Impact Assessment of Small-Scale Pump Irrigation in the Somali Region of Ethiopia

PLI Policy Project
September 2010

Acknowledgements

The assessment team is grateful to all who participated in the impact assessment and made a valuable intellectual contribution to the assessment process. These are the participants of the ABGs from Gode, Kelafo and Mustahil districts; CHF experts namely Mr. Abuboker Haji Ali, Mr. Abdulahi Mohamed, Mr. Mohamed Ahmed, Mr. Issie Ali, Mr. Heys Farah and Mr. Samuel Tesfayethe; irrigation experts consulted in Gode town namely Mr. Teyib Sherif of FAO, and Mr. Dereje Rorisa and Salehu Woldeyes working for the government of Ethiopia on the South Gode irrigation development project; private pump owners Mr. Yussuf Issie and Ismail Mahad in Kelafo; elders and ex-settlers from the Wollo and Gojam area; W/ro Meselu Abebe, owner of Jignoch Hotel who organised the meeting held with onion traders from Somalia in Kelafo; and government employed human health experts consulted in Mustahil town. The team would also like to thank Mr. Solomon Tibebu of CHF Addis Ababa for his support in the design, planning and organisation of the assessment.

Contents

SUMMARY

Gode zone in the Somali National Regional State of Ethiopia is a remote area in the east of the country, characterized by marked under-development and frequent humanitarian crises. In addition, various forms of conflict in and around the zone, including in neighbouring Somalia, have created a very difficult operational context for international NGOs.

The L-SAP project of CHF International was funded by OFDA for one year, in three woredas in Gode zone, and ended in December 2008. The project aimed to improve the household income and assets of targeted poor households through establishing group-based small scale irrigation schemes along the Wabe Shabelle River for the production of food and cash crops. The project established 18 'Asset-building Groups' (ABGs), each comprising at least 50 households. The ABGs were provided with water pumps, fuel, seeds and tools, and training. Each group was to be allocated 25 ha of land, equivalent to 0.5 ha/household for a group of 50 households. The project was assessed in mid 2010, 18 months after the project ended.

Main findings

1. The project areas had a long history of both private sector and government project-based pump irrigation, dating back to the 1960s and in terms of private activities, influenced by experiences from small-scale irrigation in neighbouring Somalia. Many years before the project, communities had evolved locally-appropriate irrigation systems based on *dhulqeyb* (land sharing) or *birgerac (*pump renting). These existing systems – developed to suit the natural and socio-political environment - seemed to have been overlooked during the design of the project.
2. An impact assessment of the project was initially viewed as useful due to the proposed target beneficiaries in Gode woreda being destitute women pastoralists, and the potential to offer an alternative livelihoods option to these women via small-scale irrigation. However, the participants in Gode were all pre-established crop producers and some had experience of pump irrigation dating back to 2001. Similarly in Mustahil and Kelafo woredas, the project participants all had prior and often long experience of pump irrigation.
3. The above findings only became apparent when the assessment team first visited Gode, and highlighted a set of difficult project attribution issues. Attribution was further complicated when in Mustahil and Kelafo, it also became evident that intended beneficiaries were farming as individuals not groups, and had mostly reverted to the well-established *dhulqeyb* or *birgerac* systems. Project pumps in these areas had simply been added to pre-existing pumps provided by private owners and previous projects. The measurement of impact and attribution was further hindered by the lack of verifiable crop production or sales data from the irrigated farms, either in CHF or among the L-SAP project participants.
4. At the time of the assessment in mid 2010, CHF reported that 15 out of 18 of the original ABGs were still functioning. The assessment sampled 13 of the

remaining 15 ABGs, but found that only three were still functioning as groups (both in Gode) and one of these had been linked to another NGO. As noted in point 3 above, all ABGs in Mustahil and Kelafo had reverted to pre-existing individual farming arrangements. It seems possible that in many project locations, local people agreed to form groups mainly to access high-value and freely-distributed project resources such as pumps, spares, fuel, tools and seeds.

5. Of the 25 ha planned for each ABG to cultivate, in Gode only around 5 to 10 ha had been cultivated by the groups. In Kelafo and Mustahil, the land allocated to the ABGs was 'incorporated' by the community and in most cases, allowed them to expand the pre-existing irrigated area. However, the recent floods in Mustahil swamped some of the irrigated plots and reduced the area under cultivation in other former ABG sites.
6. The pump-based irrigation supported by the project produced substantial gains in terms of the volume of agricultural production, and income from the sales of produce, in all three woredas. These trends corresponded with increases in household consumption of produce, and more expenditure on health and education. These findings pointed to an overall benefit to those households which continued to farm, relative to the pre-project period. However, from the perspective of aid investment these benefits have to be compared with the costs of the project, and the increased costs incurred by households (e.g. for fuel and spare parts) for using pump irrigation.
7. Not all project participants maintained their plots, and, local informants described the various risks of crop production and marketing in Gode zone, and associated impacts on harvests. These risks were numerous and included crop diseases, crop damage by wild animals, flooding, wind storms, salinity problems, human diseases, fuel price increases, storage problems, market instability, and conflict.
8. The issues outlined in point 6 above were captured in the cost-benefit analysis for the project in Gode zone. When only the L-SAP project period was considered, the cost-benefit ratio was 1:0.4; if a longer time period was considered, covering three crop plantations, the cost-benefit ratio was 1:0.7. Although the benefits increased over time, as more crops were produced and sold, the costs also increased over time as the water pumps became less efficient, and required more fuel and spare parts. In addition, it was evident that water pumps could be acquired privately in Gode at approximately half the cost of the pumps which were supplied by CHF.
9. The assessment covered various policy and institutional issues related to small-scale irrigation. Of particular relevance was the history of riverine irrigation in Somalia, where minority ethnic groups practicing irrigation were displaced from their land and suffered extreme impoverishment. This displacement occurred when land was appropriated by private commercial companies and later, through the violent actions of more powerful clans. In Ethiopia, although the Rer Barre are associated with the Hawiye clan, they could be considered a minority group. If so, their food insecurity not only relates to the risks of a crop-based livelihood summarized in point 7, but also to the risk of displacement and limited security of land tenure.

Main recommendations

1. Support to small-scale irrigation is a development activity, requiring good initial analysis of the pre-existing systems, and related constraints and opportunities. Constraints are not only technical, but relate to complex social, environmental, policy and institutional issues. A one-year project timeframe is not sufficient either to ensure the success of new irrigation schemes or to assess the results.
2. CHF and OFDA should not directly support small-scale (i.e. one-piston pump) group-based irrigation schemes targeted at poor households but instead, consider how best to encourage the strengthening and appropriate expansion of pre-existing, privately-run schemes. Poor households might then access the private service through a voucher system. As water pumps can be purchased locally in Gode at half the cost of the pumps provided by CHF, the delivery of more free pumps through aid projects is difficult to justify.
3. Technical approaches to be tested include spreading the costs of future schemes by ensuring multiple productive water uses, and, promoting other low-input water technologies such as rainwater harvesting, treadle pumps, etc. that can potentially be used not only for irrigation, but also for rainfed farming.
4. Support and stimulate the private and governmental sectors as appropriate for the supply of and access to the other inputs necessary for the success of irrigated and rain-fed farming, such as agricultural and health extension support, supply chains for farm inputs and credit, improved post-harvest storage, and marketing options.
5. Options in 2 to 4 above require good local analysis with stakeholders. In addition, future projects need to consider risks and how to minimize them. For some risks, such as the control of pests or wild animals, further costs will be incurred which in turn, further question the economic viability of the systems.
6. In the absence of secured land tenure, crop farming remains especially risky for minority groups. This raises the question of how NGOs should engage regional government on land tenure issues e.g. through linkages with the Ethiopia Land Administration Project.

1. INTRODUCTION

Under the 12-month emergency Livelihood Support for Somali Agro-Pastoralists program (L-SAP), funded by the Office for Foreign Disaster Assistance (OFDA), CHF International (CHF) established small scale irrigation interventions along the Shabelle river, in three woredas of Gode zone, in Somali National Regional State. The project set up 18 'Asset Building Groups' (ABGs), with the aim of building household assets through diversifying farm production and increasing income from irrigated crop farming. The project helped to organise the allocation of land to the groups and provided Indian-made Anil water pumps, fuel, farm tools and seeds and training on irrigated farming. The project ended in December 2008.

This report describes an impact assessment of the ABG irrigated farming activities, conducted in July and August 2010. The assessment focused on household income and asset creation, and the performance and the sustainability of the groups since the project ended, with a view to learning lessons to inform the scaling up of similar interventions in future. The assessment also considered the social and environmental impacts of the intervention. Of the 15 ABGs reported to be still functioning at the time of the assessment, 13 ABGs were visited.

The report begins with a short background section on the development of small-scale irrigation generally in Ethiopia (section 1.1), and then describes the CHF project intervention (section 1.2) and the assessment methodology (section 2). The report then gives a brief history of crop farming and the development of irrigated agriculture in the project area, placing the CHF intervention in an historical and geographical context, and describes the results of the impact assessment, including a cost-benefit analysis (section 3). The report ends with a discussion and set of recommendations (section 4).

1.1 Background to small-scale irrigation development in Ethiopia

Large-scale irrigation programs and related technologies are relatively well known in Ethiopia, and the government actively promoted these schemes during the 1970s and 1980s. However, during the 1990s many irrigated state farms were abandoned and investment in large-scale and medium-scale schemes stagnated. At the same time, there was a corresponding expansion of small-scale communal irrigation schemes. Until recently there has been relatively limited government investment in improving these traditional small-scale irrigation schemes or in expanding modern schemes either through providing incentives to encourage private sector involvement, or through government research and extension programs. The government's Water Sector Development Strategy (2002) and Plan for Accelerated and Sustained Development to End Poverty (PASDEP), 2005/6-2009/10 emphasises the importance of irrigation development in stimulating rural economic growth and development, and ensuring long-term food security, and sees the further development of small-scale irrigation and water harvesting, along with agricultural research, as playing a significant role.[1]

Estimates of the potential irrigable area in Ethiopia vary. For the Somali Region, an IWMI (2005) report uses estimates from a 2004 study that suggest a total irrigable potential of 500,000 ha, of which only around 12,000 ha (2.4%) was under irrigation of any kind. Of this, the report estimates only 1,800 ha (15%) to be under modern small-scale irrigation schemes, whilst around 8,200 ha was under traditional small-scale irrigation[2]. Another report suggests that around 265,000 ha of land in the Wabi Shabelle basin is 'very suitable' for irrigation, whilst around 90,000 ha is 'moderately suitable'[3]. Traditional small-scale irrigation schemes can include spate irrigation, controlled or uncontrolled flooding, lift irrigation using buckets or gravity-fed surface irrigation canals. These schemes are usually organised by groups of interested households, sometimes with government technical and material support. The users typically farm small plots of 0.25 to 0.5 ha and produce both food and cash crops[4]. In contrast, modern small-scale schemes may involve the construction of dams, river diversions, the use of water pumps, or sprinkler or drip irrigation systems.

Until relatively recently, the modern schemes depended on the support of government or NGOs, which typically, 'handed over' to water user or management committees once the scheme was completed, sometimes with an expectation of ongoing technical or material support from the government or NGO. These schemes were usually designed with an emphasis on cash crops. What the traditional and modern schemes have in common, and what distinguishes them as 'small-scale' is that they are generally owned and managed by the farmers themselves, on their own land[5].

In terms of government responsibility for small-scale irrigation, in the past the mandate was shared between the Ministry of Agriculture and Rural Development (MOARD) and the Ministry of Water Resources (MoWR). In 2004, the responsibility for irrigation at the federal level was handed over from the MoWR to the MoARD.

The potential benefits of small-scale irrigated agriculture are well known - irrigation can mitigate against rainfall variability and crop failure, allowing farmers to intensify their production by producing two or three harvests annually (rather than one), and increase their incomes through the production of high value cash crops. The potential impact on livelihoods includes higher consumption and better nutrition

[1] The Water Sector Development Program planned to develop an additional 127,138 ha of small-scale irrigation during the period 2002-2016.

[2] Awulachew, S.B. et al. (2005), *Experiences and opportunities for promoting small-scale/ micro irrigation and rainwater harvesting for food security in Ethiopia.* International Water Management Institute (IWMI), Working Paper 98.

[3] Ayele Gebre-Mariam (2005). The Critical Issue of Land Ownership. WP 1 'Governance and Conflict Transformation', Working Paper No. 2, Bern: NCCR North-South.

[4] Awulachew, S.B. et al. (2005), ibid.

[5] Carter, R. and Danert, K. (2006). FARM Africa Ethiopia: Planning for Small-Scale Irrigation Interventions. FARM Africa Working Paper No. 4.

(through crop diversification), purchase of assets such as livestock, and investment in children's education. However, there are also significant challenges and potentially negative impacts including the high cost of inputs (pumps, fuel, agricultural inputs), pests and diseases affecting high value horticultural crops, storage problems and the perishability of some crops, plus transportation and market access problems, and increased labour demands.

The literature on the development of small-scale irrigation in Ethiopia highlights a number of technical, social, management and institutional conditions that need to be in place for the successful, sustainable development of small-scale irrigation schemes. This is discussed further in the light of the assessment findings, at the end of this report (section 4).

1.2 CHF L-SAP Project background

In September 2007, CHF was awarded a Cooperative Agreement from OFDA to implement L-SAP over a 12-month period. The project was an emergency response to the drought of 2006 in agro-pastoral and pastoral areas of Somali Region, and the goal was to, *'To improve the capacity of agro-pastoralists from selected woredas in Gode Zone to cope with shocks and achieve sustainable and improving livelihoods'*.

Within L-SAP, the 'Agriculture and Food Security' sub-component of the project aimed to assist vulnerable agro-pastoral communities in Gode, Kelafo and Mustahil woredas in Gode zone *'to increase and diversify their agricultural production, which will enhance income generation and enable the accumulation of essential household assets.'* This was to be done through helping communities to establish small-scale, pump-based irrigation schemes along the Wabe Shabelle river for the production of maize for home consumption, as well as cash crops – fruit, vegetables and oil crops - for sale. A key element of the intervention was the formation of the ABGs which on a cooperative basis, were to share the project inputs, manage the scheme and share the benefits. These groups were to begin a group savings and loans program with the aim of covering the future costs of pump maintenance and repair, as well to generate capital for other group and/or individual-based income generating activities. In this way, CHF hoped to respond to the emergency and at the same time support vulnerable households to increase their income and assets and thus mitigate the effects of future droughts.

