceed the additional costs. Three different paths are considered: domestic plus; irrigation plus and MUS-designed.

Each step implies the need for inputs into infrastructure and organisational and institutional arrangements. Direct outputs are changes in water quantity, quality, reliability and accessibility. These can stimulate changes in water use, which in turn lead to benefits from water use (impact).

This paper looks at three cases in Goro Gutu woreda, each representing one of the three different paths. The three cases have the same starting point: an unprotected spring used for drinking, animal watering and small-scale traditional irrigation. To keep influencing factors as constant as possible, cases in the same woreda (district) with similar systems and implemented by Harar Catholic Secretariat (HCS) were selected (although this may make it difficult to generalise results).

Cases

		Domestic + (Ido Jalela)	Irrigation + (Ifa Daba)	MUS-designed (Bitfu Diremu)
MUS	System: Multiple use	Domestic system with irrigation component	Irrigation system with domestic component	Multiple use system (domestic and irrigation)
	Use: Multiple use in design	Domestic+	Irrigation+	Multiple use
Single-use	System: Single use	Domestic water supply system	Irrigation system	
	Use: Multiple use (de facto)	Domestic+	Irrigation+	
No access	System: Informal	No formal system	No formal system	No formal system
	Use: Multiple use	Multiple use	Multiple use	Multiple use

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Ido Jalela (Domestic+): In 2005, the spring was capped and a domestic water supply system was constructed. People continued traditional irrigation using runoff water from the domestic system and water from nearby springs. The community asked HCS to develop an improved irrigation system, linked to the domestic water supply system, which was being implemented during the study.

Ifa Daba (Irrigation+): A spring was used as the source of an irrigation system, constructed in 2004. Since then, community has also been using the system for drinking water. In 2007, a stand post was directly connected to the capped spring, to facilitate fetching water for domestic use, but poorly located. The stand post was reallocated to a more favourable position in 2008.

Biftu Diremu (MUS-designed): A MUS-designed spring was capped in 2002 to provide four faucets, a cattle trough and washing basin and a small irrigation scheme component. The system, especially the irrigation component, has not yet been developed to its full potential.

Costs and benefits

Costs and benefits are analysed at household level (contributions and benefits) and service level (costs of design, construction, operation and maintenance (O&M), system support and benefits).

Service-level and household-level costs: Costs considered were capital investment costs in assets; operating and minor maintenance (O&M) expenditure; and support costs. To compare costs with annual benefits, investment costs are divided over system lifespan whereas operation and support costs, which may vary, are averaged.

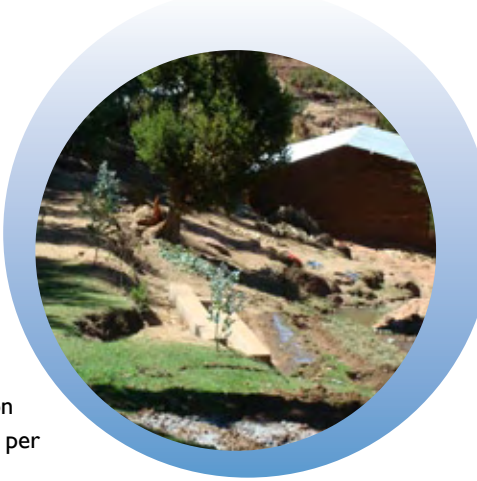
Generally, service-level costs were higher for irrigation+, in comparison to domestic+ and MUS-designed systems needed significantly less intial investment and running costs. In all three cases, water committees have been established, which set and collect the water fee and use the money for O&M expenditure. None had separate water tariffs for different water uses, as all the systems are gravity systems (providing for additional water use requires only small increases in operational costs).

Findings show that costs at household level increase only slightly when going from domestic/irrigation to domestic+/irrigation+. However, household level costs are higher for MUS-designed systems, in comparison to domestic plus, and irrigation plus systems. Irrigation+ systems in this case study, were the cheapest, in terms of household level expenditure.

Water use and benefits: In terms of benefits, health impacts are based on: (i) the value of estimated number of days missed owing to diarrhoea or dysentery over one year before and after implementation; and (ii) estimated costs of treatment over one year before and after implementation. Benefits from irrigated agriculture are expressed as additional net benefits of irrigated agriculture, as compared with rain-fed agriculture. Time-saving benefits are determined by time spent fetching water before and after the intervention (converted into Birr by multiplying it by the minimum daily wage for unskilled labour). Benefits are to a large extent estimates, as the schemes are at various stages of implementation.

