INVESTING IN COMMUNITIES

The benefits and costs of building resilience for food security in Malawi

CHURCH OF CENTRAL AFRICA PRESBYTERIAN
SYNOD OF LIVINGSTONIA

tearfund

Lead authors

COURTENAY CABOT VENTON is an International Development Economist working on poverty reduction and service delivery to the poor. She specializes in disaster risk reduction and climate change adaptation. She works on policy development, qualitative and quantitative programme evaluations, and stakeholder consultation.

cabotventon@hotmail.co.uk

JULES SIEDENBURG is an Agricultural and Environmental Economist who specialises in rural livelihoods, food security and climate change, including conducting field research, participatory consultations, project development, technical support, and capacity building.

jules.siedenburg@linacre.oxon.org

Contributors

JESSICA FALEIRO is a Policy and Research Officer on Disaster Risk Reduction, Tearfund

jessica.faleiro@tearfund.org

JO KHINMAUNG is a Policy Officer on Food Security, Tearfund

jo.khinmaung@tearfund.org

Acknowledgments

Thanks go to Hendrix Dzama, Policy Adviser, Tearfund and Bryer Mlowoka, Coordinator of the DRR Consortium, EAM for commenting on the research design; Richard Sulu, Programme Manager, and Donald Manda, Development Department Director for CCAP Malawi for coordinating and supporting the field work. We are grateful for comments on the report from Donald Manda (CCAP), Vincent Moyo, Country Representative for Malawi, Donald Mavunduse, Head of Southern Africa Team, Laura Webster, Head of Policy, Richard Weaver, Senior Policy Officer, Oenone Chadburn, Head of the Disaster Management Unit, Mike Wiggins, Environmental Sustainability Adviser, Tearfund, and Karl Deering, CARE International UK.

The recommendations of the research report are based on the findings and the authors' assumptions of the cost benefit analysis and its methodology.

Managed and edited by Jo Khinmaung

Copy edited by Seren Boyd

Front cover photos by Marcus Perkins / Tearfund
Back cover photo by Layton Thompson / Tearfund

Designed by Wingfinger Graphics

This report can be found online at
www.tearfund.org/investingincommunities

A one-page summary poster and other reports, such as *Adaptation United*, can be found at
http://tilz.tearfund.org/Research

Tearfund is a Christian relief and development agency working with a global network of local churches to help eradicate poverty.

Investing in communities

The benefits and costs of building resilience for food security in Malawi

Risk reduction is an investment. It is our first line of defence in adapting to climate change. It will pay handsome dividends.

Statement by Ban Ki-moon, Secretary-General of the UN[1]

Every development dollar invested in agriculture in Africa has two to three times the positive impact on poverty than the same dollar invested in other economic sectors.

Kofi Annan, Chairman of AGRA, the Alliance for a Green Revolution in Africa[2]

The view from the frontline is that far greater resources are needed at local levels to reduce vulnerability and improve the security and well-being of lives and livelihoods.

Global Network of Civil Society Organisations for Disaster Reduction[3]

1 Video message for the second session of the Global Platform for Disaster Risk Reduction, Geneva, 16 June 2009

2 Speech at 'Down 2 Earth', the Global Conference on Agriculture, Food Security and Climate Change in The Hague on 4 November 2010

3 Global Network of Civil Society Organisations for Disaster Reduction (2009) *Clouds but little rain… Views from the Frontline: A local perspective of progress towards implementation of the Hyogo Framework for Action*

Executive summary

Almost 1 billion people are currently food insecure, primarily in developing countries. Food insecurity is compounded by climate change which is predicted to make natural disasters such as drought and flooding more frequent and severe, in addition to making weather more erratic generally. Small-scale agricultural communities are particularly vulnerable to such trends. Preventative investments in disaster risk reduction (DRR), climate change adaptation and resilience strengthening can minimise damage while enhancing food security, but motivating donors and governments to make preventative investments can be difficult.

To help address this gap, Tearfund conducted a community-based cost benefit analysis of a DRR and food security programme in a Malawian agricultural community. The programme, which is funded by DFID, has run for four years and spans 53 remote villages in Mzimba District, Malawi.

This study found that the programme had a highly positive impact on target communities in terms of household income and assets, education, health and reduced mortality rates. Remarkably, for every US$1 invested, the project activities delivered US$24 of net benefits for the communities to help them overcome food insecurity while building their resilience to drought and erratic weather. This is a conservative estimate and the true figure could be as much as US$36. This positive financial return on investment provides a powerful argument for investing in preventative activities in vulnerable small-scale agricultural communities.

Cost benefit analysis (CBA) is a useful, evidence-based tool to analyse the benefits of resilience-building activities and to make a strong contribution to debates on the value of integrating a resilience-strengthening approach into development and humanitarian programmes. However, the programme's quantitative benefits should be considered alongside its qualitative benefits, such as the confidence communities expressed that they will be able to withstand future droughts.

The empirical evidence gathered by the fieldwork shows that drought has serious impacts in the study area. According to the affected communities, the main direct impacts of drought in the past have been: widespread crop failure; reduced access to water; and adverse impacts on livestock production including emaciation, illness and death. The communities further described a myriad of direct and indirect impacts during and immediately after the drought, creating a vicious circle of food insecurity, asset depletion, environmental degradation and vulnerability to shocks.

In sharp contrast, the DRR and food security programme has delivered profound benefits to the communities, contributing to a 'virtuous circle' of food security, asset building, environmental restoration and climate resilience. Community members consistently expressed confidence that they will be able to withstand future droughts without becoming food insecure, thanks to the programme. When asked which project activities were most important to food security, given the threat of drought, the focus groups all cited the same factors: crop diversification, soil and water conservation (SWC), and provision of drought-resistant livestock.

The cost benefit analysis is based on making quantitative estimates of the following project benefits:

- increased crop production
- increased livestock production – goats
- loss of education avoided (from drop-out/hunger/lack of school fees)
- loss of life avoided (from malnutrition or hunger-related mortality).

The CBA was supplemented by a review of the government of Malawi's policy and practice in the realm of food security and risk management, to understand the broader context in which the communities' own efforts sit. The government of Malawi seems to have made good progress by increasing investment in agriculture. However, there is insufficient budget for effective disaster risk management or scaling up interventions, with a focus on emergency response to disasters. There are also questions around the effectiveness, governance and transparency of the Agricultural Input Subsidy Programme, and it was

reported that other aspects of agriculture, such as extension services, lack support. While this study demonstrates that an effective and well-targeted local programme can deliver profound benefits for a specific community, further progress towards achieving greater food security requires strong policy frameworks at a national level, coordinated across government ministries, coupled with decentralisation of budgets and decision-making to district and local levels and effective partnerships between the government and civil society.

Recommendations

(More detailed explanations of the recommendations can be found at the end of the report.)

GOVERNMENTS, DONORS, UN AGENCIES AND NGOS SHOULD:

- integrate cost benefit analysis into monitoring and evaluation, vulnerability and capacity analyses, and project design, where appropriate
- integrate risk analyses and resilience-building activities into development planning and implementation to address the underlying risk factors of drought and food insecurity, as part of the agreement by African governments to allocate at least ten per cent of national budgetary resources for agricultural and rural development (Maputo Declaration, 2003)
- increase investment in reducing the risks of severe food insecurity and preventing food crises. Invest a minimum of ten per cent of humanitarian aid budgets to support context-specific activities and increase people's asset base, livelihood security and preparedness for drought
- promote strong linkages and coherence between climate change adaptation, DRR, poverty reduction and national sustainable development plans. Encourage systematic dialogue, information exchange and joint working relationships between institutions, focal points and experts working in these areas
- engage financial and technical support to strengthen local adaptive capacity in order to reduce the risk of the poorest and most vulnerable communities to food insecurity and deliver lasting climate change adaptation solutions.

THE GOVERNMENT OF MALAWI (WITH WIDER RELEVANCE TO OTHER GOVERNMENTS FACING FOOD INSECURITY) SHOULD:

- integrate DRR into central policy and programming such as the national agricultural policy (Agriculture Sector-Wide Approach), the Agricultural Input Subsidy programme and other related programmes. This requires increased budgets, political priority and improved coordination, communication and cross-sectoral working between ministries and departments
- support effective decentralisation with financial and human resources for appropriate administrative levels, in line with the national framework on DRR (eg to coordinate and scale up food security and disaster risk reduction activities at the district level and implement contingency plans, so as to avoid having to submit requests to central government and so speed up responses to food insecurity)
- compare the effectiveness of natural fertilisers and chemical fertilisers in agricultural areas facing the twin threats of land degradation and climate change. Consider the implications of these findings for national agricultural policy, including the national subsidy programme.

THE GOVERNMENT OF MALAWI AND CIVIL SOCIETY SHOULD:

- support effective partnership between civil society and government at local and national levels, to increase transparency and accountability of resources for intended beneficiaries. These changes could also help ensure participation, eg in developing district disaster contingency plans and environmental hotspot analyses.

NGOS AND WIDER CIVIL SOCIETY SHOULD:

- share best practice on the qualitative and quantitative benefits of activities in drought-prone countries and multi-hazard contexts to inform choices between potential future activities and develop measures that maximise community impacts. In Malawi, cost benefit analyses should be shared with the Ministries of Finance, Environment and Agriculture and the Department of Disaster Management in order to encourage greater investment in DRR
- advocate for sufficient budget and personnel to implement the DRR, food security and climate change adaptation policies of donors and developing country governments.

1 Introduction

Almost 1 billion people are currently food insecure, the highest level ever, making food security a critical global concern, especially as the world is way off track to reduce hunger and meet Millennium Development Goal 1.[4] Food insecurity is concentrated in developing countries, where it is being compounded by factors such as conflict, HIV, environmental degradation, volatile food prices and trade inequities. Furthermore, food insecurity will be compounded in many parts of the world by climate change which is predicted to make natural disasters such as droughts and flooding more frequent and severe, in addition to making weather more erratic generally.[5] Africa is particularly affected, with food insecurity threatening lives and livelihoods on a massive scale.

In sub-Saharan Africa, there has been very little investment in reducing risk and little emphasis on tackling the root causes of chronic food insecurity. This lack of preventative measures has meant that health and livelihoods are often already undermined by the time help arrives, contributing to a downward spiral of economic and social decline. Yet, food insecurity tends to be a slow onset phenomenon, creating opportunities for action as soon as the first early warning signs of deteriorating livelihoods and nutrition become evident. Where food insecurity is linked to periodic drought, preventative action is best taken well before the onset of the disaster. While there may be ample time to act, the necessary political will or incentive to take preventative action is often elusive, or there is a slow response from donors even if governments and the UN raise the alarm and appeal early on.

Cost benefit analysis (CBA) is increasingly being used at a community or local level to demonstrate the benefits of early action. This area of work is still very new in this context (CBA has traditionally been used by organisations such as the World Bank for larger infrastructure projects). However, a number of CBA studies have been undertaken at a community level in recent years, with Tearfund leading one of the first studies in India in 2004. Tearfund has identified a significant gap in this casework in the area of food insecurity and drought, since most community-based CBA studies to date have addressed floods and measures to mitigate their impact.[6] Cost benefit analysis was also recommended in Tearfund's report on food security and DRR in the Sahel region of West Africa.[7]

To address this gap, Tearfund commissioned a CBA of a DFID-funded disaster risk reduction (DRR) programme in Malawi, which targets a community that has a high incidence of food insecurity and a history of major drought events.

The aim of this study is to assess programme activities for their cost-effectiveness and to gather evidence to help inform programming decisions taken by Tearfund, their partners and other NGOs. A second key aim is to inform policy-relevant recommendations to help convince governments, donors and UN agencies to act in a timely way and with appropriate interventions to address food insecurity, given the growing threat from drought and other hazards.

