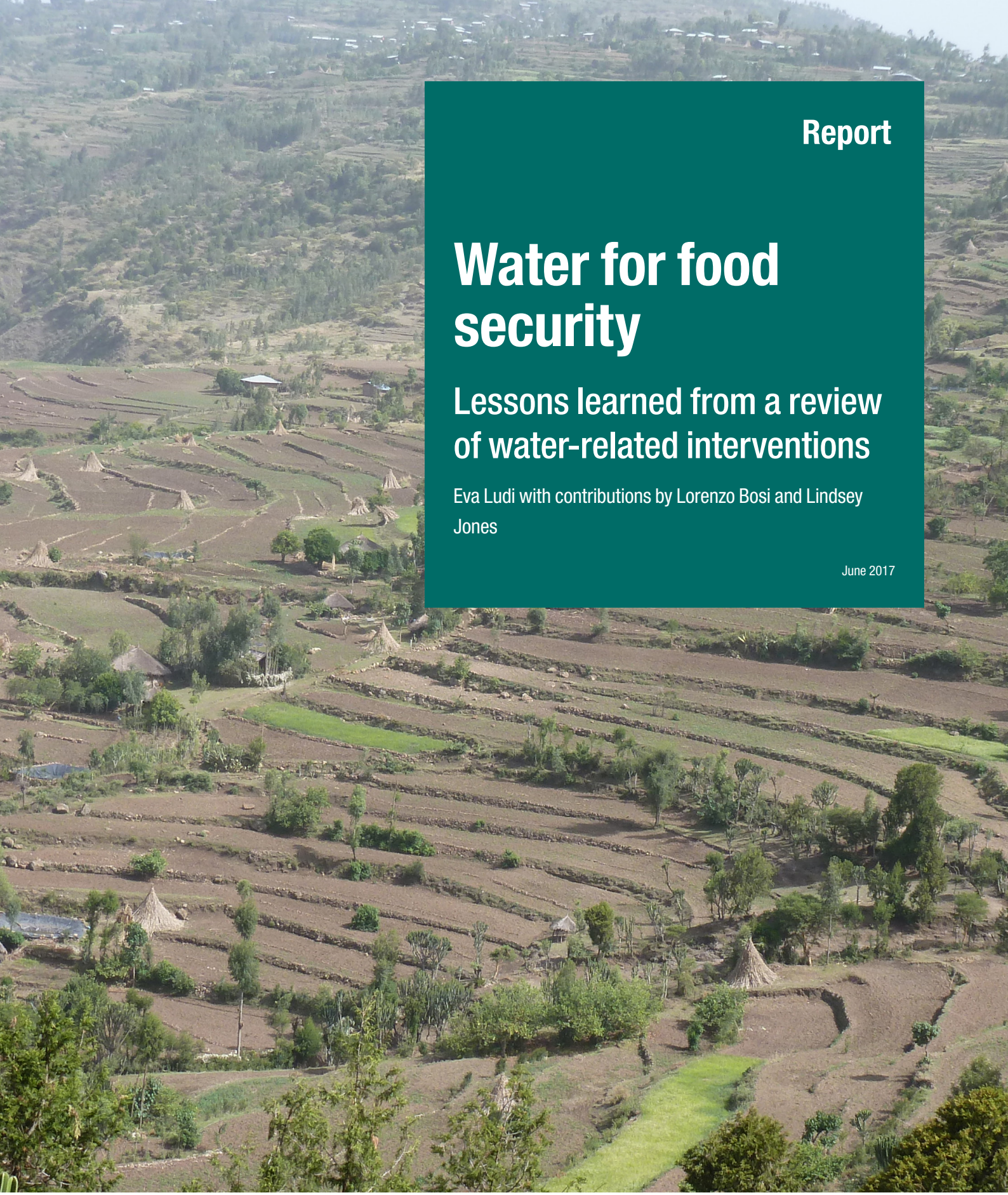

Report

Water for food security

Lessons learned from a review of water-related interventions

Eva Ludi with contributions by Lorenzo Bosi and Lindsey Jones

June 2017

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Cover photo: E. Ludi, 2012. A well-managed MERET watershed in Wello, Ethiopia.

Acknowledgements

This study was commissioned by the World Food Programme (WFP) and carried out by the Overseas Development Institute (ODI) under the overall guidance of the Policy, Programme and Innovation Division (OSZ). The research was part of the Water and Food Security Nexus: Challenges and Opportunities for Vulnerable Areas project funded by Canada's International Development Research Centre through its Climate Change and Water Programme. Complementary financial resources from the Climate Adaptation Management and Innovation Initiative (C-ADAPT), funded by the Government of Sweden's fast-track climate finance have also been used.

The study was conducted primarily through field visits to three countries – Bangladesh, Ethiopia and Kenya – in which WFP supports national governments and its development partners implementing food assistance programmes aimed at building household and community resilience through food and cash-for-work programmes. The programmes supported specific water-related asset-building activities, such as soil and water conservation, rainwater harvesting, rehabilitation of degraded natural environments, infrastructure rehabilitation, and training in disaster risk reduction and livelihood protection for poor and food-insecure households.

The author would like to thank WFP Headquarters staff, especially Carlo Scaramella and Lorenzo Bosi, and country and sub-office staff, in particular Fithanegest Gebru and Purnima Kashyap in Ethiopia, James Kamunge and Saikouba Ahmed in Kenya, and Siddiqul-Islam Khan, Asifa Ashrafi and Hafiza Khan in Bangladesh. Thanks also go to government officials and representatives of United Nations agencies, multilateral and bilateral donor organisations, non-governmental organisations and research organisations, who dedicated their time and approached the interviews in a frank and constructive manner. The expertise and insights shared and the productive discussions held are acknowledged. The staff of WFP sub-offices in the three countries visited deserve special thanks for their efforts in organising and supporting the field visits. Particular thanks go to the staff from OSZ for their open mind to engage in constructive discussions.

Special thanks go to the community members who shared their views freely and openly and spent time with the author.

Thanks go to Lindsey Jones (ODI) for writing sections related to water-resilience links, to Roger Calow (ODI) for useful comments on an earlier draft, and to Claire Shelton (University of East Anglia) and Sobona Mtisi (ODI) for providing support on a literature review. Discussions with Lorenzo Bosi (WFP-OSZ) during the field trip and after were very helpful in shaping the report. His support to edit a long version of the report is also acknowledged. Helpful comments on earlier drafts were also received from Volli Carucci and Scott Ronchini (WFP-OSZ). Dr Gete Zeleke from the Water and Land Resource Centre in Addis Ababa, Ethiopia, has reviewed the report and provided very helpful comments.

Every effort has been made to faithfully reflect the responses of interviewees for the analysis of this report. However, any inferences made remain the sole responsibility of the author.

Disclaimer

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Abbreviations

ASAL	Arid and semi-arid lands
BWDB	Bangladesh Water Development Board
CP	Country programme
DRR	Disaster risk reduction
EDP	Enabling Development Policy
ER	Enhancing Resilience to Disasters and the Effects of Climate Change
FAO	Food and Agriculture Organization of the United Nations
FFA	Food Assistance For Assets
FFW	Food For Work
GDP	Gross Domestic Product
GFD	General Food Distribution
IFAD	International Fund for Agricultural Development
LGED	Local Government Engineering Department
MDG	Millennium Development Goal
MERET	Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods
n.d.	No date
NFI	Non-food item
NGO	Non-governmental organisation
ODI	Overseas Development Institute
OSZ	Policy, Programme and Innovation Division
PRRO	Protracted relief and recovery operation
SLP	Seasonal Livelihood Programming
SWC	Soil and water conservation
UNDAF	United Nations Development Assistance Framework
WFP	World Food Programme

Executive summary

The majority of the world's 800 million food-insecure people live in regions where water and food security are intimately linked. Tackling the underlying causes of food insecurity therefore means addressing a set of livelihood vulnerabilities, including access to water for domestic and productive uses. The World Food Programme (WFP), as the United Nations humanitarian agency charged with addressing hunger and food insecurity, has commissioned this report with a view to deepening its understanding of the underlying issues and informing programme interventions.