The project gained a three-month cost extension from September 2008, and officially ended in December 2008. After the project, CHF had minimal contact with the ABGs. In September 2009 and before an external evaluation of the L-SAP, CHF were awarded USAID funding for another small-scale irrigation project which would enable them to scale-up the L-SAP approach with new ABGs in all five woredas of Gode zone. An impact assessment was requested as a means of learning lessons from L-SAP that could inform the new project and other government and INGO small-scale irrigation projects in the zone. It also provided a good opportunity to look at sustainability issues almost one and a half years after the initial L-SAP project.

1.3 Project implementation

Following approval of L-SAP in late 2007/early 2008, CHF and the Water and Agriculture Bureaus of Gode zone selected six potential project sites each in Gode, Kelafo and Mustahil woredas for the establishment of 18 ABGs (six per woreda), which would establish an irrigation scheme in their communities. At the same time, CHF negotiated with local clan leaders to allocate 25 hectares (ha) of land close to the river and suitable for irrigation, for each ABG. Each community then selected 50 vulnerable households to be a member of the ABG, with each household using a plot of around 0.5 ha. The criteria for the selection of the ABG members included:

- the level of poverty of the community i.e. the ABG members did not own individual private irrigation plots before and could not afford to buy a pump by themselves;
- the ABG members live close to the area allocated for irrigation and belong to the same sub-clan;
- the ABG members are willing to participate in the project and willing and able to contribute to the purchase of the water pumps;
- the majority of the participants should be female (specific to Gode woreda).

CHF provided each ABG with two Anil-Indian water pumps of one piston capacity, fuel for the first production season, farm tools and 10 quintals of seeds including maize, sesame, onion and tomato, and banana plants. Details of the inputs provided are shown in Annex 1. The project also conducted a number of trainings e.g. in irrigated agriculture, in nursery establishment, savings and credit etc.

Each group was asked to make an initial contribution of ETB 50 per member (total of ETB 2,500 per ABG) to set up an 'operations and maintenance' (O&M) fund, in addition to a monthly savings contribution of around ETB 3 per member, which was to cover the salary of the pump operator. However, because of the short project time frame and CHF internal staffing constraints, the planned savings and credit programme did not materialise and the ABGs made their own arrangements for covering these costs[6].

[6] Information provided by senior CHF management staff.

2. ASSESSMENT METHODOLOGY

The assessment was based on two main activities. First, a field assessment was designed with CHF to examine the performance of the irrigation schemes and related issues. Second, economic analyses were conducted which in part, drew on data collected in the field.

2.1 Field assessment design

The initial design of the study was based on information provided by CHF and an understanding that the ABGs differed both in their locations and in the participants' main sources of livelihood prior to the project. Therefore, two main clusters of ABGs were identified in initial meetings with CHF:

i. Gode ABGs, made up of impoverished ex-pastoralists, largely women.
ii. Kelafo and Mustahil ABGs, formed predominantly by members of the *Jirir* tribe[7] who traditionally, depended on crop farming for their livelihoods.

However, during the early stage of the field work the authors noted that the Gode groups were predominantly agro-pastoralists, who were permanently settled and who had conducted rain-fed crop farming in the area for many years. As a result, the ABGs were re-classified based on the three separate locations, as Gode, Kelafo and Mustahil ABGs.

Based on discussions with CHF senior management and program staff, the study was designed around six key questions relating to the potential livelihoods impact of the irrigation intervention and the implications for scaling-up. Indicators were developed around each of these questions, leading to the development of a set of participatory tools to measure the indicators.

Key question	Indicators
• What was the household-level livelihoods impact of the intervention? • How sustainable is the intervention, both in terms of the sustainability of the ABGs and the irrigation scheme? • How did the formal or informal policy and institutional environment assist or constrain the project, for example in relation to clan, land access or trade issues? • What are the main opportunities and constraints around marketing of ABG produce, for the existing groups and for new groups? • What are the implications for scaling up in relation to organisational technical capacities?	• Household income from irrigated farming; uses of income obtained • Functioning and performance of the ABG groups post-project, without any external support • Cost of inputs deployed (by project) and value of produce sales from irrigated farming • ABG utilisation of project inputs provided • Land use/access arrangements, changes in land use • ABG access to markets (internal and cross-border trade); • Documented good practice and key lessons for improved program delivery and policy making.

[7] In the literature, this group is known as the *Rer Barre*, farmers of Bantu descent who are associated with the Hawiye clan in Gode zone.

The assessment collected data from two main areas viz. project areas and non-project areas.

Project areas - primary data was collected as follows:

- individual household interviews with ABG participants to capture perceptions of impact at the household level;
- focus group discussions with ABG members to capture information related to group performance, and the costs and benefits of the irrigation scheme, as well as to triangulate the data from the individual interviews;
- key informant interviews with,
    - elders and religious leaders from the sampled communities to identify changes in community wealth status;
    - irrigation experts involved in the design and implementation of irrigation programs in Gode zone.

  These interviews were also used to triangulate data from the individual and focus group discussions.

Non-project areas - secondary data was collected from non-project sites and from discussions with key informants in Gode town.

2.1.1 Assessment areas

The CHF intervention area comprised riverine areas of Gode, Kelafo and Mustahil woredas in Gode zone, Somali Region (Figure 1).

Figure 1. Map of Somali Region, Ethiopia, showing CHF project woredas

Source: UNOCHA Ethiopia

2.1.2 Sampling method and sample sizes

L-SAP reports and CHF staff confirmed that the performance of the ABGs differed by location and therefore the geographical sampling was stratified to cover all three woredas – Gode, Kelafo and Mustahil. CHF informed the PIA team that three of the Gode ABGs were no longer functioning, that one of the Mustahil ABGs was inaccessible due to flooding, and that one of the ABGs in Kelafo was not secure enough to visit[8]. Therefore, 13 operational ABGs (with 650 registered members) were included in the assessment.

- In Gode, all three of the reported functioning ABGs were selected and households for individual interview were randomly sampled from these AGBs, using a list provided by CHF.
- In Kelafo and Mustahil, a random stratified sampling approach was used to identify both the sample sites for the focus group discussions and the households for individual interview within each assessment woreda. The sampling frame was derived from the lists of ABG sites and household participants of the ABGs established by CHF in each assessment district.

Individual household interviews were held with a total of 104 households (16% of the 650 registered members). Focus group discussions (FGDs) were held in 8 of the operational and accessible ABGs at the time of the assessment. Both the household interviews and the FGDs were pre-arranged by the CHF field staff and were mostly held at, or close to, the ABG irrigation sites[9].

It should be noted that when first visiting the field, it became evident that the ABGs in Kelafo and Mustahil were no longer functioning as groups.

Table 1 Distribution of sampled ABGs

Woreda	**Number of ABGs**			**Number of household interviews**		**Number of focus groups**
	Established 2008	Reported as functional 2010	Assessed 2010	Female	Male	
Gode	6	3-4	3	35	0	3
Kelafo	6	6	5	21	15	3
Mustahil	6	6	5	15	18	2
Total	18	15	13	71	33	8

<u>Gode</u> - All of the Gode ABGs, including those classified as 'non-operational' were visited. Bardo-quorah was visited for the pre-test and was found to be partially functioning. The team visited Dabaldag and Dud-ade for the collection of secondary data and found that both of these ABGs disbanded prior to the first harvest.

[8] CHF staff had not been able to visit this site since the project started for security reasons.
[9] The Qonlawe ABG was not accessible and the interviews were conducted at the Danyere ABG site.

Kelafo - In Kelafo, the Luqdhere ABG was excluded because of ongoing security problems.

Mustahil - In Mustahil, the Ibad-badi site was excluded since it could not be accessed because of floodwater remaining from the severe flooding of March and April 2010. A field researcher visited all of the other sampled sites except Qonlawe in Mustahil, which was also inaccessible because of flooding.

2.1.3 Data collection methods

The assessment was conducted by Tufts University from July 13 to August 4, 2010. One member of the assessment team spoke the Somali language.

Individual household interviews - were conducted using semi-structured interviews and were structured around a standardized set of exercises using participatory methods, particularly 'before' and 'after' proportional piling. These tools were used to capture perceptions of change in overall household production and the proportion of total production obtained from farming in 2007 i.e. before the project established the ABG irrigated plot, and in 2010. The same tool was used to capture perceptions of change in the relative proportion of farm production that was consumed (by humans or livestock) and sold, as well as to identify changes in the uses of the income derived from produce sales, particularly the proportion spent on farm inputs.

Focus group discussions - were conducted with ABG participants at 8 ABG sites (Table 1). The focus group discussions were held with ABG members other than those involved in the individual interviews. The discussions were primarily used to capture quantitative and qualitative data relating to the ABG's performance and achievements since the start of the L-SAP project, including data on the inputs received from CHF and the use of these inputs, the costs incurred and benefits obtained from the irrigation scheme to date and any challenges faced by the group. A timeline was developed with each group to define the project's temporal boundaries and to understand the history of rain-fed and irrigated farming activities in their respective areas.

Key informant interviews - were held with elders at the Gode ABG sites. These were structured around a 'before' and 'after' proportional piling exercise to capture and explain any changes in community wealth classes between 2007 (pre-project) and 2010. Key informant interviews with government and INGO irrigation experts consulted in Gode town provided useful information on irrigation program interventions in south Gode by government and aid agencies since the early 1960s.

Secondary data - was derived from the literature and key informant interviews and community discussions as well as direct observation during field visits to the three 'non-operational' ABG sites in Gode and through site visits and/or informal discussions with ABG participants in the five 'non-FGD' sites in Kelafo and Mustahil.

Table 2 Summary of participatory methods

Method	Use/issue	Sample
Before and after proportional piling	To measure: • relative changes in overall HH production • relative changes in HH production derived from farming • relative changes in proportion of farm production consumed and sold • relative changes in uses of HH income derived from farm sales • relative changes in the proportion of time spent on farm activities • relative changes in wealth, assessed in terms of receipt or payment of *zakat*	104 households
Focus group discussions	To collect: • qualitative perceptions of the impact of the CHF inputs • quantitative data on the number and type of plantations and estimates of the yield and cash income obtained since project start • data on changes in the size and gender composition of the ABG and the size of land holdings since project start • crop preference rankings for irrigated crops • qualitative information on the challenges encountered with the project and irrigated farming activities generally	8 groups
Key informant interviews	To: • measure relative changes in community wealth classes between 2007 and 2010, and reasons • collect technical information and timelines relating to irrigation program interventions in south Gode	Gode ABG site Various
Semi-structured interviews	Used with all methods to cross-check information and clarify responses	

2.1.4 Pre-testing

Field testing of the data collection tools was done on July 14 to 15, 2010. The FGD pre-test took place at Bardo-quorah, one of the sites identified by CHF as non-operational. During this visit the team identified that the Gode ABGs were not 'ex-pastoralists' but were from well-established, settled communities, with a history of engaging in rain-fed and irrigated farming. The pre-test of the household interviews was done at the Barsan ABG site. Following the pre-tests, the research team revised the tools and finalised the data sheets.

2.1.5 Triangulation

Prior to the field work, one of the research team members reviewed the project field and donor reports and ABG production data provided by CHF. This included data on the amount and type of crops harvested and area planted by ABG for the first production season. During the field work, documentation in the Gode, Kelafo and Mustahil field offices was used to match project service delivery and inputs with the outputs and impact captured during the assessment. Unfortunately, CHF records were incomplete and since the ABGs did not have any written records of inputs received, expenditure or crop production data, the study team relied on oral reports from the FGDs to cross-check this data. The CHF production data could not be verified by these oral reports and did not match with technical data relating to the capacity of the pumps, the area irrigated, the number of irrigations required per crop or with crop yield data for the area.

Other resource documents that were used for triangulation were the Save the Children UK/DPPC Livelihoods Profiles (2008) for Somali Region, particularly the Shabelle Riverine Livelihood Zone. Focus group discussions and key informant interviews were also used to triangulate the data collected during the household interviews. This was done by collecting more qualitative data on project impact, and comparing the perceptions of the FGD participants with the more quantitative perceptions captured in the household interviews. Finally, the assessment team held discussions with CHF management and field staff before and during the assessment, and during a feedback meeting at the end of the assessment in the Gode field office.

2.1.6 Data analysis

All the quantitative data from the household interviews was analysed using SPSS in PASW Statistics 18 and Microsoft Office Excel version 2007.

2.2 Economic analyses

This component of the study focused on a cost-benefit analysis (CBA) of the CHF irrigation activities under L-SAP. The analysis used:

- Data provided by CHF on project costs, including materials inputs such as water pumps, spares, fuel, seeds and farm tools, and operational costs such as staff time, travel, per diems and organizational overheads.
- Data collected from the field on crop production and sales, and costs incurred by farmers and agro-pastoralists.

As explained in later sections of the report, the CBA was restricted to Gode, where relatively better production and sales data was available, and where project attribution was less affected by various private sector activities around irrigation, and other projects.

3. ASSESSMENT FINDINGS

3.1 Background information on crop farming along the Wabe Shabelle River

3.1.1 Traditional land management and livelihood systems

The Wabe Shabelle riverine area passes through Gode zone. Approximately 95% of the zone is grazing land, while the remaining 5% is arable. Of the arable land, around 20% was under cultivation in mid 2008, mostly using irrigation along the river. The rural population of the assessment woredas make up around 65% of the rural population of the zone, with around 52% of people living in the Shabelle riverine area[10] .

Table 3 Population of assessment woredas

Woreda	Rural population	Population in riverine area
Mustahil	53,227	37,259
Kelafo	88,156	61,709
Gode	95,647	23,912

Gode zone, and particularly Gode woreda is among the most drought-affected pastoral areas in Ethiopia. At the same time, the communities located in the low-lying areas along the river in Mustahil and Kelafo are also affected by regular flooding caused by heavy rainfall in the highlands. The floods destroy crops and livestock, but also provide an opportunity to practice flood recession agriculture.