This report is very timely, given the current political momentum on food security issues: namely, the need to attain MDG 1 by 2015; the G8 pledge in 2009 to increase investment in agriculture; the reform

4 Target 1c: Reduce by half the proportion of people who suffer from hunger
Indicator 1.8 Prevalence of underweight children under-five years of age
Indicator 1.9 Proportion of population below minimum level of dietary energy consumption

5 IPCC (2007) 'Summary for policymakers', in *Climate change 2007: impacts, adaptation and vulnerability.* Edited by Parry, Canziani, Palutikof, van der Linden, Hanson. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. 7-22

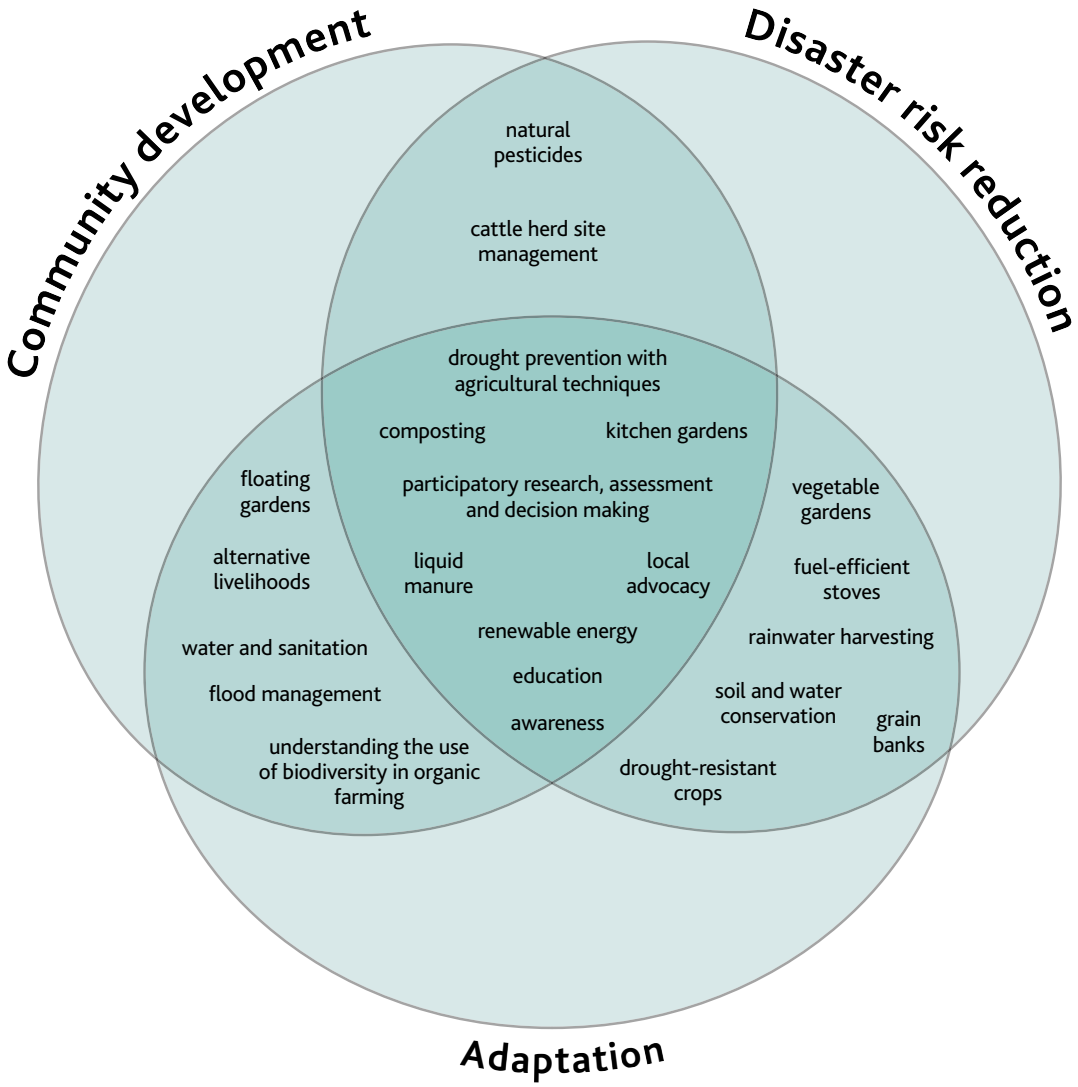
6 Cabot Venton C (2010) *Cost benefit analysis for community based climate and disaster risk management: synthesis report.* Developed and commissioned by Oenone Chadburn from Tearfund and Jacobo Ocharan and Karey Kenst from Oxfam America

7 Kelly C, Khinmaung J (2007) *Prepare to live: strengthening the resilience of communities to manage food insecurity in the Sahel region.* London: Tearfund

of the Committee on World Food Security; the revision of the Comprehensive Framework for Action (UN and IFI menu of policy options to ensure food security); and the new EU strategies for food security and humanitarian food assistance.

While the programme came from a DRR funding pipeline, the programme activities are also highly relevant to the issues of food security, climate change adaptation, environmental sustainability and water resource management, especially as more than 90 per cent of disaster losses are climate related.[8] These areas of practice are closely interlinked, and the findings from this report should be of relevance to practitioners across this range of specialities.

The diagram below shows the strong overlap between activities that can be classified as community development, disaster risk reduction and adaptation. These activities are all linked to each other, which is why different sectors have to work closely together in an integrated approach. However, it is not possible or desirable to agree the exact overlap of specific activities. The diagram is not conceptual, but is designed to be used as a tool to provoke discussion between practitioners and policy makers about matching each activity to the most appropriate circle segment and to show how adaptation and DRR should be integrated into all activities in all sectors. Resilient interventions are those that are deliberately designed to fit within the central overlap between all three circles as they achieve benefits across the three areas. The diagram focuses on the overlaps, rather than activities in the outer circles which also exist.



8 EM-DAT: OFDA/CRED International Disaster Database. www.em-dat.net

2 Food security and Malawi

2.1 Overview of the food security situation in Malawi

Drought is more of an issue now than in the past. Nowadays, the big river usually dries up during the dry season. This first happened in 1989.

Community member from Samara village

Malawi is vulnerable to extreme weather events, notably drought and flooding, and it is anticipated that climate change will increase the incidence of extreme and erratic weather. Malawi has also experienced widespread environmental degradation due to the combination of rapid population growth, agricultural expansion into marginal lands, accelerated deforestation, lack of alternative livelihoods and knowledge gaps with reference to the optimal management of land and natural resources. Both extreme weather events and environmental degradation contribute to food insecurity.[9]

Up until 1990, the rains were fairly predictable, but since then they have become crazy. The rains start then stop during the rainy season, which makes it difficult for crops to grow strongly, or sometimes even to survive.

Community member from Gezamurjowe village

In Malawi, food crises are the principal impact from flooding and drought. Floods displace more people and result in greater damage to fixed assets, while droughts are a greater cause of death and food insecurity. More than 18 floods occurred in Malawi between 1967 and 2008. The 1991 floods claimed about 470 lives. Between 1967 and 2008, the country experienced seven major droughts. The 2002 drought affected 2.83 million people, and is believed to have caused thousands of hunger-related deaths. Malawi's small-scale agriculture is overwhelmingly rain-fed, making it vulnerable to erratic or extreme weather. The immediate impact of a drought or flood is to reduce agricultural production.

This year is a good example of how rainfall has become erratic. Because the rains started early and then stopped for many weeks, the maize initially grew well, but then wilted in most fields. Most farmers had to replant well into the season, and as a result they harvested little.

Community member from Gezamurjowe village

On average Malawi loses 4.6 per cent of its maize production each year due to droughts and 12 per cent due to flooding in the southern region, where one third of Malawi's maize is grown. In terms of economic losses, on average, Malawi loses US$12.5 million or 1 per cent of GDP each year due to droughts (and ten per cent of GDP due to a severe drought).[10] Local effects can be much worse, with whole communities experiencing crop failure in badly affected areas.[11] The World Bank estimates the costs of climate change adaptation for agriculture at around $2.5–2.6bn per year 2010–2050.[12]

9 Government of Malawi (November 2009) *National disaster risk reduction framework, 2010–2015*, p.5

10 IFPRI (2010) *Economic losses and poverty effects of droughts and floods in Malawi.* IFPRI Malawi Strategy Support Programme, Brief No. 2. Washington DC: International Food Policy Research Institute

11 Ibid

12 World Bank (2010) *Potential of agroforestry to contribute to poverty alleviation to economic growth and to protection of environmental services in the countries of the Southern and Eastern Africa regions. A discussion paper.* April 2010

These impacts are felt most acutely by the poor (under the national basic needs poverty line of US$115 per person per annum), who make up 52.4 per cent of the Malawian population.[13] Drought exacerbates the effects of poverty, either directly through its impact on household incomes or indirectly through its impact on consumer prices. Agriculture is the engine of the rural economy, with maize being the staple crop and tobacco being a key cash crop. It is therefore not surprising that the rural poor and small-scale agricultural households in particular are vulnerable to droughts.

2.2 Overview of food security policy and practice in Malawi

Whilst carrying out the CBA study, an analysis of the food security policy context was undertaken. This comprised a desk review of relevant documents supplemented by semi-structured interviews with local government extension agents, national government officials and donor representatives in the capital. This was important in helping to understand the broader context within which this specific project sits.

In recent years, the government of Malawi has developed a food security policy (2008), a national environmental policy (2004), and an Agriculture Sector-Wide Approach policy. Other relevant policies are under development, including a 'right to food' bill, a disaster risk reduction policy (set for 2011) and a social support policy. In June 2010, the government signed a compact for the Comprehensive African Agricultural Development Programme (CAADP), and it has aligned its agricultural development plan to the four pillars of the CAADP Framework. Focus areas for investment include food security and risk management, and sustainable agricultural land and water management. The government has exceeded the ten per cent of GDP target pledged in Maputo in 2003 by African governments as it spends about 13 per cent of its national budget on agriculture.[14] However, a significant amount of this goes towards the fertiliser subsidy.

While significant efforts have clearly been made, progress on DRR and agricultural policy and practice is hampered by a number of factors. Malawi's response to disasters has focused mainly on emergency response, with the associated costs partly borne by development partners, including donors such as DFID Malawi and NGOs such as Tearfund. Despite the country's vulnerability to droughts and flooding and evidence that such events are becoming more frequent and intense, it is reported that the government of Malawi has inadequate budgetary resources for effective disaster risk management.[15] This hampers its capacity to manage risks or make progress towards enhanced hazard resilience.

Coordination and communication between ministries and government departments are reported to be poor. Government departments are careful not to challenge other departments or step across portfolios, reducing effective cross-sectoral working, which is essential for progress on food security.

Although the government has officially decentralised powers since 1998, budgets are not decentralised and the districts have to submit budget requests to central government. This structure inhibits rapid and effective responses to instances of food insecurity. The National Adaptation Programmes for Action (NAPA) includes similar activities to those in this case study and developing drought preparedness plans, but districts have limited budgets to implement the NAPA.

It was reported that the policy space for civil society to engage with central government has opened up significantly over the last couple of years, with respect to food security, DRR and climate change. However, there is a sense that this engagement is superficial and there is a long way to go before effective partnering could occur.

The national food security policy does not put much emphasis on the role of livestock, despite this case study's findings of livestock production being integral to food security.

---

13 IFPRI at http://www.preventionweb.net/files/13792_ifpridp009621.pdf

14 http://dialogue2010.fanrpan.org/sites/default/files/outputs/presentations/D4S7-Edson_Musopole.pps#271,17,Slide%2017%20http://runonce.msn.com/runonce3.aspx

15 Government of Malawi (November 2009) *National disaster risk reduction framework, 2010–2015*, p.5

A key pillar of the government's strategy is the Agricultural Input Subsidy Programme. The programme provides subsidies for two 50kg bags of fertiliser and two 5kg bags of maize and legume seeds for at least 50 per cent of the poorest small-scale farmers. It currently does not give much support to farmers beyond fertilisers and limited seed varieties. Some cases of corruption in the distribution of subsidies has also been reported. Furthermore, there are no clear criteria as to how beneficiaries are to be identified under the subsidy programme.[16]

The Ministry of Agriculture's budget has focused largely on providing the inputs subsidy as a social safety net. However, ActionAid has argued that the national aims for productivity in agriculture were achieved from food surplus created by increased hectarage, not through subsidies.[17] There are also concerns that promotion of this programme has led to a decreased focus on other important areas of support – for example, extension services are not getting strategic investment and public funding for agricultural credit hardly exists in Malawi.