The findings presented are based on case studies carried out in 16 project sites in Bangladesh, Ethiopia and Kenya. The aim was to capture a range of interventions supported by WFP, and a variety of partnerships and implementation modalities at local and national levels. Information was collected through consultations and key informant interviews at different levels, field visits to specific project sites where WFP-supported water-related activities are implemented, focus group discussions with beneficiaries and observations by the author.

While findings presented in this report are based on research carried out on WFP-supported programmes, insights gained are expected to be relevant well beyond WFP. Natural resource conservation and water management activities are at the heart of many interventions by a broad range of development partners as they are assumed to contribute to enhancing food security and resilience. Although WFP's approach is unique insofar as it is using cash- and food-for-asset approaches, the recommendations and conclusions presented should be relevant to other agencies engaged in livelihood support programmes in rural areas.

Links between water and food security

At the household level, poor water access can compromise food security through a range of links related to inadequate hygiene practices, consumption of unsafe drinking water, valuable time spent collecting water, or reduced income because of compromised access to productive water. But also too much water can impact food security where infrastructure is damaged or where crops and livestock are flooded.

Impacts of watershed protection on production, livelihoods and food security depend on a range of biophysical, socio-economic and political factors. A literature review showed that few rigorous evaluations exist, and links between watershed protection and livelihood outcomes are often assumed and not rigorously verified. Where the impacts of watershed protection on production, livelihoods and food security were assessed, findings were not unambiguously positive, as they can have negative hydrological and downstream impacts and create winners and losers, both within and between watersheds. Nevertheless, watershed protection and sustainable land and water management practices are important contributions towards increasing food production and resilience if adapted to the specific context and implemented in conjunction with interventions addressing other drivers of food insecurity and poverty.

Water and WFP

WFP's water-related interventions are governed by a number of strategies and policies, including: (i) the overall WFP Strategic Plan; (ii) the Enabling Development Policy, which aims at sharpening WFP's focus in the use of food in support of developmental activities; (iii) the WFP Policy on Disaster Risk Reduction and Management, which recognises the close links between disaster risk, poverty and food insecurity; and (iv) the Gender Policy. In recent years, an important reorientation has taken place within WFP on how food assistance is used: away from food for work (FFW) and towards Food Assistance for Assets (FFA). Food and/or cash are used both to bridge food gaps and as an incentive to carry out household- or community-level labour-intensive investments in natural resources that might otherwise not be done. WFP supports a broad range of water-related activities, including water for nutrition and health, soil and water resources conservation, and water for food production and hazard protection. In 2010/2011, of 341 projects supported by WFP globally, 113 (33%) included water activities. The three case study countries – Ethiopia, Kenya and Bangladesh – are among the five countries supported by WFP with the most water-related interventions.

In Ethiopia, field visits took place in four sites of the national programme, Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods (MERET). WFP supports the Government of Ethiopia in implementing MERET in 72 food-insecure districts, and aims to increase the ability of rural food-insecure households to better manage shocks, meet food needs and enhance livelihood strategies through improved, sustainable land management practices. In Kenya, six project sites in two districts were visited where WFP supports the Government of Kenya to implement programmes that focus on water conservation and storage, rehabilitation of irrigation systems and promotion of

sustainable land management practices. In Bangladesh, four project sites under the Enhancing Resilience to Disasters and the Effects of Climate Change (ER) programme were visited, where WFP works with the Government of Bangladesh to enhance the resilience of vulnerable communities to natural disasters and the effects of climate change through the creation of community assets and improved food and nutrition security of ultra-poor households.

Findings from Ethiopia, Kenya, Bangladesh

In all sites visited, beneficiaries reported increased water availability, reduced runoff and soil erosion, or improved water management as a result of WFP-supported interventions. This has led to an increase in area under production, rising crop yields and improved livestock health and production, and a range of livelihood improvements, including reduced drudgery for women and girls for collecting water, improved hygiene and sanitation, improved income, reduced food gaps and improved nutrition. Specific support was provided to help women access income, and training programmes are targeting the particular food security needs of women. Among the main challenges reported was that water sources, having been built mainly for providing productive water, are insufficiently protected to provide safe and secure domestic water. The scale of benefits, i.e. the number of people benefiting directly from the assets, could not be ascertained. Although interventions were reported to have contributed to reducing food gaps, the number of households able to become food self-sufficient was limited, albeit larger than in areas not supported by FFA programmes. However, differences need to be taken into account across the three countries – the programme in Kenya is still ongoing, the ER programme in Bangladesh has gone through a number of different phases, and progresses in Ethiopia need to be seen against the seriousness of land degradation.

Ethiopia (Tigray and Amhara regions)

The WFP-supported MERET programme in Ethiopia has invested in a broad range of soil and water conservation and natural resource rehabilitation activities. In addition, homestead development packages including different income-generating activities were promoted to enhance household income in general and support women in particular. Increased soil moisture, increased soil fertility, reduced soil erosion and reduced sediment deposition on cropland further downslope are attributed to conservation activities on cropland and hillsides and considered a contribution to improved crop yields. In all sites visited, respondents reported increased water availability, both in terms of soil moisture and water from ponds, springs and shallow wells, which can also be used for small-scale irrigation. Improved water availability is of great concern to women and girls, who often had to spend long hours walking to water sources. They reported that time spent collecting water has reduced due to increased water availability from shallow wells and springs.

Respondents indicated that income-generating activities, combined with improved crop yields and revenues from livestock, have led to increased household incomes. Exact figures could not be obtained, but beneficiaries estimated that in the best situations income might have doubled. In terms of increased production, some farmers estimated that in favourable locations yields had doubled since MERET interventions were initiated. But as with income changes, because no baseline data were collected it is impossible to triangulate farmer's perceptions against measured crop yields or discount other (non-MERET) influences on production and income.

Enabling women to gain an income has been a central concern for MERET. Specific income-generating activities were targeted at women, and women's associations were usually formed. Some of these enjoyed access to closed areas for planting trees for timber, cutting and selling grass, and planting fodder for livestock fattening. Similarly, supporting youth groups and creating income-generating opportunities for landless youth was also important.

As a result of participating in FFA activities, some previously food-insecure households were able to improve their own production and income sufficiently to "graduate". In other words, they no longer depended on external support provided through safety-net programmes. None of the watersheds visited were able to graduate and become food-secure as a result of MERET interventions. This, however, has to be seen against the initial severity of land degradation in these sites. Despite positive reports of increased production and income, improved livelihoods and increased ability to deal with stresses, the majority of respondents still considered themselves vulnerable or even food-insecure.

Kenya (Turkana and Makueni counties)

As elsewhere, FFA activities in Kenya start with problem identification and the prioritisation of on-site or off-site rainwater harvesting projects by communities. Respondents mentioned that measures have increased water availability for livestock, irrigated crop cultivation and domestic use, and enhanced grain crop, vegetable and fruit production, all of which are contributing to improving food security and nutrition, reducing drought risk and enabling additional income-generating activities.

In pastoral areas, WFP is using FFA for the construction of water pans. These pans are combined with trapezoidal bunds for rainwater harvesting to initiate crop farming. In semi-arid areas, a number of different resource conservation interventions have been implemented through FFA to improve rainwater harvesting on cropland, water collection in dams and farm ponds, combined with rehabilitation and construction of rural feeder roads to improve market access, and a range of different training activities.

Respondents indicated that water harvesting increased yields and that the introduction of horticulture contributed to increasing incomes. Respondents also mentioned livestock health improvements as a result of greater water availability. Exact figures on how much production or incomes increased could not be obtained, but beneficiaries estimated that in the best situations yields might have doubled and food security, measured in terms of food availability throughout the year, had improved. Although income has increased and food gaps could be reduced, in none of the sites visited were households able to become fully food self-sufficient. In large part, this can be explained by FFA interventions having been relatively recently introduced; their impacts have yet to be fully felt.

