



Small-scale irrigation in the Ethiopian highlands

What potential for poverty reduction and climate adaptation?

Introduction

Small-scale irrigation is a policy priority in Ethiopia for rural poverty alleviation and growth (MOFED, 2006), as well as climate adaptation (GoE, 2007). Only around 5% of Ethiopia's irrigable land is irrigated (World Bank, 2006), and less than 5% of total renewable water resources are withdrawn annually (FAO, 2005), so there is considerable scope for expansion. The following discussion draws on evidence from a micro-level study by RiPPLE to assess the contribution of small-scale irrigation to income diversification and livelihood resilience in three highland communities in East Hararge, Oromia region (Eshetu et al, 2010). Household interviews and focus group discussions (for different wealth groups and female-headed households) were conducted in three sites with spring-based community-managed irrigation schemes.¹

Direct benefits of irrigation

Irrigating households reported an average 20% increase in annual income since adopting irrigation, and in some cases up to 300%, due to cultivation of higher value crops, intensified production and reduced losses. Nutrition was said to have improved as various fruit and vegetables became locally available. The most successful households have increased their assets, particularly livestock which is an important form of saving and wealth accumulation. Some have bought new farming equipment to further increase productivity. In this way irrigation can lead to an upward spiral of increased production and income, and some households say that their livelihoods have been 'transformed'.

However, many saw only modest increases in income, particularly poorer households. The extra income helps them to meet day-to-day expenses but many are still food-insecure and reliant on food or cash for work from the Productive Safety Net Programme (PSNP).

Costs and constraints: why aren't the benefits greater?

Wealth matters...

Relatively better-off households benefited more because they have more land, labour to work the farm and money

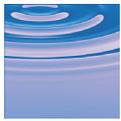
to buy farm inputs, which allow them to exploit irrigation opportunities. Poor households are mostly smaller, hire out labour for vital income and cannot afford to hire in labour. They may also restrict irrigation use because of the cost of water, and when water shortages occur they can rarely afford alternative supplies. Boxes 1 and 2 tell the contrasting stories of two irrigating farmers. It should be remembered, however, that local wealth groups are relative and many 'better-off' households in these communities would be classed as poor under international definitions.

... But it is not the only source of inequality

'Head-tail' inequality is a common feature of irrigation systems. Farms far from the water source usually receive less water than those close by, and lose out at times of water

Key points:

- Small-scale irrigation can promote rural food security, poverty alleviation and adaptation to climate change. It enables households to generate more income, increase their resilience, and in some cases transform their livelihoods. The poorest households do not benefit much directly, however, and require other support to build up their assets.
- However, small farmers face high costs and risks when entering markets, which severely limit the returns from irrigation. Irrigation has the potential to stimulate rural growth and generate new employment opportunities, but not without parallel investment in market infrastructure.
- Irrigation development should be based on sustainable use of sources which are themselves resilient to climate variability, and schemes need to be proofed against weather-related hazards. Equitable mechanisms for water distribution and benefit sharing are critical.



scarcity. This has a considerable effect on the production of tail-end farms. Many households also report that irrigation committee chairmen distribute water preferentially to relatives and friends, or to chat producers.

Households have different levels of knowledge about improved agricultural practices, and female-headed households in particular are often excluded from training. Farmers also have different attitudes to risk-taking, and some are unwilling to invest in new activities due to high risks in production and marketing. However, some have said that they have learned new skills by watching others or adopted new crops after seeing the benefits to their neighbours, suggesting that farmer to farmer learning is important.

All farmers face serious constraints and risks

All farmers face serious constraints and risks in making a reliable income. Production risks from climate and pests are only partly mitigated by irrigation, and are exacerbated by a lack of improved inputs in local markets. Availability of irrigation water itself is becoming a constraint in some sites, possibly because more farmers have started irrigating than schemes were designed to support.

At market, farmers face low and unpredictable prices for crops because they lack the necessary infrastructure and information to access high-value markets. Most produce in small quantities and have no affordable means of transport, which restricts them to local markets where buyers act monopolistically to set prices. Farmers have little bargaining power as they lack market price information and have no facilities to store crops for sale another day. Rural markets in Ethiopia are thin and the transaction costs of entering are high due to the lack of transport infrastructure. Even if irrigation is in place at community level and successfully increases farm yields, the high costs and risks of marketing severely limit the returns for farmers.