2.3 Programme activities of Tearfund partner CCAP

Church of Central Africa Presbyterian (CCAP) is a development organisation working in Malawi. CCAP works in a DRR consortium of Tearfund's partners led by the Evangelical Association of Malawi (EAM), as part of Tearfund's Malawi churches' Partnership Programme Strategy. CCAP has been implementing food security projects since 1993 and DRR projects since the southern Africa food crisis of 2001–2002. Recently, it has been active in the DRR consortium funded by DFID (see Box 1 for an overview of DFID-funded work in Malawi).

Food security and disaster mitigation are key priorities in the Tearfund Malawi Partnership Programme Strategy. One objective of this strategy is to increase food production, livelihood diversification and preparedness to droughts. It also seeks to link disaster preparedness and disaster response activities, and engages in advocacy for the development and implementation of local- and national-level disaster management plans.

BOX 1
DFID-funded programmes in Malawi

Malawi has invested in a number of DRR-related initiatives aimed at building community resilience, improving early warning systems for slow onset disasters, and supporting government to access macro-level weather insurance to mitigate the increased risk of weather variability resulting from climate change. DFID's efforts include the NGO-DRR consortium programme on community resilience to natural disasters (CHASE-funded), the DFID 2007/08 flood response, contributing to a DRR analysis for the UNDP Bureau for Crisis Prevention and Recovery (BCPR), and analysis of the Lower Shire floods.

These projects and analyses have contributed to a better understanding of good practice, and provided a situational analysis of disaster management programmes and practices. As the NGO-DRR programme on community resilience to natural disasters came to an end this year (August 2010), DFID Malawi is funding the continuation of activities, building on previous successes and DFID-funded programmes.

CCAP is currently finishing a major DRR programme that is the focus of this study. The programme has run for four years and spans 53 remote villages in Mzimba District, Malawi, funded by DFID. It targets 5,000 farmers in these villages, and has diverse activities. CCAP hopes to extend the project with funding from other donors.

16 Munthali, Mdyetseni (2009) *Public financing of agriculture in Malawi.* ActionAid Malawi

17 Ibid

Programme activities include:

- crop diversification, notably growing sweet potato, beans, cassava, groundnuts, soya and pigeon pea, as well as fast-maturing maize varieties
- fostering adoption of soil and water conservation (SWC) practices and sustainable agriculture techniques
- pass-on scheme for fast-maturing 'composite' maize, whereby households receive seed on the condition that they help disseminate it to others
- pass-on scheme for goats, which provides goats to households on the condition that they help disseminate offspring to others
- capacity building in 'best practice' agriculture, gender and development, post-harvest treatment, food processing, leadership and empowerment.
- development of communal grain banks
- development of DRR community-action plans and a Disaster Management Committee in each community that mobilises the community for the accountable delivery of DRR interventions.

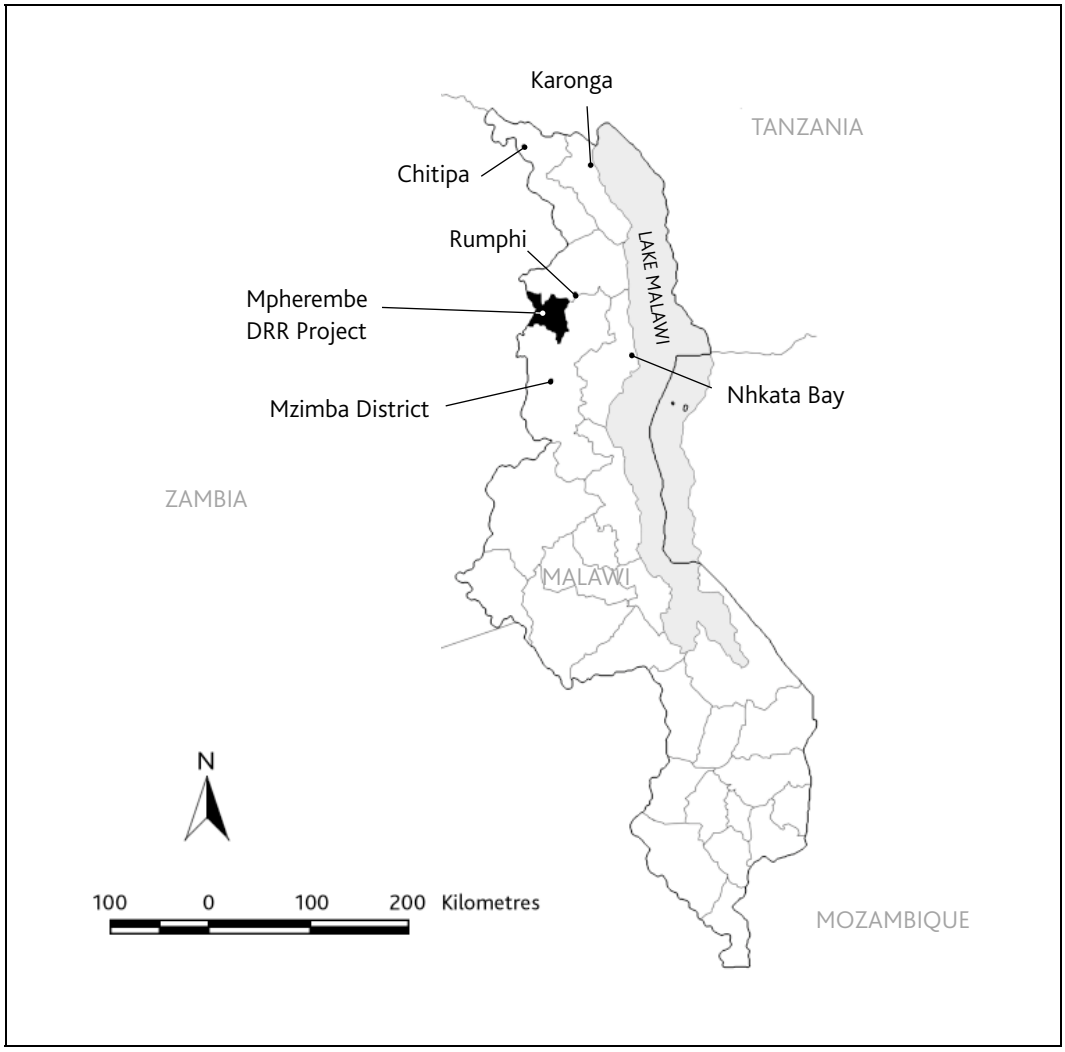


FIGURE 1
Map of the project area in Mzimba District, Malawi

The Mpherembe DRR Project is managed by CCAP Synod of Livingstonia

3 Methodology

The study uses cost benefit analysis (CBA) at a community level to help identify and evaluate the quantifiable impacts of the target programme. DRR requires that significant resources be spent **before** a disaster, yet the benefits may not be immediately obvious. CBA can provide a powerful tool to demonstrate the value of such pre-emptive action, by comparing the benefits against the costs of a project. By revealing net benefits, it helps inform the choice of investments that will maximise benefits per dollar spent.

The use of CBA at a community level uses participatory consultations with affected communities and the project team. The goal is to compare the 'with' and 'without' cases based on the experience of local people, ie how natural hazards impacted the community prior to the project compared with how they impact the community once the DRR measures are in place.

The analysis used here is retrospective, since it analyses activities that have been undertaken in the past rather than assessing possible future interventions.

3.1 Selection of study area

The first step involved selecting a suitable project to analyse, namely a DRR project, of Tearfund's partner, Church of Central Africa Presbyterian (CCAP), serving a small-scale agricultural community prone to food insecurity and plagued by periodic droughts. There is also a strong relationship with this partner and the partner has the trust of the community, which facilitated focus group discussions.

Three programme sites and one control site were selected for analysis: this combination allows for a comparison to be made between programme villages and neighbouring areas that did not benefit directly from the programme, but with an emphasis on getting a clear picture of programme impacts. Study sites were selected by CCAP to ensure representation from all parts of the programme area. CCAP was also careful to avoid choosing only 'success stories' or favoured sites (eg those with ready market access), which could give an unrealistically positive impression of programme impacts.

While it also considered other natural hazards, the study focused principally on the threat to small-scale agricultural communities from drought. Drought is the key natural hazard facing the district, as reflected in the serious consequences of the 2001–2002 drought, which affected more than 2 million people in Malawi. The findings are also relevant to other countries facing drought.

Project activities were chosen through participatory consultations during fieldwork. When asked which activities were most important to food security in the face of drought, all focus groups in the three programme sites examined chose the same three activities. The fact that all three sites produced the same results independently helped to focus the study. The CBA methodology is time-consuming, so the study could only analyse three of the ten activities conducted by CCAP.

3.2 Data collection

Fieldwork was conducted at four sites in Mzimba District, together with programme staff from Tearfund partner CCAP, based on a set of focus group questions compiled in consultation with CCAP. In each case, neighbouring villages were informed of the visit beforehand and encouraged to participate. As a result, discussions at the programme sites actually represented 19 of the 53 programme villages, while discussions at the control site represented six non-programme villages. In some cases, separate discussions were conducted with men, women and youth, but in other instances these groups were consulted together. When men and women were grouped, facilitators ensured that responses reflected the perspective of both genders.

3.3 The cost benefit analysis

The fieldwork involved gathering both quantitative and qualitative data in order to get as full a picture as possible of the project's significance. Data analysis focused on quantitative data, examining quantifiable impacts regarding household income and assets, educational gains and impacts on health and mortality. In each case, the analysis compared quantitative effects with and without the project. Since weather patterns vary in both cases, the analysis compared effects across three distinct rainfall scenarios – namely, normal rainfall, erratic rainfall and severe drought –where possible. The analysis will combine these quantitative effects with diverse qualitative effects to obtain an overall assessment of the DRR programme.

While the project was implemented over a four-year period, it is expected that the benefits will accrue over a much longer timeframe, particularly as some of the project interventions replicate themselves (and therefore further input should not be required). The analysis assumes that benefits are sustained for ten years, but clearly it could be for much longer. Indeed, over time the project should spread to more beneficiaries as goats are loaned to neighbours and seeds/knowledge are passed on.

The analysis uses a discount rate of ten per cent. The theory behind discounting benefits that occur in the future is that benefits today are typically valued more highly than benefits that are delivered in the future. Certainly, this argument has merit. However, there is also an argument to suggest that a very low – or zero – discount rate should be used for environmental projects in particular, making the case that protecting livelihoods for future generations holds as much value as protecting them today. The baseline analysis is presented for both cases.

3.4 Limitations

The present analysis is limited in several respects:

- Most fundamentally, the study was conducted over a short period. Data collection relied on participatory methods using focus groups and semi-structured interviews, but there was insufficient time to carry out more systematic data collection such as household surveys.
- The target communities do not typically gather quantitative information and tend to think in qualitative terms, which means that quantitative estimates are approximate.
- Many programme benefits are not quantifiable, making it important that both quantitative and qualitative effects are discussed and included in any evaluation and/or forward-planning.
- The study makes only rough distinctions between impacts on different groups, eg gender groups, richer versus poorer households.
- The study specifically targeted drought and food insecurity for analysis, since this was identified as a key gap in the CBA literature. However, other hazards also affect food security in the community, such as cyclones and pest attacks. As a result, assessing the net benefit of introducing something like a new crop variety is difficult, since yields may vary significantly from year to year, depending on these different factors.