The people in the rural areas are a mix of crop farmers and pastoralists who make their livelihoods largely from crop farming and livestock rearing respectively. The pastoralists tend cattle, camels, small ruminants and donkeys through seasonal movements between the wet season grazing areas in the interior and the dry season grazing areas along the Shabelle river. The farmers depend mainly on growing maize, produced under gravity or pump-fed surface irrigation along the river banks[11], and sorghum which is traditionally grown in the two rainy seasons – the main *gu* rainy season and the shorter *deyr* rainy season. These farmers also have small herds of cattle, small ruminants and donkeys, which they use to transport produce to local markets and for collecting and transporting firewood.

Along the Shabelle river, farmers also use irrigation to produce cash crops such as sesame and onion, usually on relatively small plots of land (0.5 to 5 ha) very close to the river where irrigation is easier. However, because of the hot, dry climate even farmers practicing irrigated agriculture tend to focus production in the rainy seasons, either because traditional gravity-fed irrigation channels are full and it is easy to irrigate using buckets, or if they are using pumps, because they can save on the cost

[10] Save the Children UK and Disaster Prevention and Preparedness Agency (2008); Livelihoods and Vulnerabilities: An understanding of livelihoods in Somali Regional State, Ethiopia, Updated version, June 2008, Addis Ababa, Ethiopia.

[11] Gravity irrigation can be used where the river is embanked; where riverbeds are deep, pumps are needed; farmers also plant maize and sorghum in riverbeds.

of fuel. The dry season (*hagay*) is also known for strong winds that create dust and sand storms making farm work difficult and covering crops. In Kelafo and Mustahil woredas, regular flooding allows farmers to engage in uncontrolled or controlled (i.e. using channels or pumps) flood-recession production of staple crops further back from the river. Although yields can be good, flood-recession farming is risky as floods can return before the crops are harvested.

Other economic activities, particularly for poorer households include the sale of charcoal and firewood and grass for thatching and for livestock feed, as well as farm labour.

As in other parts of the region, in all of the areas covered by the assessment, land use and access is collectively managed by the clan and sub-clan lineages occupying the area. Clan members have the right to fence land and conduct irrigated farming and there is no limitation on the amount of land that any household can use. However, the clan has the right to redistribute the best land e.g. the land closest to the river that is easier to irrigate, amongst its clan members at any time. This could include the plots of individuals already involved in irrigated farming at the time of the redistribution. Non-clan members who intend to conduct irrigated farming must get permission from the clan that owns the land.

While Gode woreda is dominated by the Ogadeni clans, Kelafo and Mustahil woredas are a mix of Ogadeni and Rer Barre groups. In these areas, pastoralists and crop farmers differ either by tribe or clan and inter-ethnic conflicts often break out, affecting the livelihoods of both groups. The farmers are mainly *Jirir* from the Rer Barre ethnic group, while the pastoralists in the area are mainly *Jile* from the Ogaden and Hawiya ethnic groups[12]. The traditional dry season grazing areas of the *Jile* pastoralists include lands used for irrigated crop farming in the Shabelle riverine areas. Conflicts arise as pastoralists attempt to access potential dry season grazing land and livestock water points and damage crops, either accidentally through livestock escaping to fields close to the roads leading to the water points, or intentionally by pastoralists releasing livestock into the farmers' crops. Although these conflicts are sometimes violent, there are also traditional processes of cooperation and exchange relations which prevail between the pastoralist and farming/ agro-pastoralist clans[13]. Issues around land ownership and user rights over land used for irrigated farming also cause conflict between the Ogaden and Rer Barre and the Hawiya and Rer Barre tribes in areas where both the *Jile* and the *Jirir* conduct irrigated farming.

[12] *Jile* and *Jirir* are Somali names given to Somalis with 'soft hair' (from the Ogaden/Hawiya tribes) and 'hard hair' (from the Rer Barre tribe) respectively.
[13] Ayele Gebre-Mariam (2005), ibid.

3.1.2 The development of irrigated agriculture in south Gode

South Gode refers to the Shabelle riverine area south of Gode town through Kelafo and Mustahil woredas to the border with Somalia. West Gode refers to the Somali regional government irrigated farm west of Gode town. Figure 2 summarises irrigation-related research and development work conducted in south Gode by the government and NGOs since the 1960s.

Figure 2 Timeline of major irrigated farming related events in south Gode

Time	Key event
1960s	• Under Haile Selassie's government, Alemaya College of Agriculture opened a research centre in Gode with the main objective of assessing the possibility of using the Wabe Shabelle River for large-scale irrigated crop-farming. • The impact of the research centre included the initiation of crop farming in the Wabe Shabelle River basin and the initial design of large-scale irrigation programs in south Gode, later developed by the EPRDF and Derg governments. • Local Somali farmers in Gode produced food crops, mainly maize and sorghum, through rain-fed farming and fruit such as papaya and lemon using irrigated farming methods, with the technical and material support of the Gode research centre.
1970s	• Following the 1972-74 drought, pastoralists were settled on around 1,000 ha of irrigable land. • During the Ethio-Somalia war in 1977, the Somali crop farmers migrated to Somalia and their land was taken over by the Derg government. The government's motto was 'we produce while fighting'. • Consequently, a gravity-based irrigation scheme was designed with the aim of building a dam at west Gode[14] and a series of canals to enable the development of a large-scale irrigation program for south Gode, Kelafo and Mustahil; this was known as the south Gode irrigation program. • In 1979, through its Relief and Rehabilitation Commission, the Derg government brought settlers from Wollo and Tigray to south Gode. The settlers started producing food crops through a pump-based irrigation scheme at selected sites such as Welwel and Barsan.
1980s	• In 1980, the Derg established the south Gode state farm at Welwel, Gelewage, Barsan, Gudare and Bedled. • In 1981, the RRC transferred the responsibility of managing the south Gode irrigation program to the Awash Irsha Limat Corporation, which established the Gode Irsha Limat project.
1991	• The Gode Irsha Limat project hired settlers from Wollo and Tigray and started pump-based irrigated production of cotton and fruit such as banana and papaya. This program ended with the fall of the Derg regime in 1991.
1991/2	• Returnees from Somalia claimed their land that had been converted into the state farm, now occupied by the settlers.
1992/3	• The EPRDF transitional government established a committee under the prime minister's office to handle issues related to claims on the state farm land by the Somali returnees and the settlers. The settlers were returned home.
1994	• The EPRDF government announced a new development motto 'self-sufficiency in food crops'; the Gode state farm was transferred to the Somali Region Livestock, Crop and

[14] This site was used for the dam built under the west Gode irrigation project designed for settlers by the EPRDF government in the early 2000s.

	Natural Resources Development Bureau (LCNRDB).
1995	• The LCNRDB launched an irrigation project designed for returnees from Somalia with claims to the previous state farm. Water pumps of 4 piston capacity were installed at Gelewage (421 ha), Barsan (400 ha), Bedled (596 ha), Gudare (428 ha) and Iskasheto/Welwel (118 ha) to be used by a total of 2,259 households. Each household was given up to 1 ha land mainly for maize production on an individual basis, but using state -owned tractors. Project beneficiaries contributed 500 ETB per household per cultivation period for fuel and running costs until the Ogaden drought of 1999.
2000	• As a response to the drought, the government of Somali region decided to cover the fuel cost for the pumps for the irrigation project; however, the area of land planted to maize started shrinking, mainly because of the lack of budget for pump and tractor maintenance costs.
	• CCM, an Italian NGO, implemented a food/cash for work program for the construction of canals for a gravity-based irrigation scheme in Kelafo and Mustahil[15].
2001/2	• The Pastoral Community Development Project (PCDP) was launched by the federal government in collaboration with the government of Somali region on a pilot basis in selected woredas and kebeles; inputs delivered included water pumps of 4 piston capacity, fuel, seeds, farm tools, and running costs delivered via the concerned government bureaus.
2006	• The PCDP phased out and farming activity was interrupted mainly due to problems related to pump spare parts and maintenance costs.
2007/8	• The International Committee of the Red Cross (ICRC) distributed pump spare parts to individuals and groups using pumps in Gode, Kelafo and Mustahil.
2008	• CHF launched the L-SAP project, to promote small-scale irrigated farming in Gode, Kelafo and Mustahil; they organised ABGs in selected villages and provided inputs including water pumps of 1 piston capacity, fuel and seeds for the first cultivation period and farm tools. The project ended in Dec. 2008.
2008/9	• The Wabi-Shebele Development Association (WASDA) implemented a food/cash for work program for canal construction for a gravity-based irrigation scheme in the Kelafo area.
2009	• The Somali Regional government launched a new irrigation project at Barsen and Iftin for 800 households; 2-piston capacity water pumps and running costs including fuel were provided by FAO. The project failed immediately after the first cultivation period mainly due to management problems.
2009/10	• Save the Children US established new ABGs in selected villages in Gode woreda where L-SAP used to operate; inputs included small water pumps of 1 piston capacity, fuel and seeds (mainly onion) for the first cultivation period and tools.
2010	• Severe floods destroyed irrigated crops in the Mustahil area.
	• Currently, the south Gode irrigation development project provides technical advice to individuals involved in small-scale irrigated farming using private pumps of 1 piston capacity.

In all of the areas targeted by the various irrigation projects over the years, some of the ex-project beneficiaries have continued with irrigated farming using privately-owned pumps. The pumps are usually brought in as contraband goods from Somali and are used either on a *dhulqeyb* (land sharing) or *birgerac (*pump renting*)* basis[16]. Under *dhulqeyb*, in exchange for the use of the pump the landowner gives the pump owner free use of half of the land to be irrigated by the pump. In this case, the pump

[15] Participants of this scheme indicated that gravity-based irrigation requires a two to three year period to become functional, depending on the water levels in the Shabelle River.

[16] A one-piston pump brought from Somalia costs around ETB 9,000 to 10,000. The CHF pumps cost ETB 19,000, since the CHF head office requires inputs to be purchased from a licensed supplier.

owner is responsible for oil and pump maintenance costs, while each party is responsible for the fuel and labour inputs required for cultivating their respective plots. This system is limited to the fertile lands located nearer the river that are used for cash crop production.

Under the *birgerac* system, the pump users arrange their own fuel and also pay 10-12 ETB per hour for the pump during the cultivation period. Under this system, the pump user pays 50% of the pump running costs per cultivation (ie. fuel and the hourly payment) to the pump owner after the harvest; the pump owner also receives land from the land owner for free. On average, it takes a small pump of one-piston capacity around 16 hours to irrigate one ha of maize[17]; since maize normally requires four rounds of irrigation over a four to five month cultivation period, the pump user could end up paying around ETB 640 to ETB 960 per ha of maize, plus fuel costs. Annex 2 shows the number of irrigations normally required per crop per cultivation period. The farmers form cooperatives, known as *ishkasheto* to collectively use water pumps that belong to individual investors.[18]

The availability of private pumps for rent has been steadily increasing, particularly since the demise of the government-run irrigation projects. In Kelafo and Mustahil particularly, increasing numbers of farmers and traders from Somalia are joining local farmers in the irrigated production of cash crops, mainly onion, to meet the increasing market demand in Somalia. This is partly due to the impact of Al-Shabab on farming activity in Somalia; many of these farmers left Somalia either because their land was returned to its original owners by Al-Shabab, or to escape the stringent *Sheriya* system. According to cash crop traders in the area, mainly women from both Ethiopia and Somalia, one of the reasons for the increased trade is the improved security imposed by Al-Shabab, and the removal of checkpoints (*isbadho*) in the areas that it controls, including Baladweyn. Truck owners interviewed by the field researcher said that Al-Shabab charges a 'reasonable' amount of tax and this, together with removal of the check points, has allowed an increase in the trucking of cash crops from Kelafo and Mustahil for the Somali market. As a result, the demand for onion has increased and the price has gone up from 160 ETB/quintal (100 kg) in 2009 to 450 ETB/quintal in July 2010, for a standing crop in the field. Although the price of onion in the Jijiga and Dhegahbur markets in Ethiopia is 15 ETB/kg (1,500 ETB/quintal), access to these markets has been blocked since around 2005, when the Somali regional government blocked the road to deny the ONLF access to income (*dheqala*) from taxing the Somali trucks on the trade route.

3.1.3 Traditional crop farming practice

As already mentioned, irrigation is generally limited to the lands located close to the river where farming with either a gravity or pump-based surface irrigation system is easier. Otherwise, flood recession and traditional rain-fed farming are practiced. Rain-fed farming is dependent largely on the rainfall from the Hararghe and Bale

---

[17] Estimated from manufacturer specifications, and cross-checked with ABG members and private pump owners.
[18] Ayele Gebre-Mariam (2005), ibid.

mountains to the north and west that determines the level of the Wabe Shabelle River. Generally, the major crop plantation seasons happen twice per year towards the end of the *deyr* and *gu* rainy seasons. The *deyr* plantation is dependent on the short *belg* rains in the highland areas to the north-west and particularly on the flood water which comes from the northern part of the Somali region and adjacent eastern Hararghe areas, which is used during the *jilal* dry season. The *gu* plantation largely depends on the flood water from the long *kremt* rains in the Bale mountains, which is used during the *hagay* dry season.

Farmers from the area believe that the flood water from the *belg* rains via the northern part of Somali region is not good for crops while the flood water from the Bale Mountains produces healthier crops. This perception coincides with the relatively higher incidence of crop failure encountered in the *jilal* season than in the *hagay* season, as reported by the ABGs. Although this needs to be further investigated, the general understanding is that the concentration of salt is higher in the flood water which comes from the Somali region compared with the flood water from the Bale Mountains. If true, salinity could contribute to crop failures encountered by the ABGs mostly with the *jilal* plantations (see below).

3.2 The L-SAP irrigation project findings

The project timeline is shown in Figure 3 with other key events in the area.