Among the benefits mentioned from improved water access are increased amounts of water used at the household level for different purposes, reduced time spent by women and girls for fetching domestic water, and less travelling time spent by men and boys to access water for livestock. Furthermore, respondents also mentioned that hygiene had improved as water was now more readily available for washing clothes and for personal hygiene.

Bangladesh (Khulna and Barisal districts)

In contrast to Ethiopia and Kenya, the focus of WFP-supported investments in the sites visited in Bangladesh is less about increasing water availability and more about water management, especially managing fresh and saline water flows and drainage. Interventions enabled re-excavating canals to drain excess floodwater and store freshwater after the monsoon season. These interventions have led to reduced flooding with saline water and allowed to reclaim land for paddy. Repairs to embankments, mostly built in the 1960s but since then not maintained, have become necessary, especially in the aftermath of cyclones. Repairing embankments has reduced flooding of village areas, damage to property and flooding of cropland. Alongside repairs, embankments were raised by more than 1 m, taking into account recent flood levels. According to technical experts, however, embankments should have been raised further to be better able to withstand the projected effects of increased tidal surges and sea-level rise predicted as a result of climate change.

Food gaps in the sites visited are caused by many different factors, including poverty, landlessness and dependency on seasonal and low-paying daily labour. On top of structural factors are frequent crises through flooding and cyclones. The approach used by WFP in Bangladesh is to primarily engage ultra-poor people in the planning and building of community assets and in training. Beneficiaries mentioned that the combined effect of food and cash for physical assets creation, cash for training, and increased labour availability had resulted in households becoming able to meet their food requirements.

Besides the direct income and food provisions, beneficiaries listed a range of additional benefits from WFP-supported activities, including increased paddy, winter crop and vegetable cultivation, increased on-farm labour opportunities for the landless and reduced need for long-distance migration, increased income from livestock and fish, reduced property damage, improved transport links on embankments, and improved personal and household hygiene.

Among the concerns mentioned was the unequal distribution of direct benefits of canals between landless people and those farmers with land. Although there was more freshwater available, it was noted that benefits accrue mainly to those farmers with land close to the canals. It was also pointed out that the ability to irrigate depended on having access to electricity or on being able to afford fuel to operate a diesel pump.

Women reported that WFP-supported programmes were important to them as they offered the only direct employment opportunity besides the government's safety nets. Since payments were recorded in women's names, women have gained control over cash income and a stronger decision-making position within the household in terms of allocating where the additional income goes. Accessing safe drinking water was only rarely mentioned as a major issue, despite beneficiaries reporting that they are using unprotected canal and pond water for a range of purposes including for domestic use.

WFP and its partners provide a series of training modules for the local government on disaster reduction, preparedness and management, and post-disaster management. Training provided to beneficiaries is organised into two main modules – life skills, including managing disasters, and income generation skills. Other training modules focus on health, sanitation and hygiene, and specific training modules concentrate on women's rights and empowerment. Beneficiaries mentioned that such training has helped increase their dignity and respect in the village, enabled them to use available cash in more productive ways and not just for consumption, and allowed them to buy productive assets.

In all sites visited, WFP-supported activities are still ongoing and therefore no information could be collected in terms of food security after the support ends. It could not be established whether people will be able to maintain their food security status over the longer term, or whether they would fall back into recurrent food insecurity once the safety-net function of the WFP-supported FFA component comes to an end. In addition, as underlying drivers of poverty are not addressed by WFP-supported interventions and only ultra-poor households are engaged in FFA asset creation programmes, the sustainability of interventions and impacts remains questionable.

Key characteristics of WFP's water-related interventions

Key characteristics of WFP's water-related activities across the sites visited in the three countries include:

- **Alignment with WFP's Strategic Objectives.** Activities are focusing on strengthening government capacity to prepare for, assess and respond to acute hunger arising from disasters and in establishing effective early warning systems and vulnerability analysis. At the local level, activities are supporting communities to reinforce their food and nutrition security and their adaptability to climate change through a range of cash- and food-based assets to strengthen their livelihoods and ability to deal with shocks. WFP-supported activities broadly follow a livelihoods approach, whereby critical household and community assets are built that are thought to address some of the underlying causes of food insecurity and contribute to building resilience. By combining the creation of natural assets managed by households and communities with capacity development, skills creation, training, and the introduction and promotion of alternative income-generating activities, contributions are also made that target wider livelihood needs.
- **Partnerships with governments allow WFP to influence and support policy and practice over time.** Working closely with governments, United Nations agencies and bilateral donors, WFP has played an important role in developing manuals and guidelines on participatory, community-led natural resource management planning and implementation. Through its implementation approach, WFP also helped change attitudes towards bottom-up and participatory planning, implementation, and monitoring and evaluation.
- **A focus on building natural assets considered essential for sustainable and more resilient livelihoods.** Despite the lack of rigorous and scientifically backed-up evidence of impacts of natural resource management interventions on production or livelihoods, households self-reported enhanced production and increased income resulting from interventions. Increased income is likely a result of a combination of natural resource investments and additionally introduced income-generating activities.
- **Use of implementation modalities based on:**
    - The use of food (and/or cash) to reach large numbers of people in food-insecure situations, whereby food is used to fill temporary food gaps and incentivise investment in natural assets that might not otherwise be built.
    - Working in partnership with governments, other United Nations agencies, especially the Food and Agriculture Organization of the United Nations (FAO) and the International Fund for Agricultural Development (IFAD), non-governmental organisations, community-based organisations and projects implemented by other partners. This enables WFP to access specialised technical expertise and additional funding and contributes to coordination and learning through sharing lessons. Examples include manuals and guidelines for participatory and community-led natural resource management planning and implementation in Ethiopia, the development of a national community-based targeting and distribution system in Kenya, or WFP's role in donor platforms and interagency action plans.
    - The use of community-led, participatory planning approaches to identify the most appropriate and locally acceptable interventions that become locally owned and managed.
    - Design standards that are appropriate and follow national guidelines, but that lack a specific maintenance strategy to enhance asset sustainability.
    - Integrating training, either with regard to the assets (e.g. on watershed planning, income-generating activities) or more broadly on life skills (e.g. disaster preparedness and management, food and nutrition, health, basic rights) as an important part of asset creation programmes.

Recommendations – how to strengthen water-related interventions

Interventions supported by WFP in the water sector can be an important stepping stone towards enhancing food security and household and community resilience. A number of recommendations are made towards ensuring that the positive impacts achieved so far can be maintained over time, are fully embedded in government and development partners' policy and practice, are scaled up, and are contributing sustainably to poverty reduction and resilience in a changing world. Many of these are relevant for a wider set of agencies and institutions engaged in natural resource conservation and water and land management well beyond WFP. Some changes could be implemented immediately, while others require a longer timeframe, in part because the required expertise is not readily available, further research is required, or organisational and implementation modalities need to change.

Recommendations for immediate action include:

- **Strengthening existing partnerships and establishing new ones** in view of providing further support in transforming investments created through FFA into sustainable assets.
- **Embedding water development in broader livelihood and food security systems,** recognising that natural resource degradation is but one of many drivers of food and livelihood insecurity. Better outcomes could be achieved if natural assets were embedded in a broader suite of interventions addressing the many social, economic, institutional and political drivers of natural

resource degradation itself and of food insecurity and poverty.