4 The benefits and costs of the DRR programme

4.1 The impacts of drought in the study area: the 'without' scenario

> *Those who had assets to sell did so in order to buy food. Some with no assets resorted to stealing. The local priest even made a plea to the community to forgive thieves at this time, saying it was not them doing this, but rather the evil of hunger.*
>
> Community member from Malindade Jere village

The empirical evidence gathered by the fieldwork shows that drought has serious impacts in the study area. The impacts described are those that occurred in the absence of DRR interventions during the severe drought of 2001–2002. They are based on recollections by villagers of the time before the DRR programme began.

According to the affected communities, the main direct impacts of drought were:

- widespread crop failure
- reduced access to water
- adverse impacts on livestock production, including emaciation, illness and death.

> *Malnutrition was endemic in the community, since the maize and groundnut crops largely failed. Malnutrition is obvious, since it leads to swelling, which was everywhere in 2002.*
>
> Community member from Mzuku Mabaso village

Discussions with community members revealed the true extent of these impacts, with a myriad of direct and indirect impacts during and immediately after the drought. Impacts on the community ran deep and wide, creating a vicious circle of food insecurity, asset depletion, environmental degradation and vulnerability to shocks.

More specifically, Figure 2 describes in detail the range of impacts cited by community members and shows how the drought had long-lasting impacts on the community. The diagram attempts to demonstrate how the immediate impacts of drought led to further knock-on impacts and lasting damage, creating this 'vicious circle'. For example, the drought did not just affect crops in one year – it led to such levels of malnutrition and weakness that people were unable to work their farms in subsequent years, and hence crop production and in turn nutritional status remained low, making populations more vulnerable to further shocks, trapping people in a cycle of poverty and vulnerability.

This picture fits with the baseline assessment that CCAP did for the project in 2006. Using discussions, household interviews and key informants, this assessment identified the main threats to food security in the area. The overarching problem was low and unreliable farm production. This in turn was linked to persistent droughts and erratic rainfall, soil infertility due to land degradation, the high cost of fertilisers, over-dependency on maize, and poor agricultural extension support.

The impacts described by the communities are separated into the five sustainable livelihoods categories – physical, economic, human, social and natural. These are by no means mutually exclusive – for example, health impacts can be considered economic or human. Rather, the intention is to help frame the analysis.

FIGURE 2 The 'without' scenario – the severe drought of 2001–02

A 'vicious circle' of food insecurity, asset depletion, environmental degradation and vulnerability to shocks

The severe drought of 2001–02 had the following direct physical impacts:

- widespread crop failure
- adverse impacts on livestock - emaciation, illness and death
- reduced access to water

These impacts resulted in the following knock-on effects during and immediately after the drought:

Economic impacts:

- depletion of household assets, which undermine people's capacity to maintain livelihoods and food security following the drought
- distress sales of livestock and other household assets at depressed market prices (sometimes as low as ten per cent of normal levels)
- loss of education - many families cannot afford school fees and, even where they can, children are too weak or worried to concentrate
- women travel up to five hours per day to get water, relative to one hour or less normally. Water only used for drinking and cooking, but not bathing
- high levels of disease, particularly dysentery, which go untreated because people lack money to buy medicines and because they cannot take medicine when hungry

Human impacts:

- widespread malnutrition and anaemia (ie swelling), particularly affecting men - who are expected to provide for their families first - the elderly and children
- people forced to rely on hardship foods such as weeds, maize husks and the roots of banana trees, which often cause vomiting
- loss of life due to severe malnutrition and susceptibility to disease, especially in men and children under five
- some men shot by wardens for hunting (ie poaching) in the neighbouring game reserve out of desperation

Social impacts:

- Harm to social fabric, notably forced marriages and infidelity as a means to obtain food, and theft of household goods and crops
- No reproduction (people too weak to be intimate).

...with significant longer-term consequences:

Economic impacts:

- direct impacts were still being felt in 2003, after the severe drought had passed, due to the population being so weak. Critically, people were too weak to work in their fields for more than one to two hours per day, so production was poor despite normal rainfall
- high drop-out rates - girls who married and boys who went to work on estates did not return to school
- where possible, people took out loans to meet immediate needs despite exorbitant interest rates, thus incurring debt

Human impacts:

- breakdown in social fabric, notably failed marriages due to infidelity and the forced marriage of teenage girls
- girls emerging from forced marriages were generally unable to remarry subsequently due to social stigma
- stunted growth of children as a result of malnutrition, and long-term impacts on health status of the community

Social impacts:

- increased HIV due to sexual promiscuity

Natural impacts:

- people were forced to eat roots of banana trees, which kills the tree and future production

Those who could, borrowed maize and other grains from those who had more, but this meant incurring debt. In our community, if you borrow one tin you must give back two. Even at this very high interest rate, these people were considered the lucky ones.

Community member from Ngumayo village

The drought of 2001–02 caused marriages to break up, since some people were unfaithful as a means to get food. Infidelity borne out of desperation also contributed to the spread of HIV/AIDS.

Community member from Malindade Jere village

Some teenage girls got married to much older men to help provide for their family. Many such 'hardship' marriages later broke down, but then these girls were no longer considered marriage material by younger men, and could only marry another much older man, if at all.

Community member from Gezamurjowe village

During drought, we often sell animals to buy maize, since maize is our staple food. But the market is very bad at such times. Since our animals are thin, there are few buyers and many sellers, and we are desperate.

Community member from Mzuku Mabaso village

4.2 Benefits of the DRR programme: the 'with' scenario

The evidence gathered by the fieldwork shows that the CCAP DRR programme has delivered huge benefits to the community. The evidence for the scenario with the DRR programme only covers the cases of normal rainfall years and erratic rainfall years, since the district has not experienced a severe drought since the programme began. Yet, it is notable that, despite the communities' vivid memories of the ravages of drought, they are nonetheless confident about the future. Specifically, they expressed confidence that they will be able to withstand future droughts without becoming food insecure, thanks to the programme.

The following observations help understand this remarkable transformation.

When asked which project activities were most important to food security, given the threat of drought, the focus groups all cited the same factors: crop diversification, soil and water conservation (SWC), and the provision of drought-resistant livestock. This unanimity underlines the centrality of these factors to food security in this context. It is also notable that all three activities involve farm production, revealing the importance of farm income to food security for these communities. Specifically, project interventions in these areas involved the following:

CROP DIVERSIFICATION – The project fostered diversification into both different crop types and improved maize varieties via capacity building and provision of seed. Alternative crops include cassava, groundnuts, sweet potato, beans, soya and pigeon pea. Early-maturing maize seeds were also provided. Interplanting was encouraged as a means to raise production, improve climate resilience and control pests.

SOIL AND WATER CONSERVATION (SWC) AND ENVIRONMENTAL RESTORATION – The project fostered this via capacity building in diverse practices. These include applying manure to fields, composting, water harvesting, contour ridges, tied ridges with vetiver grass and agroforestry.

FIGURE 3 The 'with' scenario – crop diversification, livestock production and soil and water conservation (SWC)

A 'virtuous circle' of food security, asset building, environmental restoration, and resilience to shocks

The DRR programme took the following actions:

- Provision of alternative crop types and early-maturing seed varieties
- Donation of two breeding goats to each household
- Training in soil and water conservation (SWC)
- Contingency planning for future shocks

These DRR actions have had the following direct impacts:

- doubling of crop yields in normal rainfall years
- improved crop yields in irregular rainfall years due to greater resilience
- increased livestock numbers – a key asset
- increased use of water-harvesting and micro-irrigation

With benefits including:

Economic impacts:

- increased income from crop production, thanks to crop diversification and SWC
- increased household assets in the form of goats and new investments, raising income and providing fallback options in periods of hardship
- livestock provide a source of manure for cropping, as well as providing milk, protein and cash income
- intercropping and SWC help control crop pests
- educational gains from children consistently attending school, increasing skills and options
- livelihood diversification fostered by activities and the possible investment opportunities they create

Human impacts:

- improved nutrition and choice of foods, eg diverse crops, livestock products
- lives saved, not only through improved nutrition, but also fewer deaths due to hunting (ie poaching) in game reserve (shot by park wardens)

Social impacts:

- village disaster management plans in place

Natural impacts:

- restoration of local environment (eg better soil fertility, more trees and livestock fodder, greater water retention), thanks to SWC practices

...with significant long-term consequences:

Economic impacts:

- new income allows people to have an adequate diet, maintaining their capacity to work and learn. This in turn ensures food security and helps build a better future
- surplus income used to pay for school fees, milling of grain, petty trade and new assets such as bicycles, all of which bring longer-term development gains
- build-up of savings and assets for future contingencies

Human impacts:

- people avoid the suffering associated with malnutrition and fear of famine and associated social disruption
- strong, well fed people are less susceptible to disease

Social impacts:

- social fabric is strengthened - marriages are not strained, livestock are used for social events such as weddings and funerals, unity amongst the churches has increased, people are again able to sit and discuss problems
- future natural disasters not likely to disrupt social fabric
- improved confidence and sense of dignity - people feel they could cope with another severe drought
- community solidarity - farmers who have benefited most will be able to help others in times of hardship

Natural impacts:

- restoration of the natural resource base leads to wider environmental restoration, or reversal of land degradation that improves the productive capacity and resilience of land
- improved local hydrology makes it easier to access water

LIVESTOCK PRODUCTION – The project provided each target household with a breeding pair of goats as part of a pass-on scheme. (The household passes a young goat on to a neighbour when their own goat has given birth.) Goats are a key asset in the area because they are drought resistant and not susceptible to tsetse fly, yet still produce manure, milk, meat and marketable assets.

During the focus group discussions, it became clear that one fundamental aspect of the programme is that it involves environmental restoration of degraded lands. Such restoration addresses key agricultural needs, notably fertile soil and ample moisture. It also diversifies livelihoods, provides marketable assets, and builds climate resilience. All of this is relevant because local farmlands had become degraded and hence had infertile soil with low water-holding capacity, creating poor growing conditions for crops and acute vulnerability to climate change.

In sharp contrast to the 'vicious' circle of drought and food insecurity described in the previous section, communities identified not only immediate benefits from programme activities, but also a range of knock-on effects that are helping them escape from this downward spiral. Indeed, the scenario with the programme activities clearly demonstrates a 'virtuous circle' of food security, asset building, environmental restoration and climate resilience. For instance, increased crop yields lead to sale of food in the market, allowing families to purchase assets such as farm tools and generators, which provides a safety net in harder times, and building resilience to future climate shocks.

If another big drought hit, it wouldn't be like before. Ample food would still be available within the community, since some farmers have greatly increased their production and those using SWC may get a good harvest despite drought. We also now have savings from previous years. We are much more secure now.

Community member from Jobe Jere village, which benefited from the DRR project

If another big drought hit, it would be even more critical for us than before. One reason is that we cannot harvest as much nowadays as before due to the increased pest problems and erratic rainfall in non-drought years. It is also difficult to obtain improved seeds, since the government issues few coupons and the nearest sales point is 41km away. A third reason is that it is no longer easy to find casual work on estate farms.

Community member from Gezamurjowe village, which did not benefit from the DRR project

5 The cost benefit analysis

5.1 Introduction

This section supports the findings presented in the previous section, describing in greater detail the analysis used to derive the baseline findings, and sensitivity testing around the assumptions used for the analysis.

5.2 The cost benefit analysis – summary of baseline scenario

Clearly, the DRR programme has had a wide range of positive impacts on its target communities delivered through diverse project interventions. Many of these impacts are difficult, if not impossible, to quantify and hence are best stated in qualitative terms. Still other benefits are unknown, given that they involve contingencies that have not yet occurred.