Figure 3 L-SAP project timeline

Date	Project events	General
2006		Poor *gu* and *deyr* rains
Sept-Oct 2007	L-SAP funding approved by OFDA, Regional agreement signed	
Oct-Dec 2007	Recruitment and induction of L-SAP staff; technical training of staff;	Poor *deyr* rains, drought
Jan-Feb 2008	Site identification; ABG formation and beneficiary selection; technical training and signing of MOUs with ABGs; purchase of 36 pumps	Adoption of distress coping mechanisms (slaughter destocking); migration to river areas; livestock deaths.
Mar-Apr 2008	Land preparation; Training of ABGs in irrigated farming and nursery establishment; distribution of seeds and tools	Poor *gu* rain; Hyper-inflation of staple food prices
May-Jun 2008	Distribution of water pumps (2 per ABG); Distribution of fuel to ABGs for first round of irrigation	Poor *gu* rain; livestock deaths
July-Sep 2008	Refresher training & supervision of ABGs; 3 months no-cost extension approved	
Nov 2008	L-SAP field staff's contracts ended	Poor *deyr* rain
Dec 2008	Official end of L-SAP	

3.2.1 Operational status of ABGs

The L-SAP project was implemented in a total of 18 kebeles across the three woredas i.e. 6 kebeles each in Gode, Kelafo and Mustahil. The number of ABGs established by CHF in 2008 and their current status are shown below.

Table 4 Operational status of ABGs, mid 2010

Woreda	ABGs established 2008	ABGs reported as functional 2010	Actual status in mid 2010
Gode	6	3-4	Three ABGs still functioning on a group basis. • Barsen and Ilan ABGs are still operating as a group, but were struggling to cover the costs of pump repairs and fuel. • Dud-Ade and Dabaldeg ABGs were disbanded in 2008. • Bardo-quorah ABG was linked to SCUS. • Bahktiley ABG members were not farming as a group.
Kelafo	6	6	No ABGs still functioning as groups - the Kelafo ABGs were incorporated into various privately and community-managed irrigation schemes using a mix of CHF, private and government pumps that serve individual plots.
Mustahil	6	6	No ABGs still functioning as groups – as above, the Mustahil ABGs were incorporated into various privately and community-managed irrigation schemes using a mix of CHF, private and government pumps that serve individual plots. Because of recurrent floods, farmers are practicing flood recession farming rather than using pumps.

Gode - of the 'non-operational' ABGs in Gode:

- Bardo-quorah was still functioning, at least in name. Following the breakdown of the CHF pumps in 2009, this ABG could not afford to pay for spare parts and instead purchased a subsidised pump from the government. The group said that they have been operating at a loss and were renting a donkey cart[19] to transport firewood to Gode, which they sold to cover the costs of fuel. They requested support for fuel and spare parts. One of the reasons originally given for the disbandment of the group was that since the close of L-SAP, Save the Children US (SC US) has established a new irrigation scheme in the area, which included many of the former Bardo-quorah ABG members. Although this could not be fully

[19] Half of the sale proceeds were paid to the cart owner.

ascertained, on visiting the site it appeared that some of the former ABG member households may be supported by the SC US project.

- Dud-Ade and Dabaldeg ABGs both disbanded in 2008.
    - In the case of Dud-Ade, the ABG planted maize on 25 ha of land and received an initial two barrels of fuel (400 litres) from CHF, which they used for the first round of irrigation. The group were expecting to receive an additional nine barrels (1,800 litres)[20] from CHF but this fuel was reportedly sold in Gode town before it reached the group, and the ABG subsequently dissolved. It is not clear who sold the fuel - according to CHF staff, the ABG participants were farming on an individual rather than a group basis and therefore it was difficult for them to hold either the ABG committee, the kebele administration (or CHF) accountable for the loss of the fuel.
    - In the case of the Dabaldeg ABG, the site chosen for the ABG irrigation scheme was a previously uncultivated site, close to the west Gode irrigation project. When the assessment team visited, most of the community members had left the village to become registered as settlers with the west Gode project and there were no signs of any irrigation equipment at the site. The group disbanded before the first plantation for reasons that are unclear. However former ABG members suggested that the site was not suitable for farming. Although the Tufts team did not have time to investigate further, there may also have been some misuse of fuel in Debaldeg[21].

Kelafo and Mustahil - in Kelafo and Mustahil all of the ABGs were reported by CHF as still being operational. However, these communities were already involved in irrigated farming using private water pumps well before the formation of the ABGs by CHF. The CHF pumps delivered to the Kelafo ABGs were 'pooled' with the other pumps already being used by the community, and enabled the community to expand and intensify irrigated farming in the area. The ABG pumps and land have effectively been incorporated into the various ongoing irrigation schemes in the community, although the ABG participants, like others in the community, are conducting irrigated farming on an individual, rather than a group basis. In most of these areas, the CHF pumps have been handed over to individuals selected from the former ABG members. In Mustahil, because of the recurring floods, farmers are practicing flood recession farming, rather than using the pumps.

3.2.2 Group membership and land status

The project was targeted at 50 households per kebele and the CHF list of registered ABG participants indicated a total of 900 direct beneficiary households. As soon as

[20] Note that CHF records in the Gode field office showed a total of three barrels of fuel (600 litres) being delivered to the Gode groups.
[21] Note that misuse of fuel was also reported in one of the non-sampled ABGs in Kelafo.

the project started, many of the groups voluntarily included additional, non-registered, ABG members who they felt met the selection criteria. All of the Gode ABG members were female (except the chairman of the Barsan group), as per the CHF selection criteria. Between the end of the project in December 2008 and the time of the assessment in July 2010, there were further changes to the group membership. For example, in some groups (Bakhtiley in Gode, Qufdhaley Kincho in Kelafo) members left the ABG or the village because of economic problems. However, because of the changes in most of the groups' mode of operation from farming as a group to farming as individuals on a private basis, as explained above, it was not possible to give accurate figures of current ABG 'membership'.

With regard to the land cultivated by the ABGs, the project was planned on the basis of 25 ha per ABG, equivalent to 0.5 ha per household, and CHF negotiated with clan leaders to allocate land to the ABG on that basis. During the FGDs in Gode, the research team found that only around 5 to 10 ha had been cultivated by the groups. This was supported by the groups' accounts of the amount and types of crops produced and sold, as well as by direct observation at the sites. In Kelafo and Mustahil, as mentioned above, the land allocated to the ABGs was incorporated by the community and in most cases, allowed them to expand the irrigated area, although this could not be verified by the site visits. However, the recent floods in Mustahil swamped some of the irrigated areas and reduced the area under cultivation in other former ABG sites, for example God-aro. Again, it was not possible to accurately estimate the area of land currently under cultivation by (former) ABG members.

3.2.3 Production histories

Although in theory irrigation means that crops can be planted outside of the main rainy seasons, in practice farmers in the area stick to these seasons since they can reduce the amount of water that needs to be pumped from the river thus reducing the amount of fuel they need i.e. they practice supplementary rather than full crop irrigation. In the dry, windy *hagay* season (July to September), crops need more water and farmers are reluctant to plant. The CHF pumps were delivered nine months into the L-SAP project and three months before the original project end. This timeline corresponds with the oral histories told by the FGDs, which indicate that there have been four potential production seasons for maize since the ABGs were formed until July 2010[22].

The timelines below, based on focus group discussions, summarise the history of the ABGs assessed in Gode, Kelafo and Mustahil. As mentioned above, the CHF production data for the 2008/09 cultivation season could not be verified, and the groups themselves did not have any documented production records. Therefore, the production data is based on the FGD discussions with the groups. While the Gode

[22] At the time of the assessment in July 2010 the Tufts team noted that pumps for the USAID-funded SHAPE project had just arrived in Gode town, eight to nine months after project start-up and four months before the official project end in November 2010 (i.e. missing two potential production seasons).

ABGs were able to provide aggregated production data for the group, in Kelafo and Mustahil, where farming was individually based, it was not possible to obtain estimates of the total production of the ABGs.

a. Gode

Information on the histories, activities and impacts of the three ABGs visited during the assessment is provided below.

Barsen

1991 Barsan village created by returnees from Somalia.

1997 25 women raised funds to start crop farming and received 25 ha of former *Derg* state farmland.
They produced vegetables using bucket irrigation, and rain-fed and flood recession maize.

2001 -2007 They purchased a 1 piston capacity pump and started irrigated farming.
They did not make a profit because of the high running costs of the pump.

2008 CHF re-organised them into the ABG together with another 24 women and a man (ABG chair) from the village. They received 2 Indian Anil water pumps of 1 piston capacity, 3 barrels of fuel (600 litres)[23], 10 quintals of seeds and various farm tools[24]. They added an additional 6 ha of land.
1st cultivation - ABG members shared 50 quintals of maize between them i.e. 1 quintal per person. The rest of the produce was sold and saved for fuel and spare parts for the pumps.

2009 Strong wind (*dufan*) and *soqudud* affected the first cultivation of maize and the crop failed.
2nd cultivation - nothing was shared to the ABG members.

2009 Fuel price increased from 7.50 to 11 ETB/ litre; they purchased spare parts for >6,500 ETB. They raised 150 ETB/person for fuel, spare parts and the pump operator's salary (400 ETB/month).
3rd cultivation - ABG sold 47 quintals maize for 250 ETB/quintal to WFP on credit[25]. At the time of the assessment the group had not yet received the payment

2010 They purchased a 1 piston capacity pump from the government for a subsidised price of 4,500 ETB. The fuel price increased to 17 ETB/ litre.
4th cultivation - they shared 500 ETB/ person from maize by-products sold as animal feed and other farm produce. Spare parts have cost 7,000 ETB so far.

---

[23] The three ABGs assessed in Gode woreda confirmed that the harvest collected from the first cultivation period was produced only with the 600 litres of fuel received from CHF i.e. they did not purchase additional fuel. Assuming a fuel consumption rate of 30 litres/ha (minimum), and that maize requires four irrigations per four-month cropping period (see Annex 2) this would be enough to irrigate around five ha of maize.

[24] Seed inputs included maize, sesame, onion, tomato, banana, beans and grass; six different types of tools were provided. The seeds and tools provided to the ABGs were uniform in all three woredas (see Annex 1).

[25] The main reason why the Barsen ABG sold the maize on credit was due to the UN's procurement procedure that requires them to sign an agreement with the regional government to which the payment should be made. Given this procedure and the fact that payment has been delayed for around five months, CHF should follow up the payment on the ABG's behalf, especially since the women were not even clear whether FAO or WFP collected the maize.

Ilan

1999 Ilan village was created by members of the Reer Mahad Assie clan who started rain-fed farming on the former state farm on an individual basis.

2003 The government launched the PCDP at Ilan for 400 households on 400 ha land. They received two water pumps of four-piston capacity each, 25 kg of maize seeds and 600 litres of fuel for the cultivation of 1 ha maize per household.

2008 CHF organised 50 women into an ABG and donated two water pumps, fuel (600 litres), seeds and tools. The group was given 27 ha by the clan.
1st cultivation - the group shared 100 ETB/ person from sale of produce from the first cultivation

2009 The group produced fodder for own livestock.
2nd cultivation - the first crop of maize failed due to dufan, but the ABG sold sesame and tomato for 6,000 ETB; spare parts cost 2,750 ETB.

2009 They spent 1,750 ETB on spare parts, and raised additional money from the group for spare parts and fuel. The members raised 50 ETB per person for costs.
3rd cultivation - the second crop of maize and sorghum was sold as animal feed (for 5,000 ETB and 1,500 ETB respectively); they also sold tomato (for 2,500 ETB); grass was fed to own livestock.

2010 The ABG is cultivating maize for animal feed, tomato and water melon but salinity is becoming a problem on the farm.

Bakhtiley

The village was so old that the ABG participants did not know exactly when it was formed.

1999 The name Bakhtiley was given to the village in connection with the massive livestock mortality caused by the 1999 Ogaden drought.

2008 CHF organised 50 women into an ABG and gave pumps, fuel (600 litres), seeds and tools.
1st cultivation – the maize crop was lost to warthogs.

2009 The group could not afford to pay for the pump maintenance - spare parts cost 7,950 ETB, so they gave the pumps to Mr. Nuur Ibrahim the current pump operator who invested his two cows (sold for 2,300 ETB and 1,100 ETB) to cover the cost[26]. Mr. Nuur charged 120 ETB per plot per irrigation round, towards fuel and pump operating costs.

2010 The members began to farm on an individual basis; some established new plots close to the river.

[26] The Bakhtiley ABG called their plot '*Isnugto*' meaning 'self-sucking' because of the large proportion of income from the sale of farm produce that has to be used for fuel and pump spare parts. In all of the areas assessed in Gode woreda, the women ABG participants requested a donkey cart, to be used partly for transporting firewood to sell in Gode town to raise cash for fuel and spare parts.

Upper left: Wabe Shabelle River at Ilan
Upper right: Barsan ABG water pump and pump operator
Lower left: Salinity at Barsan
Lower right: Irrigated plots at Bardo Qorah

Top left: Baktiley ABG plot
Top right: Maize stalk borer damage, Bardo Qorah
Upper left: Water melon damage caused by porcupines, Ilan
Upper right: *Hagay* wind at Dabaldeg

Top: Failed banana crop at Ilan
Lower: Pepper crop at Ilan

b. Kelafo

It was not possible to collect production data for the former ABGs as groups since farming was done on an individual basis.

Agweyne

1993 Agweyne village was created by ex-pastoralists interested in rain-fed and flood recession farming.

2006 The village lost cattle, small ruminants and donkeys to the 2005/6 drought.

2007 28 members of the village contributed money to rent a water pump from Kelafo town; each person planted half ha maize. The owner collected the pump at the end of 2007.

2008 CHF organized the ABG and provided two pumps, 12 barrels of fuel (2,400 litres), seeds and tools.

2010 The ABG rented another pump as the CHF pump was unusable. The ABG purchased an additional 105 litres of fuel.

Beladamin

1983 The *Derg* government launched an irrigation project with 2 German DOSS pumps of 4 piston capacity and the *Jirirs* started maize farming as a cooperative; the government collected the cost of fuel in kind after harvest. *'The maize yield was so good that the life of the community changed.'*

1991 The Said Bare government dissolved and returnees from Somalia came to the Kelafo area.

1992 After the downfall of the *Derg*, the Ogadenis destroyed the village and took the pumps; 2 months later the community developed canals and restarted irrigated farming through a gravity system. The *Jirir* agreed that in future they would purchase a Kalashnikov after each harvest in case of future attack.