What about those who do not irrigate?

In the communities studied, some households do not irrigate because of the location of their land, and these households have had a mixed experience since the introduction of irrigation. Hiring and sharecropping

arrangements allow cultivation on irrigated land for extra income, and some have constructed their own irrigation ponds after seeing the benefits. Irrigation schemes are being used to water livestock, and in some sites increased local production has created opportunities for trading fruits and vegetables. Some non-irrigators reported that food security has improved because a greater variety of food is available locally, at lower prices, and they are able to borrow cereals from neighbours at times of scarcity. However, some also said that irrigation has reduced their water access and falling crop prices have hit net sellers.

Wider 'second-order' impacts

For poverty reduction at scale, the effects of irrigation on food production and prices, employment opportunities and rural non-farm markets are probably more important than direct benefits to irrigators (Bhattarai et al, 2002). Agriculture is already failing to sustain the livelihoods of millions in Ethiopia who rely on the PSNP, and with increasing populations, declining land holdings, widespread land degradation and the expectation of increased future climate variability, even upgraded agriculture will not offer a way out of poverty for all. Irrigation development could, however, lead to new opportunities for rural households by generating employment opportunities in agriculture, trading and – if increased wealth from irrigation leads to more demand for non-farm products – in a growing non-farm economy.

This has happened in Asia where irrigation areas have become 'nuclei of growth' which attract investment in new infrastructure and services (Hussein and Hanjra, 2004). However this depends upon transport, communication links between rural areas and market centres, the number of people able to irrigate and the demand for labour and non-food products which irrigation creates. These multipliers are weak in Ethiopia and substantial parallel investments will be needed. Returns from irrigation investments depend critically on investments in roads and market infrastructure, yet many of Ethiopia's small-scale irrigation schemes have been developed in areas without road links (World Bank, 2006). More coordinated planning is needed to see growth effects of irrigation, even if this

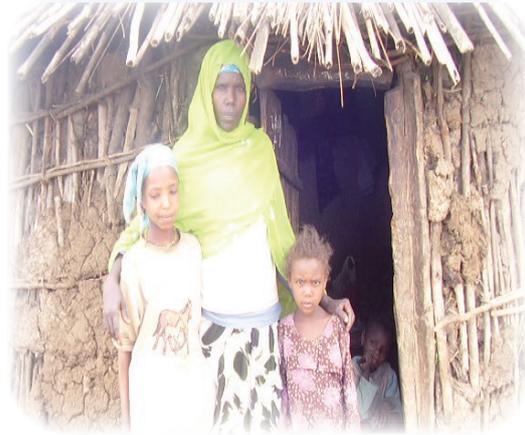
Box 1 Mohamed Abraham Abdulahi



Ato Mohamed Abraham Abdulahi is considered 'better-off' in his community. He has 0.25 ha of land and three adult children who work on the farm. He uses a motorised irrigation scheme to grow vegetables, fruits, chat and coffee for market. He has increased his income four times since he started irrigating. He has to pay for water (ETB 100 (USD 7)² per irrigation session) and inputs such as seed and fertiliser (up to ETB 100 (USD 7) per year) and makes an income of ETB 4500 (USD 324) per year. Irrigation has helped Mohamed to cope with shocks such as drought, and his family is food-secure all year. Source: Eshetu et al, 2010

Box 2 Ashda Abdo

Asha Abdo lives in the same district but is considered 'poor'. She has lost her husband and supports six children, only one of whom is of working age, on 1/8 hectare of land. Asha grows maize and sorghum for home consumption and *chat* for market, earning about ETB 900 (USD 65) per year. To produce *chat* she pays for irrigation water and hires in labour, costing ETB 250 (USD 18) per year. She also pays ETB 500 (USD 36) per year for labour and inputs for sorghum and maize production. Asha cannot afford to harvest *chat* twice per year even though irrigation would make it possible. She has only slightly increased her income using irrigation, mainly because of her small landholding and lack of labour. Source: Eshetu et al, 2010



means prioritising some geographical areas, at least at first.