Nonetheless, from the activities mentioned by the communities, the following specific benefits are quantified for analysis:

- increased crop production
- increased livestock production – goats
- loss of education due to drop-out/hunger/lack of school fees avoided
- loss of labour due to malnutrition or hunger-related mortality avoided

The CBA looks at both the benefits and the costs accrued by the project over its lifetime and discounts these to arrive at a benefit to cost ratio (BCR) and a net present value (NPV). These terms are explained in greater detail in Box 2 below. The CBA is conducted for a baseline scenario, and then revisited to test various assumptions using sensitivity analysis. This section presents a summary of the baseline analysis; it is supported by a detailed explanation of the analysis, as well as sensitivity tests, in the following sections.

BOX 2
Explanation of CBA terminology

THE PROJECT LIFETIME is the number of years that the project intervention is expected to bring benefits to the community. This is very likely to be a longer time period than the number of years that the project runs, and is normally taken as the lifetime of the longest-lived asset.

THE DISCOUNT RATE is used to discount costs and benefits occurring in the future, as people place a higher value on assets provided in the present and a lower value on benefits that may accrue further into the future. The discount rate is normally equivalent to the average return one might expect if the same money was invested in an alternative project, and can be derived by looking at the rates used for similar projects within the country. (The discount rate used by development banks can be a good point of comparison.)

THE BENEFIT TO COST RATIO (BCR) indicates the level of benefit that will be accrued for every $1 of cost. A ratio greater than one therefore indicates that the project is worth investing in from a financial perspective, whereas anything less than one indicates a negative financial return.

THE NET PRESENT VALUE takes the net benefit (benefit minus costs) each year and discounts these to their present-day value. If the result is greater than zero, this indicates that the benefits outweigh the costs. The higher the value, the greater the financial argument for initiating the project.

The baseline CBA scenario weighs the total project costs against the quantifiable benefits, over a ten-year timeframe (which assumes that one severe event will occur). Clearly, the analysis only includes a small fraction of the benefits from the project, as highlighted in Section 4.1 and 4.2. Nonetheless, if the findings

are positive on the basis of only a few benefits, we can say with confidence that the project is cost effective, given the wide range of additional benefits that it delivers.

Table 1 below indicates that the project activities that could be quantified yield a minimum benefit of US$24 for every US$1 spent.

TABLE 1
Baseline cost benefit findings

	Benefit to cost ratio	Net present value
10% discount rate	24.30	$9,379,084
0% discount rate	35.96	$14,069,375

These findings are very strong, and particularly so in light of the fact that:

- the analysis uses conservative estimates throughout; and
- the full project costs were used in the analysis, but only a small subset of the myriad benefits of the programme cited by beneficiaries could be quantified

5.3 Description of quantifiable benefits

5.3.1 QUANTIFIABLE BENEFITS IN NORMAL AND ERRATIC RAINFALL YEARS

Increased crop production

> *The effect of the project activities is to produce more crops from a given area of land, and for this production to be more resilient to erratic weather.*
>
> Community member from Malindade Jere village

Project beneficiaries consistently described large increases in crop yields over and above the pre-project case, particularly in erratic rainfall years. These gains were due to a combination of crop diversification and use of SWC practices, though having goats also helped by providing manure to fertilise fields. One key factor was the use of fast-maturing maize varieties in conjunction with SWC practices that allowed farmers to sow maize plants closer together. Table 2 on the following page provides an overview of the qualitative and quantitative benefits brought about by interventions aimed at increasing crop production and its resilience to climate change impacts.

> *If the rains are bad, those with early-maturing varieties may harvest 50 per cent as much as in a good year, while others may harvest just five per cent, since our traditional varieties require lots of rain.*
>
> Community member from Mzuku Mabaso village

TABLE 2
Impacts involving crop production

Qualitative impacts	Quantitative impacts
• more resilient crop production, given climate change impacts such as erratic rainfall and more frequent drought. Notably, SWC practices give more fertile soils that hold more water, allowing crops to better withstand dry spells • greater resistance to pest attacks • reduced spend on fertilisers • improved nutrition through more diverse production and greater capacity to buy food • increased land use efficiency • producing a surplus enables villagers to store grain for subsequent years, notably for times of hardship • greater sense of security and confidence to be able to provide for family in the event of drought, thanks to increased savings, more resilient production and replenished village-based granaries where grain is treated against pests	• increased maize yields during normal rainfall years • increased maize yields during erratic rainfall years

Before I started using manure, I produced 10 tins in a good year, but this year I produced 14 even though rainfall has been erratic. Manure is especially important when rainfall is poor.

Community member from Mzuku Mabaso village

Maize is the staple crop in the area, and yields have reportedly more than doubled in good years thanks to programme interventions. The differences are even larger in erratic rainfall years, given the strong climate resilience benefits of the programme interventions.

Last year I fertilised 50 contoured planting ridges with chemical fertilisers and 30 with manure. But because the rains were erratic, the maize on the ridges with chemical fertilisers dried up, so I only harvested maize from the manured ridges, which produced very well.

Community member from Jobe Jere village

This transformation is even more striking in the light of two facts. One is that erratic rainfall is predicted to become more common due to climate change, while farmers interviewed reported that they have already been beset by what they termed 'crazy weather' over the past few years, namely erratic rainfall patterns. The other fact is that crop prices rise sharply in erratic rainfall years, eg maize typically rises from 600MK to 1,000MK per kilo. The net effect of more resilient production given such market and climatic impacts is that farmers who adopt these interventions benefit greatly because they can sell crops at a higher price.

Agroforestry helps ensure that soil is good and fields are productive. It is especially helpful in bad rainfall years, since it increases moisture retention and provides alternative products, such as timber or fruits, while some seed pods provide excellent dry season livestock fodder.

Community member from Malindade Jere village

The present analysis focuses exclusively on maize yields, since this is the staple crop. Yet, local farmers also grow other crops, and do so now increasingly due to the project's emphasis on crop diversification. Indeed, other crops now represent roughly 50 per cent of the total value of crop production in the project's target communities, compared with 33 per cent in the pre-project case. The gains from the programme would be even greater if these alternative crops were also considered.

When we grow different crops, some cope better with certain threats than others. So, if it is dry or stormy or if a certain pest or disease attacks, it is more likely that at least one or two of the crops grown will do well. Crop diversification helps ensure better nutrition as well.

Community member from Samara village

Increased livestock production – goats

If a household is struggling in a bad rainfall year, selling goats is good option. If possible, though, we prefer not to sell, since livestock provide security, useful products and status.

Community member from Samara village

Each of the target households was given a pair of goats by the project as a means to build up household assets, diversify diets and provide manure for SWC practices. Table 3 provides an overview of the qualitative and quantitative benefits brought about by the provision of goats to target households.

TABLE 3
Impacts involving livestock production

Qualitative impacts	Quantitative impacts
• ability to generate income through the sale of goats to meet pressing needs or build up other household assets • greater sense of security, since selling goats provides a safety net in times of hardship • better nutrition and improved social ties by slaughtering goats for meat, notably on ceremonial occasions • provision of manure, a natural fertiliser that can increase crop production, especially on degraded land. Since manure provides a ready substitute, household expenditures on chemical fertiliser can be avoided. Moreover, manure performs better than chemical fertilisers during periods of erratic rainfall or drought by increasing soil's water-holding capacity • this intervention is self-replicating, since some families mentioned that they have passed on offspring to other families	• increased household assets through increased number of goats • increased income through goat sales • reduced spending on fertilisers through using manure as a natural substitute

Goats in the project area produce on average four offspring each year per breeding pair. Beneficiaries typically slaughter one goat and sell two goats each year. The result is that on average each household has one additional goat per year in its herd. Yet, to ensure the analysis is conservative, we do not assume any increases in goat stocks above their current level.

In reality, goat numbers are likely to increase. One possible implication is that additional goats could be kept by target households, while a second is that they could be sold to raise income. Beyond using goats for their own needs, some households also loan goats to neighbours or relatives, who keep them until they give birth, then return the loaned goat but keep the offspring. This practice is in keeping with the terms stipulated by the pass-on scheme.

> *Goats are very useful to us. When you need cash for things like grain or school fees, you can sell them. The manure they produce improves soil fertility, and you can eat them for meat, particularly on special occasions like marriages.*
>
> Community member from Mzuku Mabaso village

Aggregate numbers can mask important differentials. The distribution of goats varies depending on the poverty status of households. Poorer households (approximately three-quarters of households in the project area) need to sell animals more often to deal with pressing needs. All project beneficiaries received a breeding pair of goats and all breeding pairs reproduce at a similar rate. But because poorer households sell more of these offspring, they end up having fewer goats. At the present time (five years after the launch of the project), it is estimated that richer target households have an average of ten goats, while poorer target households have an average of three goats. To be conservative, the study assumes that target household have on average four goats each in assets.

5.3.2 QUANTIFIABLE BENEFITS SPECIFIC TO SEVERE DROUGHT YEARS

We do not yet know how the target communities would fare in a severe drought, given their new agricultural practices and household assets, since there has not been a drought in the five years since the project started. Specifically, we do not know whether farms would manage to produce crops despite drought thanks to their improved climate resilience. We do know, however, that when asked what they thought would happen in a future severe drought, villagers in the programme area said they believed that they would be able to withstand its effects without becoming food insecure.

While future severe droughts will undoubtedly bring great hardship, even in programme communities, it also seems clear that these communities will avoid the more extreme impacts of drought, such as malnutrition, loss of life, distress sales of assets, and forced marriage. As a result, it was possible to quantify a number of specific programme benefits in the event of a future severe drought, in the form of losses that could be avoided.

Loss of education avoided

One of the significant impacts of the drought of 2001–02 was a loss of education in terms of days of school attendance. The vast majority of pupils did not attend school.

TABLE 4
Impacts involving education

Qualitative impacts	Quantitative impacts
• Children receive a full education, even if it is temporarily interrupted by drought. This is later reflected in their livelihood prospects, whether in the form of improved agricultural practices, livelihood diversification or formal employment. • Children avoid taking life paths that constrain their options, notably working at an unsuitable job or entering into an unsuitable marriage.	• Educational gains (ie avoided losses) are typically valued using a fraction of local wage rates, representing the lost earning potential associated with absence from education.

Typically, children who had to miss school due to the drought ended up missing the entire school year, since pupils who missed a significant fraction of classes or were unable to concentrate could not pass their end-of-year exams. Thus, even where pupils were present for part of the year, they had to repeat their grade the following year.

As a result of the project, it seems clear that many of these educational losses could now be avoided as a result of increased household savings and assets and an improved village-level safety net. To be

conservative, the analysis assumes that most pupils will still miss a year of school, since during periods of hardship coping or survival strategies take precedence. Yet, the study also assumes that cessation of schooling would not lead to pupils dropping out of school, since families will recover more quickly and extreme coping measures such as distress marriages for daughters would not occur.

Loss of labour time avoided

Beneficiaries frequently stated that the impacts of the 2001–02 drought continued well beyond the drought itself. One lasting economic impact of the drought was its longer-term effects on the labour supply and household income. Notably, communities reported that in 2003 most people were still too weak to tend their fields properly, and could only work for a fraction of their normal work day. This led to a poor harvest for many, despite the return of normal rainfall to the area.

> *Following the drought in 2003, people were still very weak and couldn't work effectively, even on their own field. We could manage to work for perhaps 20 minutes before we had to stop and rest, whereas in normal times we work for six or eight hours in a row.*
>
> Community member from Jobe Jere village

TABLE 5
Impacts relating to loss of labour avoided

Qualitative impacts	Quantitative impacts
• Beneficiaries have the physical stamina to continue with a range of livelihood activities, including collecting wood fuel, gathering water and herding livestock. • Beneficiaries have the stamina to take care of children and engage in domestic and social tasks and functions.	• Beneficiaries have the physical stamina to work on their farms and maintain crop production.

Loss of life avoided

Tragically, numerous lives were lost in the drought of 2001–02. These deaths were largely due to hunger or related conditions such as getting sick from eating weeds, maize husk or other potentially dangerous food substitutes. In a few cases, deaths were the result of game wardens shooting villagers caught hunting (ie poaching) animals in the neighbouring game reserve out of desperation. The project beneficiaries clearly felt that such deaths would not occur in a future severe drought due to the factors cited above.