- **Geographically integrating investments** by adopting a watershed approach, similar to the one applied in Ethiopia, to planning, design and implementation and combining different interventions (soil and water conservation, water harvesting structures, promotion of small-scale irrigation, etc.). The aim should be to exploit synergies in areas where this is not already done.
- **Strategically select intervention areas** to ensure that assets created through WFP-supported interventions are not endangered by degradation processes in the wider environment.
- **Combining productive and domestic water and strengthening the focus on water quality.** Integration of all uses of water and of sanitation and hygiene is a major requirement that needs additional attention. Even without specific activities to improve domestic water sources, a more focused approach on improved Multiple-use Services (MUS) could enhance the value of water-related interventions established through FFA.
- **Addressing upstream/downstream conflicts** through a better understanding of the hydrology and the interconnectedness of watersheds to ensure downstream users are not deprived of water "conserved" upstream.
- **Combining food and non-food items for water development.** A more balanced share of food (to compensate people's labour for water-related interventions) and non-food items (such as machinery, concrete and tools) would be helpful, particularly when considering investments in "downstream" activities that are cash rather than labour-intensive.
- **Adopting good practice principles for water development in pastoral areas.** Pastoral areas pose specific challenges with regard to water development. A set of good practice principles should be followed that guide water development so it is undertaken within a broader landscape context, recognising the relationships between water, pasture and pastoral mobility and the risks of water-related environmental degradation and conflict. A broader portfolio of activities supporting pastoralists, and not just settled agropastoralists, should be considered. The role of indigenous knowledge in resource management should be given emphasis before embarking on new resource development interventions in pastoralist areas.
- **Collecting baseline information and strengthening monitoring.** More attention should be paid to collecting baseline information for evaluating the effectiveness and impact of water-related interventions, and for providing evidence on where and how interventions can be improved.

Longer-term priority areas for change include:

- **Increasing the duration of interventions** beyond the current two- to three-year projects. Adopting a longer timeframe over which interventions in both physical and natural assets as well as human and social capital are implemented could contribute to enhanced resilience.
- **Adopting a focus on downstream investments to increase the effectiveness and sustainability of water-related interventions.** FFA-supported water-related investments could achieve better outcomes if they were better integrated into overall socio-economic contexts. Building strong partnerships could complement WFP-supported water-related investments and are required to address "downstream" requirements. Better integration and additional investments are necessary to translate outputs (e.g. watershed protection, soil and water conservation structures) into outcomes (e.g. increased yields or income) and eventually impacts (e.g. poverty reduction and food security). A more robust and streamlined strategy for engaging partners from the outset of interventions should build on existing initial initiatives, as some countries (e.g. Kenya) have already done through the use of Seasonal Livelihood Programming.
- **Strengthening institutions.** A central characteristic of FFA interventions is their focus on building assets at the household and community levels, accompanied by capacity development and training. What is less apparent is an equally strong focus on supporting or building the institutions that are required to make assets sustainable. Institutions are also required to manage communally held assets, to ensure equitable access to assets and prevent elite capture, and to solve conflicts that may arise over how to use assets among users with diverging interests.
- **Revisiting design specifications to climate-proof interventions and enhance resilience.** Climate change will place additional pressure on already limited water resources and will enhance requirements for water management. This requires greater emphasis on screening water-related investments for resilience, and identifying strategies for incorporating climate change impacts into projects. A balanced approach is suggested that combines capture of seasonal rainfall (on-site and off-site water harvesting) and explores opportunities to tap deeper and better buffered aquifers. Equally important is to assess communities' adaptive capacity to make sure the right interventions are supported that actually enhance adaptive capacity and resilience.

Conclusions

Degradation of natural resources is one of many drivers undermining food security and livelihoods. Investments in natural resources are a critical requirement in the fight against hunger and an important stepping stone to support

people to move out of poverty. Increased water availability and improved water management have had positive knock-on effects on crop yields, and have allowed more water to be used for productive and domestic purposes, reduced the number of assets damaged by flooding, improved livelihoods and increased incomes. Despite these important contributions, in none of the sites visited could all beneficiaries escape poverty and food insecurity entirely. This points to two crucial issues: first, poverty and food insecurity in many of the areas where WFP is working is deep-seated, protracted and difficult to solve. Second, the availability of natural resources in general, and water in particular, is only one of many factors required to make people more food-secure and resilient.

Water-related investments are an important entry point on which to build by integrating them into a web of other interventions that strengthen livelihood systems more broadly and that address the range of interconnected causes of poverty. This is a long-term process and needs strong partnerships with a wide range of stakeholders, as well as the adoption of a set of operational principles towards enhancing resilience.

1. Introduction and study features

1.1 Objectives of the study

Despite substantial progress over the past decades in advancing human development and improving access to water for domestic and productive uses, water management and sanitation coverage, achievements are highly unequal (Hoff, 2011). Insufficient water quantity, inadequate quality and unfavourable distribution of water availability over the years affect the food and nutrition security and health of millions of people globally. The majority of the world's 800 million food insecure people live in regions where water and food security are intimately linked. Climate change is likely to further exacerbate pressure on water resources and food security, as impacts of extreme weather events, in particular floods and droughts, will become more pronounced, frequent and severe, and particularly affect vulnerable communities (Kundezewicz et al., 2007).

Tackling the underlying causes of food insecurity therefore means addressing a set of livelihood vulnerabilities, including access to water for domestic and productive uses. The World Food Programme (WFP), the United Nations humanitarian agency, is actively engaged in water-related interventions while fulfilling its food security mandate across the relief to development spectrum. Given the number and range of WFP's interventions related to water (see Section 3.3), WFP commissioned this report on the organisation's water-related activities based on case studies from different agro-ecological areas, with the following objectives:

- Deepen and consolidate WFP's understanding of the effects of its water-related activities, and the overall rationale for WFP's interventions in the water sector *vis-à-vis* its primary food security and development goals.
- Identify approaches, activities and implementation modalities that could contribute to making WFP's water-related interventions more effective, especially in terms of contributing to strengthening livelihoods and enhancing food security and community resilience to shocks.

1.2 Approach and methodology

In close collaboration with WFP, three case study countries were identified that would offer different insights on how water and food security are related in specific local contexts and affect the livelihoods of people, and illustrate the range of interventions, collaboration modalities and country-specific implementation models. The study was never meant to capture the whole breadth of activities supported by WFP, but to assess the contribution of specific water-related interventions on food security and resilient livelihoods.

This report documents what WFP already does in the three countries and what it could be doing differently in the future. Being cognisant of the limitations, the study also seeks to present evidence by providing an account of activities, outputs and outcomes, and areas where water-related interventions could be improved or mainstreamed into other programmes towards improving food security. Finally, the study highlights partnerships with a range of different stakeholders and discusses how such partnerships could be further strengthened.

Although the findings presented in this report are based on research carried out on WFP-supported programmes, general insights, recommendations and conclusions are expected to be relevant well beyond WFP. Many interventions supported by multilateral and bilateral development partners and non-governmental organisations (NGOs), as well as government programmes, have natural resource conservation and land and water management activities at their heart, as they are assumed to be important contributions towards enhancing food security and increasing people's and community's resilience to current and future climate variability. Although WFP's approach is unique insofar as it is largely based on cash and food for asset (FFA) approaches, the recommendations and conclusions presented in Sections 6 and 7 should be useful to other agencies engaged in livelihood support programmes in rural areas.

The findings presented in this study are based on field visits to Ethiopia, Kenya and Bangladesh.[1] Upon arrival

1 Ethiopia: 21 to 30 May 2012; Kenya: 21 June to 3 July 2012; Bangladesh: 5 to 13 November 2012.

in the countries, meetings were held with WFP country office personnel, followed by a range of consultations and key informant interviews with government staff, donor representatives, United Nations agencies, NGOs and researchers. Key informant interviews were also held with government and NGO representatives and technical experts at the district level. Field missions included visits to specific intervention sites where WFP-supported water-related activities are implemented in partnership with government and NGOs (see Table 1). Intervention sites were identified by the WFP country office. In general, the visited sites were successful cases where outputs were of good quality and functioning and benefits to people clearly visible.