1996 The level of the Shabelle River decreased and the gravity scheme failed to work.

1998 A village member brought a water pump of 4 piston capacity and irrigated farming restarted through the *birgerac* (pump rental) system - the pump was rented for 10 ETB/hour; fuel cost 6 ETB/litre. Irrigated farming was conducted with private pumps to 2008.

2008 CHF organized the ABG and provided two pumps, 12 barrels of fuel (2,400 litres), seeds and tools.

2009 118 households shared the pumps and cultivated land on individual irrigated plots. In all of the Kelafo ABGs,an additional 5 ha was cultivated for the kebele chair and vice chairpersons and the pump operators[27] .

2010 There were 12 private pumps operating in the village at the time of the assessment in August 2010.

<u>Irkabanan</u>

1983 The *Derg* government brought water pumps and the community began irrigated farming.

1992 Following the downfall of the *Derg*, the Ogadenis invaded the village and took the water pumps. Three private pumps were brought to the village and irrigated farming restarted via the *birgerac* system. The pumps were rented for 200 ETB/ha per irrigation round.

2008 CHF organized 50 households into the ABG and provided pumps, fuel (2,400 litres), seeds and tools. The ABG purchased an additional 200 litres of fuel for the first cultivation.

2009 119 households shared the pumps and cultivated land individually

2010 The ABG purchased an Anil water pump of one-piston capacity for 7,000 ETB from the government with income from the sale of livestock[28].

c. Mustahil

A total of five ABGs were assessed in Mustahil woreda. Godaro is close to Mustahil town, while Kunaso and Kobane ABGs are located to the north and Qonlawe and Danyere ABGs to the south. Generally, the areas to the north of Mustahil are highly flood prone and more suitable for livestock than crop production – the groups reported only one successful cultivation during the last four potential production seasons, because of floods[29].

The Mustahil groups reported that the prevalence of water borne disease particularly ‘bloody urine’ (schistosomiasis, also called bilharzia) has been increasing

[27] Five ha represents half of the area that it is possible to irrigate with one pump of one-piston capacity.
[28] In Kelafo, the ABG participants indicated that the main purpose of purchasing livestock from crop sales after each harvest was to save money for pump maintenance costs.
[29] Note that there have been further floods since the time of this assessment.

over the past few years[30]. This was borne out by the case record at the government hospital in Mustahil which indicated that the number of cases admitted has increased from two per month in 2007 to around seven per month in 2010. The hospital has officially reported the increase to the Regional Health Bureau. A 'before and after' scoring exercise with the Godaro ABG showed an increase in the incidence of bloody urine, mainly in children, from around three cases in 2008 to seven cases in 2010 and an increase in malaria from 12 to 15 cases per season over the same period. The hospital is conducting extension work in areas where communities engage in irrigated farming to advise farmers how to reduce the risk of infection e.g. by discouraging children from playing barefoot in irrigation canals.

<u>Kunaso</u>

1990 Mardhis village split into two and Kunaso was created; the community began saving to buy a water pump, but failed.

2000 CCM brought a DOSS pump of four-piston capacity and fuel for one cultivation. The pump was used from 2000 to 2004.

2008 CHF organized the ABG and provided two water pumps, fuel (1,400 litres), seeds and tools. They purchased an extra 6 barrels of fuel for the 1st cultivation.

2009 There was a minor flood and the ABG was able to cultivate a 2nd plantation following flood recession; however, the harvest was nearly nil due to tree-locust and disease outbreaks.

2010 They purchased eight barrels of fuel for the 3rd plantation but a severe flood destroyed the crops. Using the flood recession, the group cultivated a 4th plantation of maize.

<u>Kobana</u>

1998 Kobane village was formed by *Jile* (Hawiya) and *Jirir* agro-pastoralists displaced by flood from a village east of Mustahil; they started flood recession farming of maize and sorghum.

2005 A good harvest was obtained from maize and sorghum following flood recession (medium flood).

2007 Sorghum fields were lost to birds.

2008 CHF organized the ABG and provided two pumps, fuel (1,100 litres), seeds and tools. The ABG bought an extra 6 barrels of fuel and used 40 litres of fuel per plot.

2009 The 2nd plantation was lost to a tree-locust outbreak.

2010 Severe flooding destroyed the maize and sesame cultivated during the 3rd plantation Increasing incidence of 'bloody urine', especially among children, reported to the Regional Health Bureau.

---

[30] Schistosomiasis is a parasitic disease transmitted by aquatic snails. The larvae of infected snails penetrate human skin and over time can cause damage to internal organs and impair growth in children. The disease is commonly associated with irrigated areas where surface water in canals carries the infected snails. Risk can be minimised by good design of the scheme, such as reducing/avoiding potential areas of ponding and allowing parts of the irrigation channels to dry out periodically.

Upper left: Irrigated plots, Kelafo
Upper right: Irrigated plots, Kelafo
Mid left: Sesame harvest, Kelafo
Mid right: Transporting maize crop, Kelafo
Lower left: Flooding, Mustahil
Lower right: Cattle eating maize stove, Kelafo

3.2.4 Trends in production, costs, sales and net benefits

a. Trends in wealth groups, non-ABG members in Gode

As indicated in preceding sections, in all of the areas covered by the assessment, community members who were not ABG members were also involved in some kind of irrigated farming using private pumps. 'Before and after' proportional piling of community wealth classes was conducted with non-project households in the Gode ABG areas to identify any trends in wealth status between 2007 and 2010 in the general population. The exercise was not conducted in Mustahil and Kelafo since the communities did not make a distinction between ABG members and the general community[31]. The results were:

- the proportion of 'better-off' households decreased by around 9% (from 33% to 24% of the population);
- the proportion of 'poor' households decreased by around 33% (from 67% to 34% of the population);
- the proportion of 'middle' households increased by around 42% (from 0 to 42% of the population).

The reduction in the poorest wealth category and increase in the middle category was attributed to the increase in irrigated farming activity through water pumps brought to the area both by government and private individuals. For example, between 2009 and 2010, the regional government sold around 50 small (1-piston capacity) water pumps at subsidised prices to individuals and groups in Gode district alone. As outlined already, in the Kelafo area, clan members returning from Somalia carried their pumps with them, and their experience of irrigation in Somalia.

b. Trends among L-SAP participants

Trends in farm production and related home consumption of produce and sales of produce are shown in Figure 4, along with trends in expenditure, by type of expenditure.

When viewing Figure 4 it should be noted that:

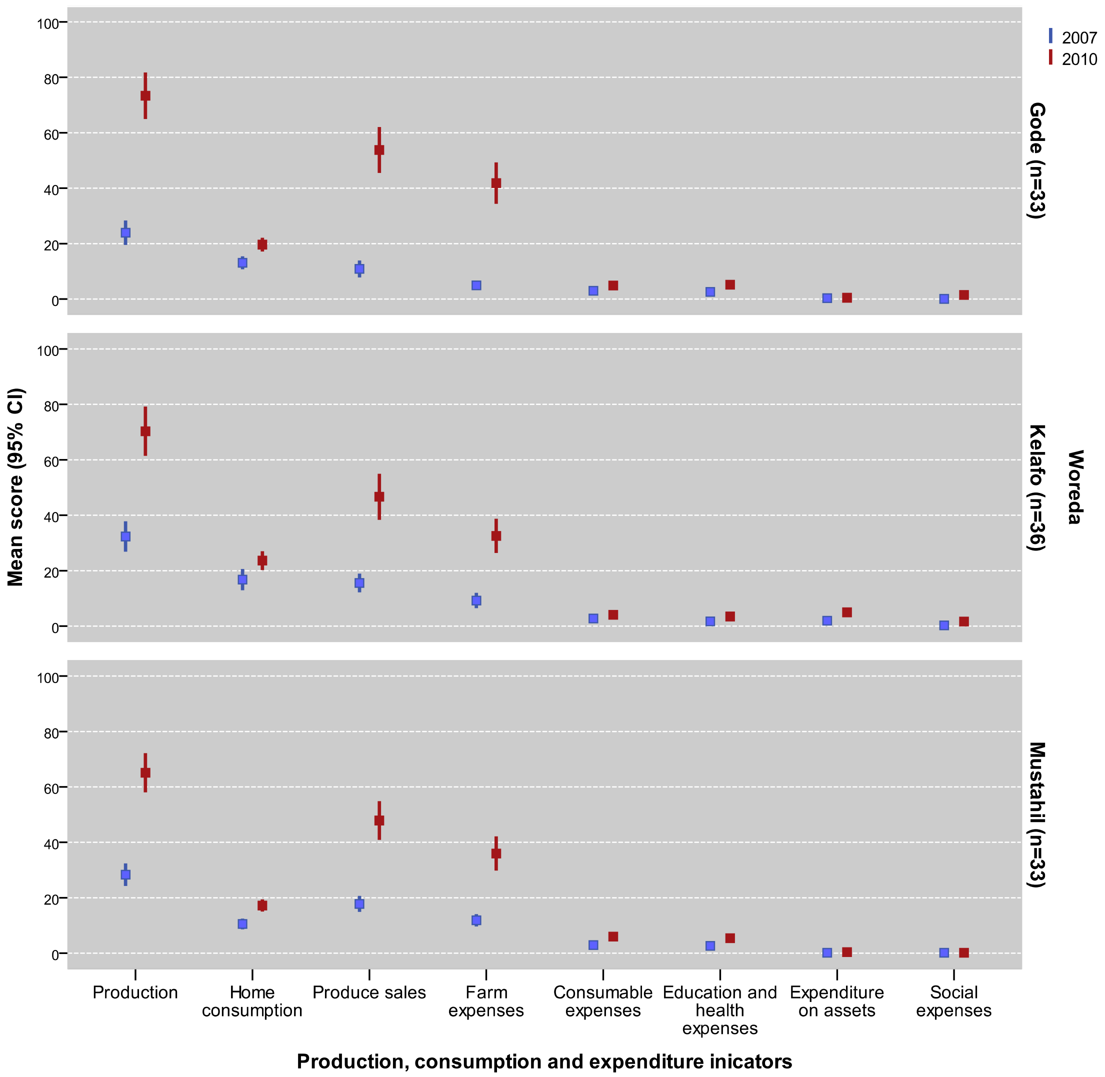
- for Gode woreda the assessment covered only the three out of six ABGs which were reported as still functioning in mid 2010. Therefore the results are biased towards remaining ABGs and overlook the limited impacts and changes in the three non-functioning ABGs.
- for Kelafo and Mustahil, project inputs were combined or absorbed into pre-existing irrigation systems by local communities. It was difficult to disaggregate impact and changes due to project inputs from private activities. The possibility that the trends shown are attributable mainly to private sector or pre-existing community arrangements has to be considered.

In terms of general trends the results showed that:

- trends in production, consumption, sales and expenditure were similar in the three woredas;
- household production from farms was far higher in 2010 than in 2007, being 3.1 times higher in Gode, 2.2 times higher in Kelafo and 2.3 times higher in Mustahil;
- marked increases in the home consumption of farm produce were evident;
- expenditure on farm supplies increased substantially, being 8.5 times higher in Gode, 3.5 times higher in Kelafo and 3 times higher in Mustahil;

[31] In Kelafo and Mustahil where all village members participated in irrigated farming in the 'ABG' areas , informants insisted that all households were poor in 2007.

Figure 4 Trends in household financial indicators



Notes for Figure 4

1. Data derived from proportional piling with household informants. When viewing the graphs, the *x*-axis scales are arbitrary and are used only for illustrating the trends for each indicator between 2007 and 2010.
2. 'Home consumption' refers to all produce used in the home, including tomatoes, onions and peppers for making sauce for human consumption, and grasses, maize and sorghum leaves used to feed livestock.
3. Farm expenses for irrigated plots included cash spent on seed, fuel and spare parts for the water pumps, farm tools and hired labour (for example, the pump operator or farm labourers).
4. Social expenses included weddings and funerals.
5. Statistically significant changes are illustrated using 95% confidence intervals for each indicator.

- increases in farm production and the need to acquire cash to meet rising farm expenses, led to correspondingly large increases in the sale of farm produce, being 5 times higher in Gode, 3 times higher in Kelafo and 2.7 times higher in Mustahil;

- moderate increases in health, education, and household consumables were evident, with education expenses related to both Koranic and formal education;
- expenditure on assets, especially livestock, increased slightly and was most noticeable in Kelafo.

Table 5 represents the net profit obtained by the ABG households in 2007 and (current/ former) ABG households in 2010, as measured using proportional piling.

Table 5 ABG household net profit from farming

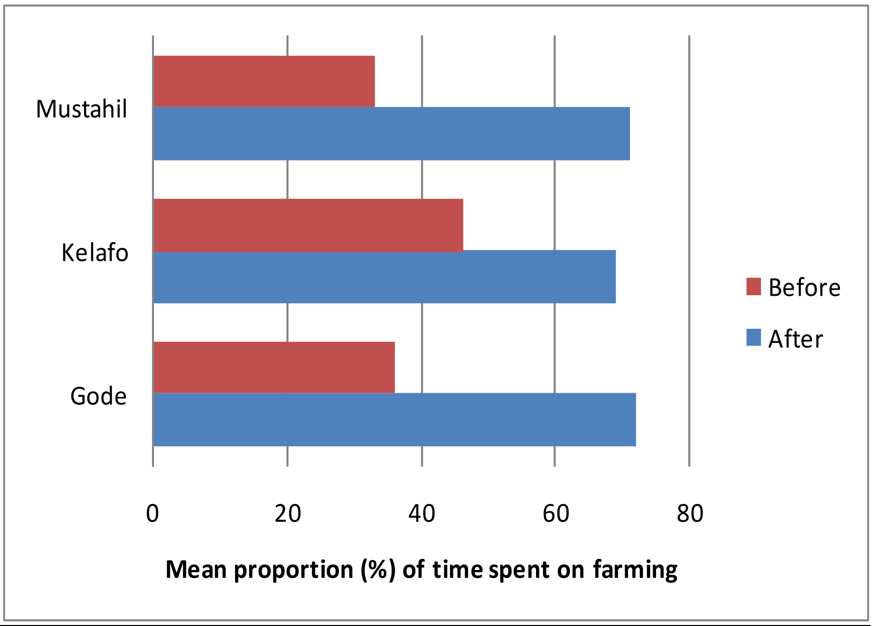
Woreda	Mean score 2007			Mean score 2010		
	Sales	Expenditure	Net profit	Sales	Expenditure	Net profit
Gode (n=35)	11	5	6	54	42	12
Kelafo (n=36)	16	9	6	47	33	14
Mustahil (n=33)	18	12	6	48	36	12

There was a high level of agreement across the three areas regarding the net profit from farming both before and after the L-SAP. On average, the net profit from farming doubled between 2007 and 2010 for the ABG households.