There is limited evidence of spillover effects to the non-farm economy in RiPPLE's study sites. Expenditure on farm inputs has increased, suggesting that more widespread use of irrigation would stimulate local input markets, if market infrastructure were put in place. Many irrigating households have invested in educating children which could see the next generation move out of agriculture; some of these children already have jobs in towns and send money to their families. However, reinvestment by irrigators into non-farm activities has been very limited. Some households would like to invest in upgrading agriculture or in new ventures such as poultry production, herding or trading, but are constrained by a lack of start-up finance. There is very little credit available in rural areas in suitable amounts for business establishment.

Small-scale irrigation for climate adaptation?

The Government of Ethiopia has identified small-scale irrigation as an important component of adaptation (GoE, 2010). A second RiPPLE study (Kaur et al, 2010) assessed the effectiveness of small-scale irrigation as a climate adaptation intervention in Ethiopia. The study found that small-scale irrigation is a potentially valuable component of adaptation strategies as it increases agricultural productivity and households' ability to cope with climate variability. However, accompanying measures are required to ensure that (a) water sources themselves are resilient to a variable climate and (b) the design is proofed against extreme events. Broadly speaking, boreholes and deep wells are likely to be less vulnerable to the effects of climate variability and change than surface water sources or shallow wells (Calow and McDonald, 2009). However, drilling costs in Ethiopia are high due to the low level of infrastructure development, high failure rates and bureaucratic procedures for private sector involvement (Carter, 2006), and most irrigation is currently supplied by surface water. There is a low level of knowledge about the groundwater resource and little monitoring of groundwater levels, making it difficult to assess the sustainability of abstraction.

It is also critical to develop mechanisms for fair distribution of water, both within communities and between upstream and downstream users. In some study sites water users had developed an informal payment system between communities for use of water; lessons could be learned from such benefit-sharing arrangements, but the potential costs need to be borne in mind.

Policy recommendations

The following recommendations would help ensure that investments in irrigation are equitable, poverty-reducing and have sustainable impact in a variable climate.

Environmental sustainability / climate-proofing

Assess the vulnerability of water sources to climate variability before irrigation development. Assessments should ideally make use of hydrogeological expertise, e.g. from a university; otherwise the reliability of nearby schemes in dry seasons and drought years, as well as the depth of the water source, can serve as a guide. Scheme maintenance or upgrading and parallel soil water conservation measures will enhance water availability. Develop irrigation projects in the context of wider natural resource management planning, considering the sustainability of the water resources being used.

Equitable management

Support the development of accountable, well-trained water user associations/ irrigation committees. These associations need ongoing support, not just one-off training. Support should include the development of by-laws and mediation mechanisms for equitable and accountable distribution of water.

Maximising poverty impacts

Ensure that irrigation development is accompanied by complementary investments in market development, transport infrastructure and communications in rural areas. Without these, irrigation development will bring limited returns and will not generate the desired rural growth. Provide ongoing support for farmers following construction of irrigation schemes. This should include agronomy training, marketing support, and support for management and maintenance of the irrigation scheme. Targeted efforts



Briefing Papers present a summary of key findings and research conclusions from RiPPLE.

Readers are encouraged to quote or reproduce material from them for their own publications, but as copyright holder, RiPPLE requests due acknowledgement and a copy of the publication.

RiPPLE is funded by UKaid from the Department for International Development and the Consortium hosted by Hararge Catholic Secretariat

Contact

RiPPLE Office
c/o WaterAid Ethiopia,
Kirkos Sub-city,
Kebele 04, House no 620,
Debrezeit Road,
PO Box 4812,
Addis Ababa, Ethiopia

t: +251 11 416 0075
f: +251 (0) 11 416 0081

e: info@rippleethiopia.org
w: www.rippleethiopia.org

should be made to include women and female-headed households.

Support farmer-to-farmer learning on both agricultural practices and marketing, e.g. by supporting farmer field schools and farmer organisations. Plans to intensify extension provision and create demonstration centres, proposed in the PASDEP³, should provide opportunities for horizontal learning as well as top-down knowledge dissemination.

Expand provision of credit, microfinance or revolving funds for small-scale business purposes. These will facilitate both upgrading of agriculture and diversification into new activities.