TABLE 6
Impacts relating to loss of life

Qualitative impacts	Quantitative impacts
• grief and psychological strain of losing a family member • disruption of family social fabric and cohesion • children could become orphans if their parents lose their lives; elders and disabled people could lose carers	• loss of income/labour that contributed to the family's livelihood and safety net

It is very important to highlight that this analysis does not seek to place a quantitative value on the loss of life. It is not possible to value human life in this way, since it is infinitely precious. However, it is also important to recognise that the loss of a household member can bring significant hardship to a family, not only as a result of grief and changes to the social fabric of a household, but also because the family must

now cope without the economic contribution of that family member to the household. This material loss is important to grieving families, notably to their food security. The present study therefore includes this one aspect of human life in its analysis, namely the avoided loss of income for that household.

5.3.3 CALCULATION OF BENEFITS

Table 7 below describes the findings from the analysis. The full set of data, assumptions and calculations is included in Annex A, and should be referred to in order to understand how these figures were derived. These quantitative impacts are then brought together for analysis in a cost benefit framework, where benefits accrue over the lifetime of the project.

TABLE 7
Calculation of benefits

Intervention	Description of benefit	Total benefit	Benefit per household
Increased crop production	In both good and erratic rainfall years, maize crop yields are increased by 100% in good years, and even more in erratic rainfall years (accounting for the different values in the total benefit column – see Annex A for full data analysis)	Total benefit good year = $612,000	Good year = $144
		Total benefit erratic year = $1,360,000	Erratic year = $320
Increased number of goats	Value of four additional goats per household plus value of manure	$725,334	$170
Loss of education (drop-out) avoided	Loss of education days due to drop-outs is avoided across 20% of the population (beneficiaries)	$29,040	N/A
Avoided loss of labour	Farmers can work a full six hours a day after the drought as opposed to being reduced to 1.5 hours per day due to weakness/hunger	$153,000	$36
Avoided loss of life	Years of lost income are avoided	$9,800	N/A

The above calculations are supported by the following assumptions and/or observations:

- The project is estimated to have 4,250 direct beneficiaries. Out of the 21,000 people in the project area, the project worked with 5,000 farmers. However, it is estimated that approximately 85 per cent of these people adopted the range of innovations advocated, while 15 per cent adopted only a subset.
- The project has had diverse indirect effects on the wider population. Most notably, other people from the target villages have benefited greatly from the project, adopting many of the target innovations. In addition, people from neighbouring villages have also benefited to a degree. These indirect benefits include both (1) copying SWC practices, farm management practices and experimentation with crop diversification, and (2) being loaned goats or given improved seed varieties by neighbours.
- While there have been several other recent projects in the wider area, the CCAP DRR project has been the only project in the target zone in recent years. The sole exception is that Plan International provided food aid to a few target groups (ie orphans, AIDS sufferers, widows, the disabled, the elderly) in the period immediately following the severe drought of 2001–02. The only other interventions in the project area were ongoing government activities. These included capacity building of farmers via extension agents and some help with water provision and irrigation.
- Given this backdrop, it is safe to conclude that the major changes observed among target households over the last five years are attributable to the CCAP DRR project. This assumption fits with the

statements of the farmers themselves, who strongly asserted that the project activities had had a transformative effect on their livelihoods and food security in the face of drought.

5.4 Identification of risk reduction measures and costs

The total programme cost, for four years, was £268,314, which is equivalent to US$402,471.

The analysis offsets the quantifiable programme benefits against the costs of the full programme of work, as it was not possible to break down the budget by task, and hence the benefit to cost ratios understate the case for DRR, given that the costs for these specific activities should be considerably less.

Data was not available on the avoided cost of relief/food aid associated with responding to a severe drought, but the evidence cited above suggests that government, donor and NGO budgets for relief could represent a significant cost-saving, which would only serve to improve the findings presented below.

5.5 Sensitivity testing

Sensitivity testing allows the findings of the baseline CBA to be tested for different assumptions, such as the frequency of events, as well as any underlying assumptions in the data analysis. These findings help to give an indication of the upper and lower bound estimates of the analysis, and can be particularly important in the light of changing hazard patterns under climate change. For instance, if hazard events are predicted to alter under climate change, sensitivity analysis can be used to look at project returns under these varying conditions. If BCRs are still positive even in a 'worst case' scenario, it can be safely assumed that the project will yield positive returns.

For this study, the following factors have been varied to test the sensitivity of the analysis to changes in underlying assumptions:

- increased frequency of drought under climate change
- increased uptake of project activities
- increased crop yields.

SENSITIVITY TEST: INCREASED FREQUENCY OF DROUGHT UNDER CLIMATE CHANGE

The model was tested with the assumption that erratic rainfall years increase under climate change. The cost benefit model was adjusted to test for an increase from a one-in-three year event to a one-in-two year event.

TABLE 8
Cost benefit findings – increased frequency of severe drought under climate change

	Benefit to cost ratio	Net present value
10% discount rate	26.82	$10,390,234
0% discount rate	39.67	$15,565,375

The quantifiable benefits identified for this study are greatest in erratic rainfall years – largely due to the significant increase in crop yields in these years. As a result, sensitivity testing to account for an increase in severe drought years does not have a strong effect on the CBA outcomes. However, this is because a severe drought has not happened in the project area since project inception, and therefore the analysis only includes a minimum of the quantifiable benefits that we can assume to occur in a severe drought. If data was available on the full magnitude of impacts, then the analysis would more accurately reflect the impact of a changing climate on severe drought and mitigated impacts.

SENSITIVITY TEST: INCREASED UPTAKE OF PROJECT ACTIVITIES

It is estimated that 85 per cent of the 5,000 targeted households have taken up activities under the programme. However, it is also clear that the programme is growing organically (as people pass on/loan goats, pass on learning on SWC and other practices etc). The analysis was therefore tested to assume that the full 5,000 beneficiaries take up activities. The result is a small increase in the BCR, but clearly these ratios could increase quite substantively with organic growth, as the benefits of these practices spread with little to no additional cost.

TABLE 9
Cost benefit findings – increased uptake of project activities

	Benefit to cost ratio	Net present value
10% discount rate	27.95	$10,846,317
0% discount rate	41.35	$16,240,152

SENSITIVITY TEST: INCREASED CROP YIELDS

The baseline analysis evaluates only increases in maize crops, whereas it was clear that communities plant a range of crops, all of which will benefit from SWC, manure and other interventions. Indeed, the project has been promoting crop diversification, and so crop types are only becoming more diverse. It is estimated that maize crops represent half of a given household's yield, and so the analysis is re-evaluated assuming that total crop yields are double those estimated in the baseline.

TABLE 10
Cost benefit findings – increased crop yields

	Benefit to cost ratio	Net present value
10% discount rate	37.32	$14,618,679
0% discount rate	55.22	$21,821,375

Crop yields are one of the areas of greatest benefit within the analysis, and hence a doubling of this figure results in a significant increase in net benefits.

6 Conclusions

6.1 The cost benefit analysis

The DRR programme in Mzimba District, Malawi, has had a very positive impact on target communities, helping them become more food secure despite local climate change impacts. **The programme has delivered US$24 of benefits for every US$1 invested**, as shown by the quantifiable factors examined. This is a conservative estimate, and the true figure could be as much as US$36 of benefits. This is a very strong result, considering that any cost benefit ratio greater than one indicates a positive return on investment. The programme's economic value should not be seen in isolation, however, but rather considered alongside the qualitative benefits of the programme that could not be included in the cost benefit analysis, such as the confidence expressed by the community that they will be able to withstand future droughts.

DRR interventions that emphasise 'no regrets' activities are particularly beneficial – in other words, they deliver developmental gains and hence bring benefits whether or not a natural disaster occurs. **They would have been advantageous even without drought or climate change, yet also help communities respond to these threats across a range of potential future climate change scenarios.**

This case study shows that cost benefit analysis is a useful, evidence-based tool to:

- analyse the benefits of resilience-building activities
- make a strong contribution to debates on the value of integrating a resilience-strengthening approach into development and humanitarian programmes
- inform choices between potential future activities
- develop measures that have the greatest impact on the community
- demonstrate the cost effectiveness of activities when reporting to donors and writing proposals for future projects

The findings show that small-scale farmers can get caught in a 'vicious circle' of food insecurity, asset depletion and vulnerability to shocks. Droughts have ongoing impacts via eroding assets and damaging livelihoods. These changes lower people's resilience to shocks, and affected families often find that they have an even harder time responding to future events. Yet, such communities can also move to a **'virtuous circle' of food security, asset accumulation and resilience**, as activities that improve lives and livelihoods help them to build an asset base that in turn helps them to be more resilient to subsequent events. The programme has helped target communities do just this, as reflected in the powerful quantitative and qualitative findings presented.

The programme has demonstrated a set of **agricultural innovations** and associated measures that have delivered food security to the area. Underlying principles that have supported this progress include:

- Environmental restoration: Restoring degraded lands via mechanisms such as soil and water conservation, which can raise farm productivity while enhancing resilience to shocks
- Diversification and integration: Planting different crops and integrating symbiotic components (eg livestock, trees) into the farm. Examples include practising intercropping to control pests and improving land use efficiency, using manure to fertilise soil while increasing its capacity to hold moisture, and planting farm trees to deliver products (eg wood, fruit, livestock fodder) while improving soil fertility
- Improved seed varieties: Accessing suitable improved seed varieties, such as fast-maturing maize that copes well with short, erratic rains and local pests, yet can be harvested and replanted for years before suffering a significant fall in performance

Some activities can benefit wider communities, especially those that depend primarily on capacity building (eg SWC practices), since people can learn from the example of others. There is also clear evidence that tangible inputs such as goats and composite varieties of maize are being passed on to neighbours and

relatives. The capacity building component also ensures that farmers can benefit fully from interventions and deal effectively with diverse contingencies.

Employing a holistic approach with complementary activities boosted the success of programme interventions. For example, goats provide manure that is used to fertilise fields, while trees planted in fields control erosion and provide dry-season livestock fodder.

BOX 3
Characteristics of a food-secure community

The flow diagram on page 17 shows the benefits of the DRR activities, which can also serve as characteristics or indicators of a food-secure community. These resemble the **'characteristics of a disaster-resilient community'**, and create a vision of what resilience looks like:[18]

- a secure food supply from increased, more resilient crop production
- a stable, nutritious diet from diverse crops, goat's milk and extra income
- access to sufficient water
- skills and knowledge that reduce risk, such as crop diversification, soil and water conservation and livestock-breeding
- drought-resistant agricultural technologies, such as drought-tolerant seeds
- a restored natural resource base – better soil fertility, more trees and livestock fodder
- non-agricultural livelihood options as a result of school education
- surplus income to build up assets and pay for school fees
- savings and assets (goats) for future contingencies
- village disaster management plans in place
- community solidarity to help others in time of need
- stronger social fabric and problem-resolution capacity
- improved confidence and sense of dignity

6.2 Linking the CBA to the broader policy context

As the desk-based study and interviews demonstrated, the government of Malawi has increased investment in agriculture. However, currently there is insufficient investment in disaster risk management and questions remain about the effectiveness, governance and transparency of existing spend in the agriculture sector. As demonstrated, community-led programmes which build local resilience can have a profound effect and build a virtuous circle. Further progress towards achieving food security on a wider scale will require (1) strong policy frameworks at the national level coordinated across government ministries, (2) decentralisation of budgets and decision-making to district and local levels, and (3) effective partnerships between the government and civil society, so that efforts such as these can be replicated and scaled up.

6.3 Learning from CBA – the process

Based on the present study and its experience with gathering field data in Malawi, we may draw several conclusions about using the CBA process to evaluate DRR interventions.