3.2.5 Time costs of farming by ABG households

In all areas, the amount of time spent on farming was far higher in 2010 than in 2007 (Figure 5). In Gode and Mustahil, households were spending at least twice as much time on their farm as in 2007, while in Kelafo households are spending half as much time again on the farm as in 2007.

Figure 5 Trends in time spent on farming by L-SAP participants (n=104)



Note
Data derived from 'before- and-after' scoring with 100 stones.

Reasons for these changes included:

- an increase in the scale and intensity of irrigated farming by the ABG households;
- an increase in the scale and intensity of irrigated farming by communities generally through private investment in irrigation, particularly since the interruption of the large-scale government irrigation schemes in 2006.

Specific to Mustahil, the floods of April and May 2010 destroyed the first round of crops and meant that farmers had to cultivate twice already this year, partly explaining the increase in time spent on farming in that area. In Kelafo, the increase is relatively smaller probably since farmers in that area were already heavily involved in farming, while in Gode, the increase is greater because they were less involved in farming prior to the project, than in the other areas. The extra time was mainly used for irrigating the plot and for guarding the crops against animal damage, both wild and domestic (the risk increases during the dry season when there is a shortage of their natural sources of food). These activities were mostly done during the evenings and early morning. Therefore, although the workload increased, the additional time did not necessarily affect the time spent on other, non-farming activities.

3.2.6 Zekat

The assessment planned to use the payment and receipt of *zekat* by L-SAP households to cross-check for any change in their income or wealth status. However, although the number of sampled households receiving *zekat* declined from 7 in 2007 to 1 in 2010, the *zekat* payment system did not reflect actual household wealth status because there are two types of *zekat* payment rules. Under 'normal' *zekat* a household paid 10% of its income (in livestock, grain or cash), based on wealth, whereas under *wajib zekat* all healthy adults voluntarily gave something to someone in need in the community, in the form of firewood, water, labour etc.). Since 1977, religious leaders have stopped collecting and dispatching *zekat* and it is generally paid to someone in return for a service, such as Quranic teaching.

In the case of the Gode ABGs, the *zekat* payment was deducted by the ABG committee from the group's produce – 1 quintal for every 10 quintals produced by the group.

3.2.7 Benefits and risks of growing different crop varieties

Local preferences for different crops are summarized in Table 8, with reasons for the ranking. Across all areas, maize was ranked first followed by sesame, onion and tomato (See Annex 4).

Table 6 Crop preferences (n=9 groups)

Crop and median rank (range)	Reasons for ranking
Maize – 1st (1,3)	• *We can sell both as animal feed and human food* • *We feed maize leaf to our livestock* • *We can grow using flood recession* • *It does not require guarding from birds* • *Even when it fails, we can feed the leaf to calves and milking animals at least*
Sesame – 2nd (1,4)	• *There is relatively less disease problem* • *It does not require guarding against wild or domestic animals except camels* • *It requires relatively less water* • *It has a relatively good market comparatively* • *It can be made into oil for home use*
Onions – 3rd (1,4)	• *It is difficult to store when there is no market* • *It is susceptible to disease* • *It requires too much watering* • *Low price and there is no alternative way of using bulk production* • *It kills the soil*
Tomatoes - 4th (3,4)	• *Low price and there is no alternative way of using bulk production* • *It is difficult to store as well as transport to distant located markets*

The ranking and reasoning agreed with the information from focus groups on the production history of the Gode ABGs, where all of the groups prioritised the cultivation of maize (section 3.2.3a). All groups had sold maize stalks or leaves as fodder in at least one of the four production seasons since L-SAP started. The Gode ABGs could not find a market for their tomato and onions in the first 2009 cultivation and all groups also mentioned the high cost of irrigating onion, since it required irrigation on average every three days for a six-month growing period. Also, onions required the purchase of pesticides needed, and spraying during each watering.

3.2.8 Perceptions of the benefits of irrigated farming

One of the key reasons identified by the study participants for undertaking irrigated farming was to protect their livestock assets against recurrent drought by growing crops for fodder. The value of fodder was explained by reference to two trends viz. the reduction in pasture as traditional pastureland was converted to farmland, and the damage being caused to traditional pasture due to invasion by *Prosopis juliflora*. Informants referred to the former state farms, now abandoned, that were being encroached by *Prosopis (*in Somali known as *birsoobis*, literally 'when the stem is cut it sprouts with shoots')[32]; this was a particular problem in the Kelafo area. Related to

[32] Ayele Gebre-Mariam (2005), ibid.

this trend, informants also referred to the benefit of farming for controlling the expansion of *Prosopis*[33].

Maize could be sold for fodder after two to three months, either as maize shoots or at the green stage. This was practiced to reduce the cost of production by avoiding the third and fourth rounds of irrigation needed to bring the maize to full term. Selling maize for fodder at the early stage also reduced the risk of crop failure due to disease and damage by wild animals[34]. However, the Somali regional government had a policy of encouraging human food production in the region and government-supported farmers e.g. those receiving farm inputs or food aid were not allowed (in theory) to produce maize for animal feed. Therefore, producers noted the potential benefits of cashing in the maize crop early against the potential negative consequences in terms of access to government assistance.

3.2.9 Common risks and challenges

Referring to repeated crop failures, informants highlighted some of the factors, both natural and manmade, that contributed to the relatively low returns (in their view) from pump-based irrigated farming. In areas covered by the assessment, L-SAP participants encountered one to three total or partial crop failures between 2008 and 2010 from a potential of four harvests.

a. Environmental factors

<u>Poor harvests</u> – crop failures were attributed to disease[35], pests including tree locust and birds[36], and damage from wild animals[37]. Crop failures were said to be more likely in *jilal* season because of the 'bad' floodwater (see below) and because damage from wild herbivores was more common than in the *hagay* season. However, the *hagay* season plantation was also said to be difficult due to the wind storms (*dufan*) that cause high water evaporation and bring heavy dust, increasing the number of rounds of irrigation required and reducing seed germination respectively.

<u>Water and soil salinity</u> - all of the FGDs reported failures of crops planted in *jilal* for at least one type of crop. As described above, these crop failures were at least partly

---

[33] USAID already has a program for *Prosopis* control in Gode zone and there appears to be some evidence that irrigated farming can help to stop the reinvasion of cleared land.

[34] For example, Bakhtiley ABG lost maize planted during the first cultivation in 2008/9 due to damage by warthogs and told the field researcher that they highly regretted not selling it earlier as fodder.

[35] *Gududiye* - a disease affecting all crops except sesame - is named after the red colour of the roots of the affected crop and was a commonly-reported problem in all assessment areas.

[36] In maize and sorghum, birds cause problems both by eating maize seeds from the field and by attacking the matured sorghum. In the case of sorghum, the cost of production increases because labour has to be hired to protect the sorghum fields. In the case of maize, farmers irrigate the newly planted maize immediately to protect the seed against birds; this increases the number of irrigations applied per cultivation from four to five rounds.

[37] Warthog and porcupine are common problems in all areas covered by this assessment (see photo), as well as hyena and fox, particularly affecting maize and watermelon.

associated with what was believed to be the relatively saline floodwater from the highland *belg* rains and used for irrigation in *jilal.* Although the risk of increasing secondary salinity, due to irrigation had been recognized for some time, informants felt that the problem was increasing.

The assessment team saw evidence of salinity in several of the study sites (see photograph, page 22).

Some of the factors that may contribute to the salinity problem included:

- the increasing use of small one-piston water pumps, which has forced farmers to concentrate on land close to the river where irrigation is easier;
- poor design of the irrigation in that there was no process for leaching off the saline water (e.g. sub-surface drainage channels) and preventing the build up of salt in the soil;
- high temperatures and arid climate which cause high evapotranspiration; the use of loose soil for the construction of the irrigation canals which means that the water is absorbed, leaving the salt behind (thus aggravating secondary salinity).

The risk of irrigated farming activity being affected by secondary salinisation is reportedly higher in the Mustahil area than in Kelafo and Gode. In the former, the concentration of salt in the soil is relatively high and run-off water from the hillsides during the rainy season was reported to aggravate the salinity problem.

<u>Water borne diseases</u> – this problem was limited to Mustahil, where the prevalence of schistosomiasis was reported to have increased over the last two years as irrigated farming expanded. As mentioned above, good design of the irrigation scheme can reduce the risk as can extension efforts aimed at raising awareness about how to prevent children and adults becoming infected.

b. Economic factors

<u>High costs of production</u> – the increasing price of fuel was seen by informants as one of the main reasons for the relatively low net benefits from irrigated farming. Between 2008 and 2010, the fuel price increased from 11 ETB to 17 ETB per litre (a 54% increase). The effect of increasing fuel prices was exacerbated as fuel consumption of the pumps increased as they aged, and also, by the heavy wind storms that increased the number of irrigations required (especially in *hagay*). Although there was no major change in the prices of spare parts for the pumps, informants complained about the declining quality of the parts available in the local markets, which meant that they had to be replaced with increasing frequency.

<u>Absence of reliable markets and low market prices</u> – in Gode the ABGs failed to find a market for their onion and tomato harvests from the first-round harvest in 2009. In all the assessment areas, the ABG participants felt that the prices paid for both cash and food crops in the local markets were too low. They blamed the regional government for blocking the road from Gode to Jijiga, effectively cutting them off

from the Jijiga market. They also noted the almost blanket injection of poorly targeted food aid into the area, which they said had depressed farm prices.

c. Social factors

Conflict – in the Kelafo area, pastoralists' dry season grazing land had been converted to farmlands and here, informants reported tension and conflict between camel pastoralists and sesame farmers. Specific examples included cases of camels being burned alive or knifed by crop farmers, and a pastoralist who held a sesame farmer at gunpoint while his camels fed on the crop[38]. In Mustahil, where the crop farmers were agro-pastoralists with relatively large livestock herds themselves, a significant part of the pasture land was fenced off.

Pump management – in the ABGs covered by the assessment, there were no major problems related to the use or management of the water pumps. In Kelafo and Mustahil, where farming is conducted on an individual basis, each pump user connected the fuel tube of the pump directly to their fuel container rather than putting it into the main tank. In this way, each person could only use the pump for as long they provided fuel. The communities in these areas also used a system where they allocated the land close to and far from the river equally, thus sharing the extra cost of fuel incurred in irrigating plots further from the river.

One exception was the Tundhow ABG in Kelafo, which had not used their pumps since the first cultivation because of a conflict between the participants and the former ABG committee members, with the latter blamed for misusing part of the fuel collected from CHF in 2008. Although the ABG participants agreed to privatize the pumps, they failed to agree on who should be responsible for pump management – candidates had been identified from four different sub-clans of the six sub-clans that shared the pumps.

3.3 Cost-benefit analysis of irrigated farming in Gode

A cost-benefit analysis (CBA) was conducted using information provided by CHF on project costs, and information collected during the assessment on benefits, being mainly the income from produce sales. Farm expenses by project participants were also considered in the analysis. The CBA was restricted to Gode, as ABGs in this area were able to provide production data estimates, whereas in Kelafo and Mustahil, people were farming on an individual basis and representative production data was not available.

The Gode and Kelafo ABGs collected three harvests from the four plantations conducted between the *hagay* 2008 season and the *jilal* 2010 season. Generally, the first plantation in 2008 was perceived to be the best in terms of yield, followed by the third plantation in the second half of 2009. In Mustahil, where the third

[38] These types of conflicts took place even before L-SAP and were not necessarily caused by or exacerbated by the project.

plantation was destroyed by floods in early 2010, farmers had collected two harvests by August 2010.

It was notable that attempts to conduct the CBA was constrained by absent or incomplete data on the outputs of irrigated farming during the project. The production data obtained from the CHF Gode office was assumed to be inaccurate, as the figures were identical across ABGs and such an outcome was viewed as highly unlikely by the assessment team. The CHF production data also contradicted some of the information obtained from the ABGs. For example, the CHF data (albeit provided for a time period after the end of the L-SAP project) indicated that all of the ABGs had harvested four times between July 2008 and July 2010 including those of Mustahil. This contrasted with the three harvests reported by ABGs during the assessment. Also, it was not possible for informants to estimate the value of the crop by-products fed to their own livestock, or the value of farm produce that was consumed before being harvested; both were potentially substantial benefits. In Gode, where irrigated farming was conducted as a group venture, the ABGs had not kept any records.

With the above issues in mind, two cost-benefit ratios were calculated as follows:

1. A CBA during the CHF project period only, based on 1 cultivation, harvest and sale of produce:

2. A CBA based on production during and after the project, assuming 3 cultivations, harvests and sale of produce.

As noted above, the CBAs did not include benefits such as the value of crop by-products fed to livestock or direct household consumption of produce. These omissions would lead to an under-estimation of the cost-benefit ratio. However, the calculations also omitted the benefits of pre-project farming activities, and the need for a full CBA to consider only the *additional* benefits provided by the project, relative to the pre-project period. This omission would lead to an over-estimate of project benefits. Furthermore, the CBA also omitted the value of labour inputs and the additional time spend on farming activities relative to the pre-project period (e.g. see Figure 5).