Improve the market power of small farmers. This includes supporting farmer organisations, cooperatives and contract farming arrangements, and installing crop storage facilities to allow bulk sales and reduce post-harvest losses.

Take a strategic approach to designing public works under the PSNP. PSNP works should be targeted to fill critical infrastructure gaps such as access to irrigation, road links with market centres or soil water conservation, based on an assessment of constraints to long-term poverty reduction.

End notes

1 Two are gravity flow systems; one has a motorised component. Two are NGO schemes with 1-200 beneficiary households, one is a government scheme designed for 600 households which has since been improved by a local NGO. In all sites, water distribution is managed by an irrigation committee which received training from the NGO.

2 ETB 1 = USD 0.072 (exchange rate correct 26 July 2010)

3 Plan for Accelerated and Sustained Development to End Poverty 2005/6 - 2009/10

References

- Bhattarai, M., Sakthivadivel, R. and Hussein, I. (2002) Irrigation impacts on income inequality and poverty alleviation: Policy issues and options for improved management of irrigation systems. Working Paper 39. Colombo, Sri Lanka: International Water Management Institute.
- Calow, R. and MacDonald, A. (2009) What will climate change mean for groundwater supply in Africa? Background Note. London: ODI.
- Carter, R. (2006) Ten-step guide towards cost-effective boreholes: Case study of drilling costs in Ethiopia. Rural Water Supply Series Field Note. Nairobi and St. Gallen: WSP-Africa and Rural Water Supply Network (RWSN).
- Eshetu, S., Belete, B., Goshu, D., Kassa, B., Tamiru, D., Worku, E., Lema, Z., Delelegn, A., Tucker, J. and Abebe, Z. (2010) Income diversification through improved irrigation in Ethiopia: impacts, constraints and prospects for poverty reduction. RiPPLE Working Paper. Addis Ababa: RiPPLE.
- FAO (2005) Irrigation in Africa in figures. AQUASTAT Survey – 2005. Water Report 29. Rome: FAO.
- GoE (Government of Ethiopia) (2007) Climate Change National Adaptation Programme of Action (NAPA) of Ethiopia. Ministry of Water Resources and National Meteorological Agency, June 2007.
- Hussain, I. and Hanjra, M. A. (2004) Irrigation and poverty alleviation: review of the empirical evidence. *Irrigation and Drainage* 53: 1-15.
- Kaur, N., Getnet, M., Shimelis, B., Tesfaye, Z., Syoum, G. and Atnafu, E. (2010) Adapting to climate change in the water sector: Assessing the effectiveness of planned adaptation interventions in reducing local level vulnerability. RiPPLE Working Paper. Addis Ababa: RiPPLE, forthcoming.
- Lipton, M. and Litchfield, J. (2003) Preliminary review of the impact of irrigation on poverty, with special emphasis on Asia. Rome: Food and Agriculture Organisation (FAO)
- MoFED (Ministry of Finance and Economic Development) (2006) Ethiopia: Building on Progress. A Plan for Accelerated and Sustained Development to End Poverty 2005/6 – 2009/10. September 2006.
- Ngigi, S.N. (2009) Climate Change Adaptation Strategies: Water Resources Management Options for Smallholder Farming Systems in Sub-Saharan Africa. The MDG Centre for East and Southern Africa, The Earth Institute at Columbia University: New York. 189p
- Reardon, T., Berdegue, J., Barret, C. B. and Stamoulis, K. (2006) Household income diversification into rural nonfarm activities. In S. Haggblade, P. Hazell and T. Reardon (eds) *Transforming the rural nonfarm economy*, Baltimore: Johns Hopkins University Press.
- Smith, L. E. D. (2004) Assessment of the contribution of irrigation to poverty reduction and sustainable livelihoods. *Water Resources Development* 20(2): 243-257.
- Van Den Berg, M. and Ruben, R. (2006) Small-scale irrigation and income distribution in Ethiopia. *Journal of Development Studies* 42(5): 868-880.
- World Bank (2006) Ethiopia: Managing Water Resources to Maximise Sustainable Growth. A World Bank Water Resources Assistance Strategy for Ethiopia. Washington DC: World Bank.

Authors

Josephine Tucker, Research Officer,
ODI

Leulseged Yirgu, Policy Officer,
RiPPLE