Water use for domestic use: Water use for domestic purposes by household increased in all three cases (but by varying amounts) in the move from no improved access to improved access.

Irrigation: In Ido Jalela, the total irrigated area in prior to intervention was reduced as the system for irrigation has not been completed. In Ifa Daba, irrigation benefits had increased by 32%leading



to an assumption that a similar increase will take place in Ido Jalela pending system completion.

In Ifa Daba, the initial area was 5 ha (40 users), going up to 6.625 ha (53 users) after intervention. However, implementation has been accompanied by a change in cropping patterns away from chat, a lucrative crop, has seen a decrease in net benefits, after intervention.

In Biftu Diremu, the irrigated area went down from 3 ha (24 users) to 0.75 ha (12 users), since the irrigation component is incomplete. Benefits dropped about 80% per year (exaceberated by a changed cropping pattern).

Time saving: The time-saving benefits are not only related to a decrease in distance, but more strongly to water fetching being facilitated by the installation of a tap, making it easier and less time consuming Across the three cases, benefits have increased, although, in Biftu Diremu this was not as much as distance between water and homes reamins considerable.

Overview of total benefits

At service level, in the worst case, in Ido Jalela, the decrease in irrigation benefits is compensated by the increase in time-saving and health benefits, in going from no improved access to improved access. In Ida Daba, the loss in irrigation benefits is compensated by the time saved in the use of the water for domestic purposes. A big jump in additional benefits is made with the upgrading of the system to include domestic use in the design of the system, with an increase in health and additional time-saving benefits. However, because of population growth, the irrigation benefits per capita have actually decreased.

Household level: Findings present an overview of benefits at household level, with there being a clear distinction between unimproved access and improved access. In all cases, household level benefits are greatest in MUS systems in comparison to single-use systems. However, these benefits are less in designed MUS systems in comparison to incremental changes to systems moving from single-use domestic or irrigation to MUS.

Costs and benefits

Costs and benefits at household level and at service level: There is a wide variation in cost-benefit ratios (CBR) between different household scenarios. For example, based on a medium scenario of household (minimum health benefits with access to irrigated land), average cost-benefit ratios over a 20 year lifespan of a system, were greatest for irrigation plus systems, and least for MUS-designed systems.

Regarding total service-level annual costs and benefits, in both the worst (short lifespan and minimum health and irrigation benefits) and the best case scenario (long lifespan and maximum health and irrigation benefits), benefits outweigh the costs by a significant margin. Although absolute benefits are bigger for de facto irrigation plus (Ifa Daba) than for de facto domestic plus (Ido Jalela), ratios seems to be slightly lower, although the difference is very small. This suggests

that investments in single use water supply systems have a higher CBR than a single use system with an additional irrigation component. In contrast, the Ifa Daba case, saw a higher ratio once a domestic component was added to the irrigation system. This can be explained by the fact that the whole community benefits from improvements in domestic water supply, but only part of the community benefits from just improved irrigation.

Regarding the relationships between water use, when costs and benefits of single use are compared with MUS, MUS systems tends to bring higher water use and higher benefits at no additional costs. It could be argued, however, that water use that exceeds design capacity will result in system degradation (which means higher O&M costs and a shorter lifespan, and thus higher annual investment costs) and also possibly in conflicts over water resources.

Conclusions and recommendations

Even in the worst case scenario, this case study has shown that benefits easily outweigh the costs at household level, as well as at system level. The results show that the CBR for domestic water supply interventions is higher than that for irrigation interventions. However, benefits related to improved domestic water supply (health benefits, time saving) are not always easy to quantify and therefore not very obvious to users. Irrigation, on the other hand, brings significant and tangible benefits for households with access to irrigated plots. However, not everyone benefits equally, whereas all community members benefit from improvements in water supply, through both improved health and time saving.

The Ifa Daba case shows that adding a domestic water component to a spring irrigation system has a far more favourable CBR than implementing a single-use irrigation system only. It could be argued that this is the case because this is a spring system, which means that very few extra costs have to be made to supply water of suitable quality for domestic purposes and which can bring health and time-saving benefits.

Population growth has a large impact on water use and on costs and benefits per capita. Systems are often over-designed to cater for population growth. This may stimulate people to use water for other purposes, which can lead to conflict when the population grows. Integrated planning, taking into account water demands for different uses, and how these may develop over time, is key.

Researchers

The team of researchers for this project comprised of:-

Marieke Adank, Martine Jeths, Belayneh Belete, Samuel Chaka, Zelalem Lema, Demeksa Tamiru and Zemede Abebe