Table 7 Cost-benefit analysis of pump-based irrigation in Gode

Type of CBA	Amount (US$)
CBA for one plantation (2008)	
Costs	
Project costs[1]	
Cost of seed provided - total cost plus transport	5918
Cost of pumps - 12 pumps x $1698/ pump	20385
Cost of fuel provided to ABGs - 20 barrels x $213/ barrel [2]	4260
Cost of agricultural tools provided to ABGs	4441
Training for group members	333
CHF technical and admin staff costs	2790
Project vehicle rent and fuel costs	3686
CHF overhead costs	1889
Sub-total project costs for all 6 ABGs	43702
Community costs (first plantation)	
Initial contribution by the ABGs (2,500 ETB per ABG)	1364
Transportation of produce to market	109
Sub-total community costs for 6 ABGs	1473
Total costs - 6 ABGs	*45175*
Benefits[3]	
Estimated value of produce sales from 1st plantation, Gode ABGs[4]	16394
Cost-benefit ratio	**1:0.4**
CBA for 3 plantations (2008-2010)	
Costs	
Project costs	43702
Community costs: reported total costs for 3 plantations[5]	5818
Total	49520
Benefits	
Estimated value of produce sales from 3 plantations[5]	34636
Cost-benefit ratio	**1:0.7**

Notes for Table 7
[1] Costs for 6 Gode ABGs calculated as one third of total costs for 18 ABGs, except for fuel cost.
[2] Actual cost estimated from number of barrels of fuel delivered to Gode ABGs.
[3] Values estimated from FGDs and L-SAP project documents; note 2 ABGs had nil production.
[4] The sales value is equivalent to 82 US$ (902 ETB) per hh assuming 4 ABGs of 50 hh each.
[5] Costs and benefits calculated from Barsan ABG which reported the highest income of the Gode ABGs.

4. DISCUSSION

4.1 The importance of pre-project analysis

4.1.1 Participatory approaches

The physical geography and clan composition of Gode zone means that livelihoods in the zone have been strongly influenced by trends in neighbouring Somalia, including trends in the development of irrigation systems on the Somalia side of the border. In both Somalia and Ethiopia there is a long history of irrigation, dating back to the 1960s, and locally, an extensive period of experimentation and adaptation of irrigation approaches independently of government or aid projects. There was already considerable local knowledge on what works and why before the CHF project, with the development of the *dhulqeyb* and *birgerac* systems to suit local social, environmental and market contexts and opportunities.

The L-SAP project was funded by OFDA, and best practice for the design of humanitarian projects includes participatory assessment; the first Common Standard of the Sphere handbook is 'participation'[39]. This standard captures not only the right of local people to contribute to the design of projects from which they are supposed to benefit, but also, recognizes that local knowledge is a key intellectual and practical resource for project design. The L-SAP project clearly included much local involvement in project implementation, but what was less clear was the extent to which the group-based approach to irrigation and the specific material inputs drew on local knowledge or an understanding of pre-existing irrigation systems and histories. The group-based ABG approach seemed not to take account of the strong tendency for well-established irrigation systems in the areas to be organized on an individual basis, with pumps hired from private owners. This is an example of a pre-existing service which livelihoods-based approaches should aim to understand and improve[40] or strengthen, rather than replace with an alternative approach. Similarly, there were pre-existing, clear and equitable systems for allocating land for irrigation. For example, the land closest to and furthest from the river was traditionally shared equally between the community members involved in farming, in order to share the higher benefit from irrigation close to the river and the higher costs of irrigating plots further away. In communities such as Kelafo, the land allocated to the ABG was later shared out in this way. This suggests that in such communities – and contrary to L-SAP - it would not be appropriate to target selected poor households with small pumps for irrigation close to the river.

In Kelafo and Mustahil, the rapid reversion to pre-project irrigation systems indicated that communities viewed the ABG approach as unnecessary, but a relatively acceptable way to acquire the free material inputs of L-SAP such as pumps,

[39] The Sphere Project (2005), *Humanitarian Charter and Minimum Standards in Disaster Response.* http://www.sphereproject.org

[40] There are concerns that the private systems are disproportionately beneficial to the pump owners and exclude poorer farmers; further research would be needed into exactly how these systems work and how they could be expanded to benefit more farmers, including poorer farmers.

fuel, seeds and tools. In these areas, these project resources were simply absorbed into the existing systems, usually with private operators taking over control of the pumps. The planned introduction of a group-based savings and credit scheme potentially could strengthen existing systems by providing a source of credit for the individual purchase of farm inputs. However, although planned, this did not happen under L-SAP and could not be considered during the assessment.

These experiences illustrate the importance of understanding and working with private sector stakeholders from the onset. In terms of scaling-up the CHF approach, it might be argued that CHF should base further support on an analysis of constraints and opportunities with private pump owners. As these stakeholders can purchase pumps at around the half the cost of CHF (see footnote 16, page 14), OFDA and CHF will need to consider the economic logic of delivering more pumps free-of-charge.

4.1.2 Pre-project lessons from the literature

The participatory analysis outlined can be strengthened if experiences from previous small-scale irrigation are considered. Indeed, many of the issues described in section 3.2.9 are also reflected in the literature on small-scale irrigation in Ethiopia. Some of the key lessons from the literature are summarised in Table 8 in relation to the critical engineering, socio-economic, environmental and institutional aspects of the schemes which can lead to their under-performance. In analysing the opportunities for expanding small-scale irrigation in Ethiopia, IWMI (2005) summarise the difficulties as follows: *'… even in countries where water resources potential is relatively well known and known to be substantial, other conditions may not be conducive for sustainable irrigation development to achieve food security, improve livelihoods and reduce poverty. Such conditions may vary from attributes such as topography, soils conditions and rainfall characteristics, to technical and socioeconomic issues such as lack of physical infrastructure, access to innovations and information, markets, credits, extension, and other institutional support services needed to enhance viable irrigation farming. There is ample evidence that most of these conditions have not been sufficiently met in the expansion of small-scale irrigation, micro irrigation and rainwater harvesting in Ethiopia. Thus, the impacts of these initiatives in most regions of the country have been limited, especially in addressing the country's chronic food insecurity problems'.*[41]

Other reviews by FARM Africa (2006) suggest that in any scheme, the analysis of the potential benefits and costs of introducing small-scale irrigation needs to be weighed against the benefits and costs of alternative means of improving agricultural production, for example through improved post-harvest practices, better market linkages, improved seeds and so on, which may provide wider benefits than a small-scale irrigation scheme[42]. This advice is echoed in the IWMI (2005) report which concluded: *'Thus, we hypothesize that efforts to achieve food security and reduce poverty through irrigation will achieve greater impacts, if complemented by simultaneous efforts to increase productivity in the rainfed sub-sector, which*

[41] Awulachew, S.B. et al. (2005), ibid.
[42] Carter, R. and Danert, K (2006), ibid.

Table 8 Lessons from the literature, Ethiopia

Aspect of the scheme	Common factors threatening the success of SSI
Engineering/ physical	• Over-emphasis on physical design and infrastructure, and lack of an integrated approach to the enhancement of livelihoods through the scheme (a focus on the 'hardware' of irrigation) • Poor physical design due to lack of data or limited technical experience • Pump capacity not adequate to cover the planned irrigation area; this can result in a smaller area being irrigated and/or reduced irrigation frequency, both leading to lower production (and therefore income) • Focus on single rather than multiple water use systems where domestic, sanitation/ hygiene, livestock needs as well as agricultural needs are considered
Economic	• Lack of access to inputs, particularly improved inputs where these are required for the production of cash crops; lack of a source of income for the purchase of inputs (seed, fertiliser, pesticides, credit) • Lack of internal markets for the sale of outputs and low farm-gate prices; local markets may become saturated when producers in a scheme grow the same crops leading to low prices, or even the loss of perishable crops • Lack of planning for operation and maintenance, including identifying sources of income for operation and maintenance costs; inflation in the price of fuel and other inputs
Social and gender	• Increased burden of labour because of agricultural intensification not always costed (particularly impact on women farmers) • Conflicts between use of land for small scale irrigation and other uses (e.g. grazing) • Lack of attention to gender issues, for example women's access to land, labour and water, and their participation in water user committees
Environment and environmental health	• Poor catchment management/ limited soil conservation measures can result in flash floods, silt-laden soils and debris • Increased competition for water resources can create conflict between upstream and downstream water users, • Soil degradation through salinisation, waterlogging, erosion and soil nutrient mining are common problems of irrigation schemes • Year round impoundment of water can lead to an increased incidence of malaria and schistosomiasis (especially below 2000m)
Institutional	• New community management mechanisms introduced without taking into account existing structures can lead to overlap, confusion and exclusion – and may not be sustainable • Lack of local-level government bodies for the guidance of irrigation operation, maintenance and water management at community level, particularly once schemes are 'handed over' to farmers • Weak linkages to the agricultural extension system for follow up and support with crop selection, the sourcing of inputs, production techniques, pest and disease management, and storage and marketing, particularly where new, high value crops are introduced
Policy	• Weak regulatory/ legal framework for the resolution of issues related to water user rights (e.g. between upstream and downstream users, between pastoralists and farmers, between traditional irrigators and users of improved schemes)

Table adapted from: Carter, R. and Danert, K., ibid; Annen, C. (2004). Irrigation Planning and Implementation: Ethiopia Case Studies in IWMI (2004) 'Investment in Agricultural Water Management in Sub-Saharan Africa: Diagnosis of Trends and Opportunities'; Awulachew, S.B. et al. (2005), ibid.

contributes to the overwhelming proportion of agricultural production and nearly all the staple grain in the country. In fact, this may have a much more direct impact on food security than irrigation alone, because most of the food crops are rain-fed.'[43]

A comparison of the results from the L-SAP project (section 3) with the issues detailed in Table 8 is sobering, and reinforces the conclusion that the initial project design was weak, and did not take account of lessons already learned in Ethiopia on small-scale irrigation. Specific project issues are discussed in more detail in the following section.

4.2 Project monitoring

The lack of verifiable project monitoring data on production, and limited documentation of the costs and benefits of the ABG schemes under L-SAP limited the learning from the project. In this regard, the CHF field offices, particularly in Mustahil and Kelafo need to be supported to establish better documentation systems.

4.3 Livelihoods issues

4.3.1 Livelihood impact and implications

The assessment showed that there has been a substantial increase in household on-farm production since 2007 across all three areas. Although this led to more household consumption of farm produce, most of the increase in production was crops for sale. However, the livelihood impacts of these changes were minimal due to the corresponding increases in expenditure on farm inputs particularly, fuel and pump spare parts, and the relatively poor market outlets and low market prices for the crops produced.

Of the cash received from produce sales, the amount spent on farm inputs accounted for almost three quarters of income, a significantly higher proportion of income than in 2007. Similarly, the amount spent on non-farm uses accounted for around one quarter of total farm income at the time of the assessment, compared to around 43% in 2007. Household spending on consumables and health and education increased in all areas, and this increase was significant for spending on education and health care in Kelafo and Gode. It was notable that the increase in income has not translated into a significant increase in household investment in key assets such as livestock, except in Kelafo.

In terms of the net profit from farming, although the proportional piling exercises suggested that net profit has doubled since 2007 (Table 5) – with similar scores given across the three sites – this was not supported by data from FGDs, such as one to three full or partial crop failures during the previous four production seasons. The groups also described substantial expenditure on spare parts, especially after the

[43] Awulachew, S.B. et al. (2005), ibid.

first production season, with two of the FGDs stating that they could not afford repairs to the pumps. One group had purchased another pump when the CHF pumps broke down, while another group shifted to a pump rental system. The groups in Gode were selling firewood to raise funds to cover the costs of fuel and spare parts, and all requested a donkey cart to help with this activity.

Although the cost of spare parts was high, the price of fuel was far more important in terms of impacting on net profits. Since the project started in 2008, the price of fuel increased by over 50% and this was cited as one of the major factors affecting the profitability of farms. For an irrigated production area of 5 ha of maize at 2009 prices in Gode (i.e. fuel cost 11 ETB/litre and maize sold for 250 ETB/quintal), we estimated that an increase in the price of fuel to 17 ETB led to a 34% reduction in net profit. In comparison, a 50% increase in the cost of spare parts led to only a 3% reduction in net profit. Market prices were also a key determinant of profitability. For example, a 20% increase in the price of maize led to a 36% increase in net profit. Additional calculations using data provided by local informants indicated that the production of irrigated maize alone was not profitable or sustainable if current trends in fuel price continued. For example:

- We estimated a net profit of 13,973 ETB from a 5 ha maize plot, based on four irrigations per cultivation period, an optimum yield of 20 quintals/ha, and the sale of all produce (at 2009 prices as above).
- However, at an inflated fuel price of 17 ETB, if five irrigations were needed and the households consumed 30% of the maize production, then the profit turned to a loss - even if the maximum maize yield was obtained.

This type of analysis helps to explain why farmers preferred to sell maize for fodder at an early stage of growth, thus reducing irrigation costs as well as the risk of crop damage. People also placed a high value on maize by-products, for example, maize leaves fed to their own livestock.

Although similar economic analyses suggested that the production of cash crops is relatively more profitable, the high cost of production and susceptibility to disease increase the risk of crop failure and reduce profitability . For example, onions had to be irrigated every three days over a growing period of 140 days, making fuel costs very high. To counter this, communities allocated plots only for onion production closer to the river.

4.3.2 Economic issues - markets and trade

The inclusion of high value cash crops seems to be essential to the profitability of small-scale irrigated farming. It follows that access to markets and a fair market price for these crops will be a main determinant of profitability. However, access to the Jijiga market was limited and so farmers depended on local markets. This meant that some people (particularly in Gode) struggled to find a market for their crops. Although the number of traders accessing the Somalia markets had increased following the expansion of Al-Shebab, re-opening access to the Jijiga market would avoid forcing producers to depend on Somalia markets alone.

When researching the potential for small-scale irrigated agriculture, we found few studies that used the potential yields for different combinations of irrigated crops and the potential market for these crops, as the starting point for analysis. The use of simple models to calculate the potential costs and benefits of irrigated agriculture under different scenarios relating to crop yields, market prices, pump operating and maintenance costs etc. is needed during the design of future projects.
The impact of aid food in depressing market prices for farm produce and discouraging local producers was highlighted by informants. Although beyond the scope of the assessment, this is another factor that needs to be considered when assessing the potential market for locally-produced irrigated crops.