Field visits included observation of the interventions and focus group discussions with beneficiaries, both men and women. Often, these discussions included members of planning teams or local disaster risk management teams. Discussions were also held with technical experts at the village level (agricultural extension workers, water or irrigation experts). Topics covered in discussions and interviews included aspects regarding planning and implementation of WFP-supported interventions, their positive and negative impacts on natural resources,

Table 1: Study sites

Country	Sites	Characteristic	Activities
Ethiopia	Four sites of the Managing Environmental Resources to Enable Transitions to More Sustainable Livelihoods (MERET) project in Tigray and Amhara regions.	The sites differ in terms of size, agro-ecological characteristics (e.g. rainfall patterns, temperature, soils, surface water availability) and farming systems.	Area closures, including tree planting and reforestation; physical and biological soil and water conservation structures on cropland; water harvesting measures; compost-making; backyard improvement; and on-farm and off-farm income-generating activities.
Kenya	Six sites in Turkana county and three sites in Makueni county. All sites are part of WFP's Protracted Relief and Recovery Operation in Kenya's Arid and Semi-Arid Lands.	The sites in Turkana are located in arid pastoral areas, but with a target population of mainly settled households – to a large extent women-headed – that have transitioned out of mobile livelihoods. The sites in Makueni are located in a semi-arid marginal smallholder mixed farming zone which, in some cases, has been populated by farmers resettled from the surrounding hill areas.	Water pans and dams; trapezoidal bunds and pasture enclosures in Turkana county. A variety of soil and stone bunds; farm ponds; fertility-enhancing measures and crop diversification in Makueni county. In both counties, physical interventions are complemented by activities such as tree planting, compost-making, backyard improvement and income-generating activities.
Bangladesh	Four sites in Khulna district and two sites in Barisal district. FFA supported public works activities are carried out under different programmes.	The sites are all located in the coastal belt of Bangladesh and are similar in terms of agro-ecological characteristics, such as rainfall patterns, temperature, soils, surface water availability and topography. Farming systems are dominated by paddy cultivation and fish/shrimp farming.	Canal re-excavations and repairs to and rising of embankments. In those sites under the Enhancing Resilience to Disasters and the Effects of Climate Change (ER) programme, an additional component includes training of beneficiaries in life skills and income-generating activities.

Source: Eva Ludi (2012).

2 The term "community" is used throughout this report to describe a group of people living in close proximity to each other (such as a village). Communities are not homogeneous; differences in interests, aspirations, power, world views, abilities, assets, wealth or livelihoods of community members are often larger within communities than between them.

livelihoods and food security, distribution of benefits and costs across the community,[2] and areas for improvement. During field visits, the author was accompanied by Lorenzo Bosi of WFP's Policy, Programme and Innovation Division and by local government representatives acting as focal persons for the WFP-supported programme or by NGO representatives responsible for implementation.

Common to all countries is the focus on FFA activities, which are designed to promote food security through building assets and providing training that are considered important for enhancing food security and household and community resilience, to encourage communities and households to invest in a sustainable future, especially in the context of climate variability and change, and to support the transition from relief to recovery activities.

1.3 Caveats and limitations

There are a number of limitations to the analysis regarding the design of the study and the country fieldwork.

- The findings and conclusions presented in the report provide a good overview of WFP's water-related interventions characteristics, contributions and challenges. However, they need to be approached with caution given the small number of sites visited. Furthermore, the sites visited were not randomly selected but represented successful sites. In addition, the heterogeneous nature of the countries, in terms of biophysical and socio-economic contexts, makes it difficult to distil lessons to a more general level, as opposed to those messages that are situation specific. Generalisation of the findings might also be limited by the fact that study sites were not randomly selected, but identified by WFP country offices because of time constraints.
- No comparable control sites were visited, which would have allowed to compare and put into a broader perspective WFP-supported interventions and their impacts.
- The scope of the study focused on water for productive uses in the agricultural and livestock sectors only, although WFP does support a wider range of water-related interventions (Section 3.3). This limited the selection of project sites where FFA-supported activities for soil and water conservation (SWC) at the field and watershed levels dominate. Such emphasis narrowed the array of conclusions and recommendations to this specific type of interventions.
- Although it would be desirable to make evidence-based statements about the impact, effectiveness and efficiency of WFP-supported FFA interventions, this is beyond the scope of this study. The short duration of each mission (10 to 12 days) only allowed for a cursory assessment of the situation. More detailed assessment was also hampered by the lack of data at such a disaggregated level. This study thus relies on statements by a limited number of stakeholders and beneficiaries, statements by WFP staff that the interventions represent the most appropriate for a given context, and observations by the author.
- In all sites, at the time of the visit, WFP and partners were providing ongoing support to implementation activities. No areas were visited where WFP support had come to an end and where insights could have been gained regarding the sustainability of investments without external support.
- During all field visits, WFP experts from district offices, government experts or partners from implementing NGOs were present. While this was essential because of language barriers and led to enriched discussions by being able to tap into the rich knowledge of these experts, it might also have influenced the way respondents answered questions and how they reported the positive or negative impacts the project had on their lives and livelihoods.

1.4 Organisation of the report

Section 2 provides a short overview of the discourse on food security, climate change and resilience and how these relate to water at the macro level (Section 2.1), and more specifically how food security and water and sanitation relate to each other at the household level (Section 2.2). Section 2.3 presents an overview of how investments in the water sector contribute to enhancing resilience – a major objective of WFP-supported water-related investments. As the majority of interventions visited focused on rainwater harvesting, watershed management and SWC activities in semi-arid and arid environments and because such activities constitute an important intervention area for WFP and many other development partners alike, a short discussion of the effects of watershed management aimed at increasing water availability on food production is provided in Section 2.4. Section 3 discusses key policy documents that underpin WFP's engagement in the water sector, provides an overview of WFP's water-related projects globally, and summarises WFP-supported projects focusing on resource and water management in the three countries visited. Section 4 provides an overview of findings from the field visits to Ethiopia, Kenya and Bangladesh – distilling, in Section 5, general findings from the three case studies that are of wider relevance for WFP interventions globally. Section 6 provides a set of recommendations for further consideration by WFP and other development partners that are engaged in natural resource management, watershed protection, and soil and water conservation with a view of enhancing food and livelihood security of poor people in marginal environments. Section 7, provides some concluding remarks in view of better utilising natural resource management interventions for resilience building.

2. Links between water and food security

2.1 Global scale

Achieving a food-secure future will depend greatly on how water will be shared and managed. Water's vital role in underpinning equitable, stable and productive societies and maintaining the ecosystem services on which we all depend is gaining increased appreciation, not least in recognition of planetary boundaries (Rockström et al., 2009) and global resource constraints. In 2012, at least 870 million people were food-insecure (FAO, WFP and IFAD, 2012) and, despite a marked growth in per capita food production over the past half century, even more are suffering from micronutrient malnourishment (Godfray et al., 2010). Food security is a "situation […] when all people, at all times, have physical, social and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life" (FAO, 2002). Reasons for food insecurity are complex and do not relate to food availability alone. They include on the production side aspects such as availability of water and energy, the physical characteristics of the land (i.e. soil fertility or soil degradation), or the quality of planting material and livestock breeds. Socio-economic factors (e.g. access and entitlements to production factors such as land, labour and credit, access to markets or income), cultural factors (e.g. inequality, gender roles, diets or food taboos), and the policy environment (e.g. agricultural policies, disaster risk management policies, social protection systems) can also greatly influence the food security status of people.

2.1.1. Achieving food security – a conundrum

Achieving food security remains elusive, especially as we are facing a series of interlinked challenges: (i) a population that is likely to grow to 9 billion by 2050; (ii) increasing wealth of many and higher purchasing power that translates into higher consumption and changing diets, all of which places increased pressure on the food supply system; (iii) greater competition over crucial resources such as fertile land, water and energy; and (iv) the need to diminish the footprint of the agricultural and food sectors, reduce degradation and unsustainable practices, and reduce greenhouse gas emissions while simultaneously contributing to climate change adaptation and mitigation (Godfray et al., 2010).

Food security is inextricably linked to developments in the water, energy and land sectors (ODI, ECDPM, DIE/GDI, 2012): increasing energy prices affect farmers' production costs and lead to unsustainable competition between food crops and biofuel stock and increased costs for water. Pressure to increase the overall production of food crops, feed, and fuel by up to 70% to meet the growing and changing demand leads to further land degradation, while today already more than 70% of all water withdrawals are occurring in the agricultural sector (Ludi, 2009; Jägerskog and Jønch Clausen, 2012; Mason and Calow, 2012).