This approach was intuitive for both project partners and target communities, as well as educational. The Malawians readily understood the idea of comparing 'with' and 'without' scenarios and identifying concrete, quantifiable impacts. They found it amusing to see the study team's relentless emphasis on eliciting numeric

18 Twigg J (2007) 'Characteristics of a disaster-resilient community', in The DFID Disaster Risk Reduction Interagency Coordination Group Malawi Strategy Support Program (2009) *Economic losses and poverty effects of droughts and floods in Malawi.* Brief No. 2. IFPRI

impacts following the qualitative discussion of a given theme, since they tend to think more in qualitative terms. Yet, they also found this approach compelling, as they listened to examples from individual farmers about their experience with the project interventions. Some participating farmers were clearly surprised by the results others reported, and it seemed that the focus group discussion was a learning process which could spur on further adoption of programme innovations.

Some aspects of this process worked especially well. The farmers seemed to enjoy talking about the broad themes raised by the study team, notably local hazard impacts, coping strategies and responses, and changes observed over time. They seemed to relate well to framing food security as the goal and drought and erratic weather as key threats. They also appreciated the concept of climate change, since they had observed major climatic changes in recent years that they termed 'crazy weather'. Villagers even had firm ideas about the causes of climate change, pointing in particular to widespread deforestation in the area over recent decades.

Other aspects of this process were more challenging. Notably, the study involved asking farmers to comment about various competing scenarios, which sometimes led to confusion. For instance, farmers had to discuss not only the 'with' and 'without' cases, but also the effects of each of these cases under different rainfall scenarios, ie normal rainfall, erratic rainfall, severe drought. Farmers were also asked to tease out the significance of different programme interventions. Given this complexity, the study team had to be both vigilant and experienced to avoid getting erroneous data based on misunderstandings.

Several caveats need to be stated regarding the applicability of community-based CBA to evaluating DRR interventions:

- CBA could work less well where the programme in question has only started recently, since some programme activities deliver results only gradually, and hence may take time to be fully appreciated by communities. Many SWC practices fall into this category.
- CBA works particularly well where the programme being assessed has a range of activities, providing communities with scope to speak about their relative importance.
- Quantitative findings must be set in their qualitative context, since some benefits and costs are difficult to quantify eg loss of life.

In summary, community-based CBA is an invaluable tool for evaluating DRR interventions. As seen from the results of the present study, it offers strong support for preventative investments and provides a powerful tool to advocate for future DRR interventions with donors and governments. Moreover, it can help both programme partners and donors think through their programming choices in a systematic, rigorous way.

This information will help us understand how the programme interventions can bring changes in the lives of beneficiaries. This process brings out the real achievements of our work, namely how the people have gained from it. It does so in a participatory way, which gives good information while making people think about the progress they've made.

Richard Sulu, Programme Manager, CCAP – Tearfund's partner in Malawi

7 Recommendations

Governments, donors, UN agencies and NGOs should:

- **integrate cost benefit analysis into monitoring and evaluation, vulnerability and capacity analyses, and project design, where appropriate**

  While CBA may not be an appropriate tool in all scenarios, it can be beneficial for evaluating some potential interventions, improving transparency and accountability, and building communities' capacity to recognise value for money when choosing between project options

- **integrate risk analyses and resilience-building activities into development planning and implementation to address the underlying risk factors of drought and food insecurity, as part of the agreement by African governments to allocate at least ten per cent of national budgetary resources for agricultural and rural development (Maputo Declaration, 2003)**

  Tackling the structural causes of chronic food insecurity would reduce the need for costly humanitarian responses to recurring shocks such as drought.

- **increase investment in reducing the risks of severe food insecurity and preventing food crises. Invest a minimum of ten per cent of humanitarian budgets to support context-specific activities and increase people's asset base, livelihood security and preparedness for drought**

  This is based on strong evidence of programme success in this case study and elsewhere, bearing in mind that the success of interventions will depend on ensuring that they fit with the local context and its constraints. Investments in DRR should not be limited to ten per cent of humanitarian budgets and DRR programmes should have longer durations than humanitarian project cycles to have an impact and be sustainable, particularly in protracted food insecure situations.

- **promote strong linkages and coherence between climate change adaptation, DRR, poverty reduction and national sustainable development plans. Encourage systematic dialogue, information exchange and joint working relationships between institutions, focal points and experts working in these areas**

  The case study highlights the importance of linkages across sectors – notably agriculture, water and DRR – and the large potential for increasing the resilience of agriculture to drought and climate change.

- **engage financial and technical support to strengthen local adaptive capacity in order to reduce the risk of the poorest and most vulnerable communities to food insecurity and deliver lasting climate change adaptation solutions.**

  This is based on the benefits of empowering the communities through the project activities. Ensuring these outcomes requires the use of clear and measurable indicators for vulnerability and risk reduction within poor communities, in order to hold policy makers accountable.

The government of Malawi (with wider relevance to other governments facing food insecurity) should:

- **integrate DRR into central policy and programming such as the national agricultural policy (Agriculture Sector-Wide Approach), the Agricultural Input Subsidy programme and other related programmes. This requires increased budgets, political priority and improved coordination, communication and cross-sectoral working between ministries and departments**

This could prevent Malawi from losing some US$12.5 million, or one per cent of GDP, each year due to drought-related losses, and hence could offer major economic gains if applied more broadly. A more proactive and preventative approach would also ensure the most effective, long-term, positive impact on food security for the most vulnerable people.

- **support effective decentralisation with financial and human resources for appropriate administrative levels, in line with the national framework on DRR (eg to coordinate and scale up food security and disaster risk reduction activities at the district level and implement contingency plans, so as to avoid having to submit requests to central government and so speed up responses to food insecurity)**

  This should include strengthening relevant institutions, building technical and financial capacity at the local level, and increasing local representation in decision-making.

- **compare the effectiveness of natural fertilisers and chemical fertilisers in agricultural areas facing the twin threats of land degradation and climate change. Consider the implications of these findings for national agricultural policy, including the national subsidy programme.**

  This is based on the finding that farmers who used only chemical fertilisers on their farms often saw their crop wilt and die when rainfall was erratic, whereas those who used livestock manure and other SWC practices did not have this problem, since these practices foster rainfall infiltration and retain soil moisture. Currently, however, national agricultural budgets in Malawi and elsewhere emphasise chemical fertilisers rather than looking at a broader range of options.

The government of Malawi and civil society should:

- **support effective partnership between civil society and government at local and national levels to increase transparency and accountability of resources for intended beneficiaries. These changes could also help ensure participation, eg in developing district disaster contingency plans and environmental hotspot analyses.**

  This case study has shown the vital role of civil society organisations and local NGOs can play in delivering effective DRR programmes that are replicable, build capacity and act as a direct link with local communities.

NGOs and wider civil society should:

- **share best practice on the qualitative and quantitative benefits of activities in drought-prone countries and multi-hazard contexts to inform choices between potential future activities and develop measures that maximise community impacts. In Malawi, cost benefit analyses should be shared with the Ministries of Finance, Environment and Agriculture and the Department of Disaster Management in order to encourage greater investment in DRR**

  Cost benefit analysis is one tool out of many and should not be the sole means of assessing existing projects or planning future projects. For one thing, not all interventions can be assessed in this way. Nonetheless, where CBA is applicable, findings should be shared in order to inform planning activities, especially given the lack of CBA literature on food-insecure communities in drought-prone countries.

- **advocate for sufficient budget and personnel to implement the DRR, food security and climate change adaptation policies of donors and developing country governments.**

  Discussions with key stakeholders could help identify barriers that prevent investments in resilience-building activities, as well as potential ways to overcome them.

ANNEX A Data analysis of quantifiable benefits

This annex describes in greater detail the data, assumptions and specific calculations used to conduct the quantitative analysis, and should be read alongside Section 5 of the main report.

Increased crop production

The quantitative impacts of increased crop production include:

- increased maize yields during normal rainfall years
- increased maize yields during erratic rainfall years

The average farm size in the area is one acre, and maize is the predominant crop. In a good year, one acre used to yield 12–17 bags of maize weighing 50kg, but this figure has more than doubled to 25–35 bags on farms applying the husbandry practices advocated by the project.

The differences are even larger in erratic rainfall years, given the strong climate resilience benefits of the project interventions. On pre-project farms, yields might fall by 40 per cent. whereas on farms that diligently apply project innovations they may fall by only five per cent. Thus, in an erratic rainfall year, project farms will harvest 24–30 bags of maize, while non-project farms may harvest eight to 11 bags.

Importantly, the market value of a tin of maize differs according to its availability: the market value of a tin of maize is 600MK (Malawi Kwacha) in a normal rainfall year, 1,000MK in an erratic rainfall year, and 2,000MK in a severe drought year.

Increased livestock production – goats

The quantitative impacts of increased livestock production include:

- increased household assets through increased number of goats
- increased income through goat sales
- reduced spend on fertilisers through using manure as a natural substitute

Each of the 4,250 target households was given a pair of goats by the project. Goats in the project area produce on average four offspring per breeding pair each year. Beneficiaries typically slaughter one goat and sell two goats each year. The result is that on average each household has one additional goat per year in its herd.

Given an average lifespan of four to five years, household goat stocks can be conservatively estimated to double every five years. However, to simplify the analysis and ensure it is conservative, we do not assume any further increases in goat stocks above their present level. This assumption means that these additional goats will not be factored into calculations of project benefits. This conservative assumption also addresses the potential concern that rising goat numbers could in time cause decreasing returns due to intensive grazing pressures.

The benefits from goats accrue every year. However, owning goats is especially significant in drought years, given the role of goats and other marketable assets in helping see families through times of hardship. This said, livestock prices fall sharply during droughts (eg from 5,000MK to 650MK for one goat) while grain prices rise sharply, since many households sell assets in order to purchase food.

Loss of education avoided

One of the significant impacts of the drought of 2001–02 was a loss of education in terms of days of school attendance. Typically, children who had to miss school due to the drought ended up missing the entire school year, and had to repeat their grade the following year.

As a result of the project, it seems clear that many of these educational losses could now be avoided. To be conservative, the analysis assumes that most pupils will still miss a year of school, since during hardship periods coping or survival strategies take precedence. Yet, the study also assumes that cessation of schooling would not lead to pupils dropping out of school, since families would recover more quickly and extreme coping measures such as distress marriages for daughters would not occur.

Loss of labour time avoided

Communities reported that in 2003 most people were still too weak to tend their fields properly, and could only work for a fraction of their normal work day, whereas they are now unlikely to be so physically diminished that they would be unable to work properly following the drought.

The cost benefit analysis accounts only for the amount of labour time lost to tasks directly associated with crop production; other benefits, such as collecting wood fuel, are not included. In the year following the severe drought, farmers would work one-and-a-half hours per day during the rainy season in contrast to six to eight hours per day under normal conditions. Based on the seasonal calendar, it is assumed that farmers work five days a week for six months of the year.

Loss of life avoided

Approximately 15 men, eight women and 13 children under five died as a result of malnutrition/hunger in the project area in the 2001–02 famine. It is hoped that this loss of life could be avoided under a severe drought, due to project interventions. As described in the main report, the intention here is not to try and place a value on the loss of a life, but rather to account for one aspect of this loss, namely the loss of their economic contribution to the family. Children would also lose educational time, which in turn contributes to earning potential later in life, but this is not included here so as not to double-count with any losses detailed above.