Food aid in Mustahil, cited as a cause of low prices for produce from irrigated L-SAP plots

Future projects also need to consider ways to support producers to identify markets and secure production agreements in advance of the growing season. For example, where local sources are used for purchasing aid food, aid agencies could sign agreements with producers in advance, based on the biannual assessments conducted by UN agencies to forecast food needs. In this regard, UN agencies need to review the current stringent aid food procurement procedures whereby payments for grain purchased from local farmers e.g. in Gode, need to be made via the regional government in Jijiga. Also, in terms of crop selection, farmers need to have better market information to enable them to coordinate what they produce to take advantage of local markets, rather than producing the same type of crops in a given season and then over-supplying the market.

4.3.3 Environmental and health impacts and implications

The key environmental issue arising from the assessment was the impact of increasing soil and irrigation water salinity on reducing crop yields. Salt lined the irrigation channels in project sites, and informants (particularly in Gode) stressed the problem of soil salinity during the *jilal* cropping season. It was unclear whether design features (such as sub-surface drainage channels) could be used in future to reduce the salinity problems.

In part, the increase in the incidence of schistosomiasis in Mustahil also related to design factors. The risk of schistosomiasis can be reduced both through the design of irrigation channels (to reduce ponding and allow for periodic drying out of the channel) as well as through raising awareness around the management of the scheme. This could be addressed in future through a more multi-disciplinary, integrated approach to irrigation development that ensures that farmers involved in new irrigation schemes are linked to the agricultural and health extension systems in the area.

A wider issue was the general suitability of the area for small-scale irrigated agriculture, in terms of environmental characteristics. Although the L-SAP project proposal anticipated at least three irrigated cultivations per year, in reality, farmers did not produce more two cultivations per year, timed to the traditional rain-fed cropping seasons. The arid soils, high temperatures and *hagay* season dust storms meant that the costs and risks of crop production outside the traditional rain-fed cropping seasons were high. In addition, in parts of Mustahil and Kelafo, farmers faced regular floods which destroyed crops and profits for that season. Within this environmental context and unless the costs of production can be substantially reduced, livelihoods based on irrigated crop farming are high-risk.

4.3.4 Social impact and implications

The assessment highlighted a number of lessons related to the potential social impacts of aid-related small-scale irrigation schemes. First, there is a clear risk of conflict in the conversion of former pastureland to farmland when land was formerly used as dry season grazing for livestock. Unfortunately, there have been a number of cases of conflict between farmers and pastoralists in the L-SAP areas in Kelafo, not necessarily related to the project.

In contrast, in those communities with a history of practicing irrigated agriculture there are already clear and equitable systems for allocating land for irrigation. For example, the land closest to and furthest from the river is traditionally shared equally between the community members involved in farming in order to share the higher benefit from irrigation close to the river, and the higher costs of irrigating plots further away. In these communities, the land allocated to the ABG was shared out in this way. This suggests that in such communities, it will not be appropriate to target selected poor households with small pumps for irrigation close to the river.

4.4 Future considerations

4.4.1 Securing access to land

Along the Wabe Shabelle and Juba rivers in Somalia, the history of irrigation includes appropriation of productive riverine land either by government or more powerful clans, leading to the impoverishment of small-scale farmers or agropastoralists from minority clans who had hitherto occupied these areas.[44] In Ethiopia, the Wabe Shabelle has seen large-scale commercial irrigation schemes with limited sustainability (e.g. see Figure 2). In the absence of formalized land tenure arrangements which secure the use of riverine land for less influential clans, there is a risk that such groups will be displaced at some point. Furthermore, as groups such as the Rer Barre are so dependent on crop farming, if displaced they have few alternative livelihoods options to turn to.

This kind of analysis indicates that although there may be options for technical support to strengthen small-scale irrigation in Gode zone, the key issues may be around land tenure and the complexities of land rights in this part of Ethiopia. Further analysis of these issues seems to be fundamental to the future of riverine farmers in the zone, and could involve linkages with the ongoing Ethiopia Strengthening Land Administration Program. [45]

4.4.2 Irrigation investments are development investments

The assessment showed that the establishment of sustainable small-scale irrigation schemes requires longer-term technical support than can be provided by a one-year project. The L-SAP project was designed as an emergency intervention and phased out immediately after the distribution of inputs. This did not allow CHF either to learn lessons about the impact of its work, or to provide the groups with the necessary support to manage the scheme and deal with the many practical and technical problems they faced (rising fuel costs, finding markets for produce, analysis of the costs and benefits of producing different crops, access to credit and extension services etc). Most of the ABG groups were no longer operating as groups, but people continued to engage in irrigated agriculture on a private, individual household basis.

4.4.3 Design issues

In terms of the design and scale of irrigation schemes, available evidence indicates that the risk of salinity increases with the use of land close to a river, and, it is difficult to limit or control the number of households participating in the scheme. In contrast, the use of land far from a river requires more powerful water pumps and/or a gravity-based irrigation system, which is too costly for individual, small-scale irrigation users.

---

[44] Besteman, C., Cassanelli, L.V. (eds.)(2003), *The Struggle for Land in Southern Somalia: The War Behind the War*. Haan Publications London and Transaction Publications, New Brunswick.
[45] http://eltap.net/

Larger scale irrigation projects that compete with pastoralism for dry season grazing areas close to a river, can easily result in land disputes between pastoralists and crop farmers, and run the risk of causing irreversible damage to these grazing areas. However, to avoid this problem a scheme has to be large enough to justify the use of more powerful pumps and a gravity system that enables land to be irrigated further inland. Such schemes require huge initial investments, and the extent to which they are sustainable in the environmental, social and governance context of Somali Region would appear to be under question, given the history of comparable schemes in the region.

4.4.4 Recommendations

The options for an organization such as CHF include:

- Shift focus away from supporting small-scale (i.e. one-piston pump) group-based irrigation schemes targeted at a selected number of poor households, which then become responsible for management and control of fuel, spare parts and other inputs.
- Support and encourage the continued expansion of privately-run schemes (for example using pumps with a higher capacity that can support irrigation further from the river) and support the participation of poor households by helping them to cover the costs of fuel and pump hire, for example through a voucher system[46]. This would also have the advantage of reducing the risks of agency-provided inputs being misappropriated, as happened in a number of ABGs under L-SAP.
- Spread the costs of future schemes by ensuring that schemes allow for multiple productive water uses e.g. for domestic use, for livestock, for sanitation and hygiene, as well as for farming – this could potentially spread the costs of the scheme over multiple uses/ users, as well as creating benefits such as reduced labour for women and children in fetching water.
- Consider the costs and benefits of promoting other water technologies such as rainwater harvesting, manual water lifting pumps/ treadle pumps, drip kits, that can potentially be used not only for irrigation, but also for rainfed farming and for other purposes[47]; these would avoid the high costs of collective schemes and be more accessible to individual farmers if supplied through the private sector.
- Support to and stimulation of the private and governmental sectors as appropriate for the supply of and access to the other inputs that are necessary for the success of irrigated and rain-fed farming, such as

[46] More detailed research would be needed into the current modalities, and the relative distribution of costs and benefits of the existing pump rental schemes in Gode and elsewhere in the region.
[47] Ibid. Some of these technologies (e.g. treadle pumps) have already been introduced in Tigray and Amhara regions.

agricultural and health extension support, supply chains for farm inputs (improved seeds, pesticides and fertilisers) and credit, improved post-harvest storage, producer agreements and marketing options and so on.

5. Conclusions

As evidenced in this project, and supported by the literature, the value of irrigated farming to a community is dependent on a number of variables, some of which are within the control of a project and some of which are not. These need to be thoroughly considered at the design stage of any irrigation intervention. If an organisation is to set up a new irrigation scheme, it needs to have technical capacity to be able to assess the potential costs and benefits from all its various aspects – the irrigable potential of the land to be developed, the multiple needs for water and potentially competing needs, the social organisation and gender implications of the scheme, access to input markets (for fuel and spare parts as well as for seeds, fertilisers and pesticides) and access to and size of markets for the cash crops to be produced. It also needs to assess the environmental context and environmental implications of the scheme. The PIA results show that the L-SAP project had a positive impact on household income, but not to the extent anticipated in the project design. A few of the Gode ABGs are still operating on a collective basis, but the schemes are performing well below their potential and their economic sustainability is in question. In Kelafo and Mustahil, the ABGs no longer exist and the schemes are being operated and managed by the community on a private individual basis. However, again there are economic and environmental factors threatening the sustainability of these schemes – namely, the limited access to the Jijiga and Degahabur markets for produce, and consequent reliance on the Somali market, and in the case of Mustahil, the regular threat of floods which destroy inputs and crops and make the schemes economically unviable.

The FARM Africa (2006) paper suggests that each scheme needs to be considered on a case-by-case basis, taking into account the potential benefits to a community versus issues of cost and sustainability. The results from the L-SAP PIA would support the idea that the very different environmental, social, economic and political contexts operating even within Somali region justifies this kind of case-by-case approach in future project design. The use of a simple modelling tool could help to estimate the potential costs and benefits, and the sensitivity of the potential profitability of an irrigation intervention to changes in key variables such as the price of fuel and the market prices of crops.

The PIA results show that farmers in Kelafo and Mustahil who already had experience of irrigated farming were immediately able to adopt and adapt the CHF inputs to their own systems of production. In Gode, where there was less experience of irrigated farming, the groups probably required more support during and after the project to be able to gain experience and build their capacity in all of the different aspects of irrigated production. For the former, the way forward may be to support the continuing expansion and intensification of privately run schemes, supporting and strengthening the private sector supply chains for both inputs and outputs, and enabling poorer households to participate by covering their costs. For both, there is a need to investigate ways of bringing down the operating and maintenance costs through the introduction of low-input alternative technologies.

For any scheme, there needs to be much stronger linkages to local-level support and guidance services such as the health and agricultural extension services, and credit supply services that are equally as necessary for the success of small-scale irrigation schemes as the physical design of the scheme. Although there has to be a balance between providing adequate support to farmers and the risk of creating dependency on external agencies, the results of the PIA suggest that a one-year timeframe is not enough to ensure the sustainable success of this type of intervention. The lack of time for evaluation or impact assessment of the L-SAP has meant that some of the same mistakes are likely to have been repeated in the subsequent SHAPE project.

There is relatively little documented evidence of the performance of small scale irrigation in Somali region. It is important that the lessons learned from CHF's L-SAP and SHAPE projects are widely shared to inform the design of future interventions.

ANNEXES

Annex 1 ***Inputs provided per ABG*** **(based on CHF documents in Gode field office)**

Seed	Maize – 350 kg; Sesame – 80 kg; Tomato (large) – 3.25 kg; Onion – 3 kg; Sweet pepper – 3 kg; Sudan grass – 10 kg; Small cow pea – 10 kg; Banana - ? not listed
Tools	50 spades, 50 sickles, 2 rolls polybags (small), 2 rolls polybags (large), small rope (100m), 3 wheelbarrows, 50 local axes, 50 Kelafo hoes, 50 frock hoes, 35 Kawawes
Water pumps	2 Anil Indian water pumps[1] – handover document in Gode field office states '2 diesel irrigation generators with centrifugal pump and full accessories'
Fuel[2]	Gode - Undated documents in the CHF Gode field office record the handover of 3 barrels of fuel (600 litres) to the Gode ABGs Kelafo – Undated documents in the CHF Gode field office record the handover of varying amounts of fuel from 10 barrels (2,000 litres) to 14 barrels (2,800 litres) of fuel to the Kelafo ABGs Mustahil – No documents could be found. The ABGs assessed reported receiving from 5.5 barrels (550 litres) to 7 barrels (1,400 litres) of fuel.

Notes:
[1] The Anil pumps were 1-piston capacity pumps and were selected by CHF because they are water-cooled pumps (and therefore suitable for the Gode climate), spare parts are readily available in Gode, and they are small and can easily be moved if the river floods.
[2] The fuel was not delivered to the ABGs in one batch, but in varying amounts prior to each irrigation round.

Annex 2 Number of irrigations required per crop

Crop	Frequency of irrigation needed	No. of irrigations needed per cultivation period
Maize for seed/ consumption	Every 21 days for 4 to 5 months	4 normally, 5 if very dry
Maize for fodder	Every 21 days for 2 to 3 months	2 or 3 depending on the market demand (there is a good market for maize leaf from small herds dependent on buying feed)
Sesame	Every 21 days for 2 to 3 months	4
Hot and sweet pepper	Every 5 days for 1 month	6
Tomato	Every 5 days for 1 month	6
Onion	Every 3 days for 6 months	60-70 (NB higher than in highland areas)
Banana	Every 7 days for 9 months	36

Annex 3 ***Water pump maintenance costs incurred by ABGs*** **(for 2 pumps)**

ABG	Pump maintenance cost per cultivation (ETB)				Remarks
	1st	2nd	3rd	4th	
Bakhtiley		870	7100	3400	No costs given for 1st cultivation for Gode groups; pumps possibly working below capacity
Ilan		2750	1750		
Barsen		6500	7000		
Qonlawe	2500	4000	6000		
Agweyn	3000	1800	1000		
Qudhaley	3000	6000	5000	6000	
Beladamin	2500	6500	2500		
Irkabanan	5566	5566	5566		Average of total cost of 16,700 ETB for 3 cultivations
Danyare	2000	3000	2000		
Kunaso	4000				Pumps not working after 1st cultivation
Kobane		1825	1825		Average of total cost of 3,650 ETB for 2^{nd} & 3^{rd} cultivations
Average	***3224***	***3881***	***3974***	***4700***	Average over 3 cultivations is 3,693 ETB for 2 pumps

Annex 4 Results of ABG crop preference ranking

ABG	Maize	Sesame	Onion	Tomato
Barsen	1	2	3	4
Ilan	2	1	4	3
Bakhtiley	3	2	1	4
Agweyn	1	4	2	3
Beledamin	1	4	2	3
Irkabanan	1	2	4	3
Kunaso	1	2	3	4
Qonlawe	1	2	4	3
Kobane	1	2	3	4