For both rainfed and irrigated agriculture, the spatio-temporal variation of precipitation is crucial. Increasing food production in many countries will require additional investments in irrigation using "blue water" from rivers or aquifers to top up available "green water", the water stored for plant growth in the root zone. However, agriculture will have to compete for blue water with other sectors, such as domestic water supply, industrial water demand and energy production. Modelling results suggest that by 2050 67% of the global population will live in areas where there is green water scarcity and where irrigation is a requirement. More worryingly, 46% of the world's population by then will live in areas where both green and blue water are scarce, and for many of these countries the only alternative will be virtual water transfers in the form of food imports (Falkenmark, 2012).

Water, although a renewable natural resource, is not available in unlimited quantities, and even if not severely constrained physically, it is often geographically limited and unequally distributed over time. Scarcity, however, "[...] is rooted in power, poverty and inequality, not physical availability" (UNDP, 2006).

And finally, there are a range of recurrent natural disasters that affect food security and expose a great number of people to increased vulnerability. For example, there has been drought somewhere in the Horn of Africa in eight out of the past ten years, affecting 67 million people (ECB/ACAPS in ALNAP, 2011). In addition, these droughts often occur in contexts where conflict, high food prices,

Table 2: Climate change impacts on food security

Food production and availability	Climate affects food production directly through changes in agro-ecological conditions and indirectly by affecting growth and distribution of incomes, and thus demand for agricultural produce. Changes in land suitability, potential yields and production of current cultivars are likely. Shifts in land suitability could lead to increases in suitable cropland in higher latitudes and declines of potential cropland in lower latitudes.
Stability of food supplies	Weather conditions are expected to become more variable, with increasing frequency and severity of extreme events. Greater fluctuation in crop yields and local food supplies can adversely affect the stability of food supplies and food security. Climatic fluctuations will be most pronounced in semi-arid and sub-humid regions and are likely to reduce crop yields and livestock numbers and productivity. As these areas are mostly in sub-Saharan Africa and South Asia, the poorest regions with the highest levels of chronic undernourishment will be exposed to the highest degree of instability.
Access to food	Refers to the ability of individuals, communities and countries to access (produce, purchase, exchange, etc.) food in sufficient quantities and quality. Falling real prices for food and rising real incomes over the last 30 years have led to substantial improvements in access to food in many developing countries. Possible food price increases and declining rates of income growth resulting from climate change may reverse this trend.
Food utilisation	Climate change may initiate a vicious circle where infectious diseases, including water-borne diseases, cause or compound hunger, which in turn makes the affected population more susceptible to those diseases.

Source: Schmidhuber and Tubiello (2007).

natural resource degradation, competition over access to natural resources and restrictions on traditional livelihood strategies have already contributed to increasing the vulnerability of large portions of the population.

2.1.2. Climate change and food security

Areas that already today face serious challenges in terms of achieving food security while being exposed to water scarcity and a range of natural hazards – the Horn of Africa, East Africa, considerable parts of Southern Africa, the Sahel, parts of Northern Africa and the Middle East, significant parts of South Asia, large portions of China and a number of countries in Central America and the Caribbean – will also most likely be those hardest hit by climate change impacts, as predicted by the Intergovernmental Panel on Climate Change. By the middle of the twenty-first century, annual average river runoff and water availability will increase in high latitudes and in some areas of the wet tropics, while they will decrease over dry regions at midlatitudes and in the dry tropics, with semi-arid and arid areas particularly exposed to the impacts of climate change. Increased precipitation intensity and variability are projected to augment the risk of extreme weather events such as floods and droughts in many areas (Bates et al., 2008).

Higher water temperatures and more extreme weather events will most likely affect water quality and exacerbate water pollution. Among the scientific community there is also high confidence that the negative impacts of climate change will outweigh the benefits, and that by the 2050s the area of land affected by increasing water stress due to climate change is projected to be more than double that with decreasing water stress. All these effects are expected to affect food security and will increase the vulnerability of poor people, especially in the arid and semi-arid tropics and the Asian and African mega-deltas (Bates et al., 2008). The effects of climate change will impact on all four dimensions of food security, as shown in Table 2.

This overview of global food insecurity and its key drivers, among them the important role of water, points to areas on which WFP and its partners already focus, but that will require concerted attention in the future. Present and future challenges in these areas justify the need for WFP and other development partners to increase attention on investing in natural resource management, including a specific focus on interventions that enhance water management and availability, as a precondition to enhance food access and production in a sustainable manner in the most food-insecure areas of poor countries.

2.2 Water-food security links at the household and community levels

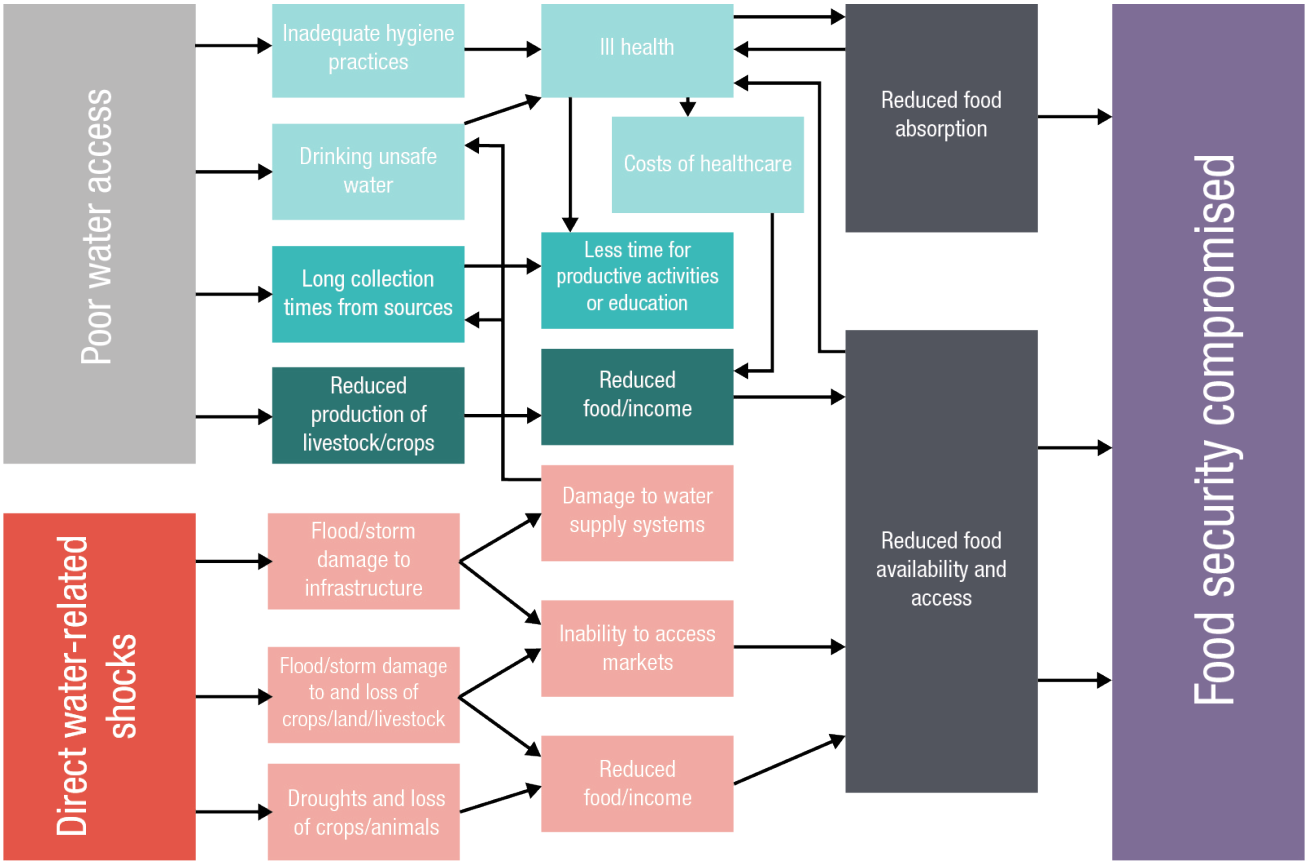
Food and nutrition security is determined by both food intake and the health status of the individual, factors which are influenced by a range of underlying causes resulting from poverty (e.g. household food insecurity, care for mothers and infants, unhealthy household environment or level of health services) and basic causes (e.g. the overall basket of livelihood assets, be they human, social, financial, physical or natural; social, institutional, economic, cultural, and political structures; shocks, stresses and seasonality

emanating from the agro-ecological, social, economic and political environment).