Table 6: Data analysis record

Intervention	Values/assumptions	a. Calculation of impact without DRR	b. Calculation of impact with DRR	Total benefit (a-b)
Increased crop production	• Average farm size is 1 acre. • Market value of a tin of maize is 600MK (Malawi Kwacha) in a normal rainfall year, 1,000MK in an erratic rainfall year, and 2,000MK in a severe drought year. **Without:** • Average maize yield per household in a good year is 12–17 bags weighing 50kg (1 bag = 3 tins). • In an erratic rainfall year, maize yields may fall by 40%, equivalent to an average household yield of 8 to 11 bags of maize. • Total crop value is about 50% more than for maize alone, since households not involved with the project rely heavily on maize production. **With:** • Yields are increased by 100% in a good year, and resilience to erratic rainfall and climate shocks is also higher. • In a good year, this is equivalent to 25–35 bags of maize per household. • In an erratic rainfall year, this falls by just 5%, which is equivalent to 24–33 bags of maize per household. • Moreover, total crop value is about 100% more than for maize alone, since household involved with the project tend to diversify their crop production.	**Good year – without:** 1 acre * 4,250 beneficiaries * 12 bags * 1,800MK per bag = 91,800,000MK /150 = **$612,000**	**Good year – with:** Above figure +100% = **$1,224,000**	**Good year:** Total benefit = **$612,000**
		Erratic rainfall – without: 1 acre * 4,250 beneficiaries * 8 bags * 3,000MK per bag = 102,000,000MK/150 = **$680,000**	**Erratic rainfall – with:** 1 acre * 4,250 beneficiaries * 24 bags * 3,000MK per bag = 306,000,000MK/150 = **$2,040,000**	**Erratic year:** Total benefit = **$1,360,000**
Increased number of goats	• Received 2 per household, but current stocks range from 3 to 18 per household after 5 years. • Each breeding pair produces an average of 4 offspring per year, but on average one would be slaughtered and possibly two sold each year. • Poorer households sell more goats and hence have fewer (ie 3+), while richer households sell fewer and have more (ie 10+). • Goats live 4–5 years before they are slaughtered. • Market value of an adult goat in normal/erratic rainfall years ranges from 3,000 to 7,000MK (females 5–7k, males 3–5k). In severe droughts, this drops to 500–800MK. • 20 goats produce one tonne of manure a year (allowing for manure that does not reach farmers' fields because goats range free). An equivalent amount of chemical fertiliser would require two 50 kg bags of urea and two 50 kg bags of NPK fertiliser. At 7,000MK per bag, the total cost per year would be 28,000MK.	$0	4,250 beneficiaries * 4 goats per household * 5,000MK per goat = 85,000,000 /150 = $566,667 (4,250 * 4 goats each)/20 * 28,000MK in chemical equivalent = 23,800,000 /150 = $158,667 **Total = $725,334**	**$725,334**

Intervention	Values/assumptions	a. Calculation of impact without DRR	b. Calculation of impact with DRR	Total benefit (a-b)
Loss of education (drop-out) avoided	• 15 schools with 5,000 students in total. Approx 3,000 children attend primary school (8 years, free) and 2,000 attend secondary school (additional 4 years, fees; completing primary school is compulsory). • Some children aged 14 to 18 get married or go to work on estates during a severe drought. • 90% of all pupils ended up getting pulled out of school in 2002 • 90% of smaller children, and 50–60% of older children, returned the following year, while 10% of smaller children and 40–50% of older children did not. • Those secondary school pupils who do not attend school are able to save school fees, estimated at 5,000MK per year per pupil. (This is not applicable to primary school students as primary school is not fee paying.) • The school year is 9 months long, equivalent to approximately 180 school days. • Most pupils leave school at 18. • Wage rate = 100-150MK per day.	Effects in the period following the severe drought • 3,000 pupils under age 14 * 90% don't attend school * 10% don't return to school * 6 years' lost schooling on average[19] * 180 school days per year * 50MK per day = 14,580,000MK /150 = **$97,200** • 2,000 students age 14–18 * 90% don't attend school * 50% don't return to school * 180 school days missed * 2 years' lost schooling on average[20] * 50MK per day = 16,200,000MK /150 = **$108,000** • 2,000 students age 14–18 * 90% don't attend school * 50% don't return to school * 2 years' lost schooling on average * 5,000MK saved on school fees = 9,000,000MK /150 = **($60,000)** Total education days lost as result of severe drought = $145,200. Project benefits approximately 20% of total population, so this figure is weighted by 20%, for **a total impact of $29,040**	$0	**$29,040**
Loss of labour avoided	• In the year following, the severe drought, farmers would work 1.5 hours per day during the rainy season, compared with 6–8 normally. • Work 5 days a week for 6 months for farming, equivalent to 120 days. • Wage rate is 100MK per day (lower estimate).	4,250 beneficiaries * 1.5 hours per day * 10MK per hour * 120 days working in fields per year = 7,650,000MK /150 = **$51,000**	4,250 beneficiaries * 6 hours per day * 10MK per hour * 120 days working in fields per year = 30,600,000MK /150 = **$204,000**	**$153,000**

19 Half of 12 years – accounting for the fact that some students will drop out at an early age and miss the full 12 years, whereas others will drop out at 14 and so not miss any primary schooling

20 Half of four years – see footnote above

Intervention	Values/assumptions	a. Calculation of impact without DRR	b. Calculation of impact with DRR	Total benefit (a-b)
Loss of life avoided	• Approximately 15 men, 8 women and 13 children under 5 died as a result of malnutrition/hunger in the project area in the 2001–02 famine. • Local wage rates vary with the climate: (1) normal rainfall = 120–150MK /day, (2) erratic rainfall = 110–135MK /day, (3) severe drought = 90–100MK /day. 100MK /day is a conservative estimate. • Average life expectancy in the study area – 49 years. Assuming that the men who died were between the ages of 18 and 49, they would have had an average of 15 years of life remaining. Children under 5 would have 13 years of school lost (not included here) and 30 years of income lost.	Years of lost income: Adults: 15 years * 100 days' work per year * 100MK per day * 23 adults = 3,450,000MK /150 = $23,000 Children: 30 years * 100 days' work per year * 100MK per day * 13 children = 3,900,000MK /150 = $26,000 **Total lost income $49,000, weighted by 20% for a total lost income of $9,800**	$0	**$9,800**

Bibliography

Barrett CB, Place F, Aboud AA (2002) *Natural resources management in African agriculture: understanding and improving current practices*. Wallingford: CAB International

Bread for the World Institute (2009) *Hunger 2009: global development - charting a new course*.

Cabot Venton C, Venton P (2004) *Disaster preparedness programmes in India: a cost-benefit analysis*. Humanitarian Practice Network Paper No. 49, November 2004

Cabot Venton C (2010) *Cost benefit analysis for community based climate and disaster risk management: synthesis report.* Developed and commissioned by Oenone Chadburn from Tearfund and Jacobo Ocharan and Karey Kenst from Oxfam America

CARE (2008) *Humanitarian implications of climate change: mapping emerging trends and risk hotspots.* CARE/ Maplecroft/OCHA report.

Chambers R (2007) *Who counts? The quiet revolution of participation and numbers.* Brighton: Institute of Development Studies

Cleaver KM, Gotz AS (1994) *Reversing the spiral: the population, agriculture and environment nexus in sub-Saharan Africa.* Washington DC: The World Bank

Climate Hearings website. http://climatehearings.org

Conway D, Schipper ELF (2010) 'Adaptation to climate change in Africa: challenges and opportunities identified from Ethiopia'. *Global Environmental Change*, doi:10.1016/j.gloenvcha.2010.07.013

EM-DAT: OFDA/CRED International Disaster Database. www.em-dat.net

FAO (2010) *Climate change implications for food security and natural resources management in Africa.* Twenty-sixth Regional Conference for Africa. Luanda, Angola, 3-7 May, 2010

Global Network of Civil Society Organisations for Disaster Reduction (2009) *Clouds but little rain… Views from the Frontline: A local perspective of progress towards implementation of the Hyogo Framework for Action*

Government of Malawi (November 2009) *National disaster risk reduction framework, 2010–2015*, p.5

Hazell P, Ruben R, Kuyvenhoven A,Jansen H (2008) 'Development strategies for Less-Favored Areas', in Bult E, Ruben R (eds) *Development economics between markets and institutions: incentives for growth, food security and sustainable use of the environment.* Mansholt Publication Series, volume 4. The Netherlands: Wageningen Academic Publishers

Heltberg R, Siegal PB, Jorgensen, SL (2009) 'Addressing human vulnerability to climate change: toward a "no regrets" approach'. *Global Environmental Change*, volume 19

IAASTD (2008) *Synthesis report of the International Assessment of Agricultural Knowledge, Science and Technology for Development*

IFPRI (2009) *Natural disasters, self-insurance and human capital investment: evidence from Bangladesh, Ethiopia and Malawi.* IFPRI Discussion Paper 00881. Washington DC: International Food Policy Research Institute

IFPRI (2010) *Economic losses and poverty effects of droughts and floods in Malawi.* IFPRI Malawi Strategy Support Programme, Brief No. 2. Washington DC: International Food Policy Research Institute

IPCC (2007a) 'Summary for policymakers', in *Climate change 2007: impacts, adaptation and vulnerability.* Edited by Parry, Canziani, Palutikof, van der Linden, Hanson. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. 7-22

IPCC (2007b) 'Africa', in *Climate change 2007: impacts, adaptation and vulnerability.* Edited by Parry, Canziani, Palutikof, van der Linden, Hanson. Contribution of Working Group II to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge, UK: Cambridge University Press. 433-446

Kelly C, Khinmaung J (2007) *Prepare to live: strengthening the resilience of communities to manage food insecurity in the Sahel region.* London: Tearfund

Lufumpa CL (2005) 'The poverty-environment nexus in Africa'. *African Development Review*, volume 17, issue 3

Lutz W, Sanderson WC, Scherbov S (eds) (2004) *The end of world population growth in the 21st century: new challenges for human capital formation and sustainable development*. See chapter 6: 'Population - environment - development - agriculture interactions in Africa: a case study on Ethiopia', by Lutz W, Scherbov S, Makinwa-Adebusoye PK, Reniers G. London: Earthscan

McGray H, Hammill A, Schipper L, Parry J (2008) *Weathering the storm: options for framing adaptation and development.* Washington DC: World Resources Institute

Munthali, Mdyetseni (2009) *Public financing of agriculture in Malawi.* ActionAid Malawi

Siedenburg J, Pfeifer K, Hauser K (2009) *People-centred resilience: working with vulnerable farmers towards climate change adaptation and food security.* Oxfam International Briefing Paper

Twigg J (2007) 'Characteristics of a disaster-resilient community', in The DFID Disaster Risk Reduction Interagency Coordination Group Malawi Strategy Support Program (2009) *Economic losses and poverty effects of droughts and floods in Malawi.* Brief No. 2. IFPRI

UNCCD (2010) 'Land Day' events held at the United Nations Convention to Combat Desertification secretariat in Bonn in June 2009 and June 2010. See: http://www.unccd.int/publicinfo/landday/menu.php and http://www.unccd.int/publicinfo/landday/2010/menu.php

UNEP (2008) *Africa: atlas of our changing environment.* Nairobi: United Nations Environment Programme

UNFCCC (2006) *Report on the African Regional Workshop on Adaptation.* Bonn: United Nations Framework Convention on Climate Change

UNISDR (2009) *Global assessment report on disaster risk reduction 2009.* Geneva: United Nations International Strategy for Disaster Reduction

Wiggins S (2009) *CEDRA: Climate Change and Environmental Degradation Risk and Adaptation assessment*. London: Tearfund

WRI (2008) *World resources report 2008. Roots of resilience: growing the wealth of the poor.* Washington DC: World Resources Institute

World Bank (2008) *World development report 2008: agriculture for development.* Washington DC: The World Bank

World Bank (2010a) *Economic evaluation of climate change adaptation projects: approaches for the agricultural sector and beyond.* Washington DC: The World Bank

World Bank (2010b) *Potential of agroforestry to contribute to poverty alleviation to economic growth and to protection of environmental services in the countries of the Southern and Eastern Africa regions. A discussion paper.* Washington DC: The World Bank

tearfund

www.tearfund.org
100 Church Road, Teddington, TW11 8QE, United Kingdom
Tel: +44 (0)20 8977 9144

Registered Charity No. 265464 (England and Wales)
Registered Charity No. SC037624 (Scotland)

20236–(1110)