Links between water access and food security have been conceptualised through the following three distinct pathways (Calow et al., 2010):

- **Lack of access to an adequate quantity and quality of water for domestic use** (including for hygiene) is a leading cause of water-related diseases, which is a major driver of malnutrition as it reduces the body's absorption of nutrients. Poor-quality drinking water is an important risk factor for diarrhoea. Diarrhoeal disease is the second most common contributor to the disease burden in developing countries (as measured by disability-adjusted life years), and the reason for 17% of all deaths in children under 5. Focusing on acute diarrhoea alone, however, underestimates the disease burden caused by inadequate water and sanitation. Especially for children, there is strong evidence that repeated or chronic diarrhoeal disease leads to malnutrition, and this results in poor educational outcomes and physical growth that can have implications throughout their entire adult life (Hunter, MacDonald and Carter, 2012).
  The relevance of secure and reliable, i.e. uninterrupted access to improved water, is crucial for preventing diseases and contributing to food security. Recent evidence suggests that the consumption of water from an unprotected source, even for a few days only, can wipe out the health benefits that come from accessing water from a protected source. Achieving improved drinking water will thus only make a meaningful contribution to public health if the systems are reliable (Hunter, Zmirou-Navier and Hartemann, 2009).
- **Lack of access to necessary water for productive purposes** such as livestock husbandry, irrigation and other small-scale productive purposes reduces the opportunities for own food production and/or income generation.
- **Lack of adequate nearby water sources** results in long time being spent in daily water collection, which reduces the time available for work or education, and can also negatively affect health. The World Health Organization

Figure 1: Causal pathways from lack of access to water and water-related shocks to food-insecurity outcomes



Source: Adapted by author from Tucker, Lema and Eshetu (2013).

estimates that 5.6 billion working days and 443 million schooldays could be gained annually if there was universal access to safe water and sanitation (Slaymaker et al., 2007). Especially women and girls would benefit from having access to secure and safe water, as they are responsible for water collection in most rural communities.

The three pathways described above are further interconnected (Figure 1). Poor nutritional status increases vulnerability to disease, while lack of adequate food is likely to reduce health and energy status with direct negative implications on the ability to work either on the farm or in paid labour. Poor health leads not only to poorer nutritional status, but also to time costs (when unable to work or attend school) and financial costs of health care. These destructive cycles may represent a chronic situation for households faced with constant water shortage, or they may be a regular or occasional seasonal occurrence during the dry season. Drought exacerbates the situation by intensifying and extending periods of water shortage (Tucker and Yirgu, 2011).

There are also those situations where too much water is a problem for food security via health impacts. Where drinking water sources such as ponds or family wells are not sufficiently protected, they are susceptible to contamination from floods. A study conducted in southern Ethiopia showed that traditional wells, while fitted with rope pumps or other lifting devices, usually had higher contamination levels (faecal coliform or thermotolerant coliform) than those sources that were protected and fitted with hand pumps and that had concrete aprons (Sutton et al., 2011). This was due to insufficient protection of the well head.

Poor access to domestic and productive water and its links to food security, shown in the upper panel of Figure 1, explain only half the story. The other half relates to the direct water-related shocks, such as droughts, floods and tropical storms, that damage food production directly or that damage infrastructure to access food (e.g. rural roads to access markets, electricity and telecommunications).

Ensuring access to secure water and sanitation should be a critical part of the efforts to protect livelihoods for disaster preparedness. Acute malnutrition – the outward sign of severe levels of food insecurity – is an indicator not only of a food crisis, but also of a crisis in public health and access to water and sanitation (ProVention, ALNAP, n.d.). There is a close correlation in sub-Saharan Africa between lack of access to water and sanitation and acute malnutrition (Devereux et al., 2004). Water shortages can be a good indicator of potential food insecurity, as recognised by evaluators of the emergency response to the 2002/2003 drought in Ethiopia (Simkin, 2004).

Despite this knowledge, early warning systems and food security assessments are surprisingly silent on issues related to water availability and access and sanitation, either as an indicator of food insecurity or as an underlying factor of household and community vulnerability. In addition, as Tucker and Yirgu (2011) note, there is rarely a clear framework for collecting, analysing and using data related to water supply and sanitation in early warning and response. In particular, the water needs of livestock, which are generally very serious during a drought, are often neglected, even though livestock are an essential component of livelihoods, both for pastoralists and for many farming households.

Links between accessing water and opportunity costs of this time – within households, between households of different wealth, across seasons and between good and bad years – are crucial links that need more attention when analysing the vulnerability of households to food insecurity. Already in normal times, women and girls often have to spend many hours walking to the nearest water source and then wait until it is their turn to fill their containers. In times of drought, both distance and waiting times can increase dramatically (Dessalegn et al., 2013). In particular, in rural Africa, where most agricultural labour is provided by women, spending long hours searching for water has a direct impact on agricultural productivity. Alternatively, where households rely on the sale of labour, opportunity costs for collecting water can be extremely high (Calow et al., 2002). When time for collecting water increases, it is not uncommon that girls are taken out of school either to help collect water or to look after younger siblings while parents search for water.

A study in eastern and southern Ethiopia using an innovative approach to link the Household Economy Approach with water use and access – the Water Economy for Livelihoods – demonstrated how seasonal levels of access to water greatly fluctuate and that poor and very poor households are often not able to meet their water needs, in particular for their livestock in the dry season even in a normal year (Coulter et al., 2012).

All this points towards the importance of achieving water security as a crucial contribution to the resilience and food security of households so that they can better withstand stresses and shocks – such as price volatility, economic shocks, climate variability and more pronounced seasonality or extreme weather events. Households need to be supported to develop coping and adaptation strategies that do not deplete their assets, but that allow them to maintain their assets and their ability to produce, access and use food and other required goods and services needed for the household and for the well-being and livelihoods of all its members. This will also require accessible social protection systems and policy support for smallholders through adequate strategies for disaster risk reduction and climate change adaptation. As the United Nations High Level Task Force on Global Food Security (United Nations, 2011b) observed, smallholders need to have secure, affordable and sustainable access to natural resources (land, water, biodiversity), energy, agricultural credit and loans, market facilities, market information, infrastructure, appropriate technology, training, education, extension and

advisory services as preconditions to achieve food security and resilient livelihoods.

2.3 Water, food security and resilience

At a basic level, resilience implies the ability of a system to "absorb disturbance and reorganise while undergoing change" (Department for International Development, 2011). However, as a concept, "resilience" has gone through a constant evolution in how it is defined and characterised. Originating from ecological sciences, the traditional view of resilience describes the ability of a system to "bounce back" or quickly return to a previously stable state after a particular disturbance. For example, in the context of water and food security, a community principally reliant on rainfed subsistence agriculture undergoes a period of prolonged drought and its resilience is a measure of the ability of the system to return to a "normalised state".

Water can be both a threat (e.g. too much, too little, or untimely supply) as well as a means of enhancing resilience. Much of the relevance of water to resilience relates to its availability, its distribution and people's entitlement to it. At the macro level, issues of infrastructure and storage tend to dominate the policy agenda in ensuring that communities are able to meet their domestic, productive and environmental water needs. Resilience in this sense is often associated with the robustness of how water is collected, distributed and administered, as well as the degree to which water resource management (both in an infrastructural and institutional sense) has built-in redundancy (should parts fail).

At the micro level, the characteristics of resilience are very similar, though mediated through different forms. It is often informal institutional arrangements that play a large role at the local level in many developing country contexts. Not only that, but "soft issues" such as cultural and socio-institutional arrangements have a very big influence on entitlements to water resources and thus directly impact the ability to access them for domestic and productive purposes during times of need (Cleaver, 1998). These norms, practices and customs are associated with differentiations among various groups defined by wealth, livelihood, gender, race or age. With this in mind, they can also result in different levels of individual resilience even within a particular household.

With an understanding of how resilience is made up and its relationship with water resources and food security, it is also important to reflect on how resilience can be supported through direct external support and interventions. Essentially, resilience can be strengthened in many different ways through a range of development and humanitarian interventions, including through social protection, disaster risk reduction, livelihood support, natural resource management, conflict prevention and financial risk management.

However, not all development interventions support communities in dealing with change and uncertainty. Levine, Ludi and Jones (2011) explore the impacts of various interventions in East Africa and conclude that programme support for adaptive capacity – a major component of resilience – is only effective when issues of local agencies, participation and flexible planning are ingrained within project delivery. The authors also point to the fact that issues of resilience and adaptive capacity do not require separate development projects. Rather, they should be mainstreamed into the design of all development programmes and "considered in all assessments, planning processes, feasibility studies, agreements with donors, implementation, monitoring, reports and evaluations" (Levine, Ludi and Jones, 2011, p. ix). Moreover, the research highlights a number of cases where development interventions are contributing to maladaptation: i.e. decision-making and investments that lead to long-term increases in vulnerability. Understanding this and the importance of a resilience approach is particularly pertinent when it comes to delivery and management of water and its relationship with food security. Here, investments typically require longer timescales (such as for the provision of technological and infrastructural assets), with serious risks associated when insufficient attention is given to how resource availability and demand may change over time.

A resilience approach to water and food security also requires people and communities to recognise the effects that a changing environment and development pressures will have on current and future water resources. For one, climate change is expected to alter many aspects of the hydrological cycle (Bates et al., 2008). In addition, development pressures such as rapid rural-urban transitions and changing forms of agricultural production (e.g. expansion of irrigated agriculture) will each interact with and impact water availability and access. Perhaps the most pronounced of these effects will be felt by food production systems – the dominant users of freshwater. Without adequate policy responses to these changes, people's health, nutrition and food security are likely to be negatively affected.

Strategies to promote communities' capacity to adapt (both incremental and transformative) will be crucial. For example, one common adaptation strategy is to buffer against interannual and seasonal rainfall through increasing water and food storage capacity. However, this is only one part of a complex puzzle. While strategies like this are needed, no single adaptation response will be sufficient in safeguarding food security; a resilience approach will require a broad spectrum of policy responses. As part of this, measures that build upon improved land and water management practices and consider a wide range of possible future scenarios to support the adaptive capacity

of food production systems, will be essential to boosting overall resilience and maintaining food security. They will also require a process of continual reflection, learning and adaptation, ensuring that communities respond to constantly changing pressures.

2.4 Watershed protection and its implications for water availability, food security and resilience

There is a widely held view that in order to improve food security, especially in the context of climate change, land and water management through watershed protection, including soil and water conservation (SWC), needs renewed attention (Bossio and Geheb, 2008; TerrAfrica, 2009). Both are at the heart of many WFP-supported FFA activities. Mitigation of land degradation is a pivotal factor for increased water productivity and for preserving both terrestrial and aquatic ecosystems and their accompanying services (Bossio and Geheb, 2008) that are so central to livelihoods and food security.

Within the wide range of SWC technologies and approaches, which form the core of watershed protection and the backbone of FFA interventions in WFP-supported water-related projects, four broad measures are usually distinguished (WOCAT, 2007; Table 3). Within a field, but more importantly within a watershed, different measures are usually combined to achieve maximum impact and synergies (Schwilch et al., 2007).

But what outcomes can be expected from watershed protection and SWC – on production, livelihoods and natural resources – and more specifically, what ultimately are the impacts on food security and on enhancing people's resilience? Only few impact assessments are available that have tried to assess the direct contributions of watershed management or SWC on food security, poverty reduction and resilience. More often than not, benefits are assumed rather than rigorously verified. Costs and benefits of SWC are difficult to assess, as many are not easily detectable and even more difficult to quantify, such as the impacts on the local hydrology and overall water availability, increased yield and longer availability of water of springs and wells, more rapid groundwater recharge and higher water table, and increased base flow and irrigation in areas further downslope due to lower risk from flash floods (Mutekwa and Kusangaya, 2006; Nyssen et al., 2010).

Without subsidising initial investments, establishing physical SWC is often not a profitable investment for smallholder farmers (Ludi, 2004; WOCAT, 2007). That is where FFA can make a difference by using food as an incentive to invest labour that would otherwise not be invested and thus make a contribution to constructing assets that are viewed as being important for enhancing food and livelihood security.

In terms of *direct yield impacts* of SWC, the picture is mixed (WOCAT, 2007). For the Limpopo basin, it could be shown that increasing green water productivity through a range of water-harvesting technologies resulted in increased yields, in particular by overcoming seasonality, especially mid-season dry spells, but only when combined with fertiliser application and conservation tillage methods (Siambi, 2010).

In terms of *ecological impacts*, many conservation technologies aim at increasing soil moisture through control of runoff and increase in infiltration. Most of the technologies analysed by WOCAT (2007) have augmented soil moisture, and many have also reduced runoff and led to greater water infiltration. Terraces usually have the highest impact on crop yields and soil moisture through ponding upslope of the bund increasing infiltration and fine sediment deposition, thus leading to increased soil nutrients and soil moisture holding capacity (Makurira et al., 2011). Where ground cover could be increased in drier environments, evaporation from the soil could be reduced and had positive impacts on the amount of water – both

Table 3: Soil and water conservation measures

Type	Activities	Characteristics
Agronomic	Composting, manuring, mulching; crop rotation	Can relatively easily be integrated into normal farming practices, require relatively low inputs, but frequently have a direct and rapid impact on crop productivity.
Vegetative	Agroforestry systems, protective bushland, vegetative strips, etc.	Often multi-purpose: reforestation has conservation effects through achieving better ground cover while also being directly useful for the production of fodder, fruits, firewood, as well as for nitrogen fixation. However, they can also directly compete with crops for nutrients, water and land, and are therefore not always beneficial.
Physical structures	Stone terraces, check dams, retention reservoirs, artificial waterways, etc.	Physical structures are hardly ever adequate on their own, and commonly involve high investment and maintenance costs.
Management	Land management practices; area closure; pasture management	They represent a precondition for effective watershed management. Especially important to regulate grazing land.

Source: Adapted by author from Schwilch, Danano, Khisa, Critchley and Liniger (2007).

from rainfall and from irrigation – being available to the plants (WOCAT, 2007). Household food security in semi-arid rainfed farming systems depends on the overall amount and timing of rainfall (Makurira et al., 2011). Rainwater harvesting and better control of runoff was found to have positive implications on reducing seasonality and uneven spatio-temporal distribution of moisture, and thus on food production.

A range of negative effects from SWC projects have also been reported that need to be considered when designing watershed protection and SWC interventions. These can include competition over labour, the alteration of labour division between men and women, increased input costs, loss of land, in particular for terraces, water logging, water distribution across and between watersheds, distributional impacts and socio-economic conflicts resulting from land conversion (such as area closures), conflicts between agriculturalists and pastoralists, and human and livestock injury (Ludi, 2004; Mutekwa and Kusangaya, 2006; WOCAT, 2007). Furthermore, some of the conservation technologies are more readily available to better-off farmers and not to the most vulnerable and resource-constrained (Giller et al., 2009), which results in further inequities between the "haves" and "have nots" or between upstream and downstream users.

Generally, the assumption is that watershed treatment leads to increased recharge and rising groundwater levels (or slower decline) in the watershed as a whole. These changes, in turn, are assumed to lead to improvements in water supply, drought resilience and, ultimately, more sustainable livelihoods for participating communities. However, the specific impacts of recharge interventions (as opposed to watershed development more generally) are rarely evaluated or documented on a scientific basis (Gale et al., 2006). Concerns have been raised over potential hydrological and downstream impacts from scaling up rainwater harvesting and SWC, in particular in more semi-arid and arid environments (Ngigi, Rockström and Savenije, 2006). Along with positive effects, such as increased groundwater recharge or decreased storm flows, this type of intervention might, in specific situations, also lead to decreasing groundwater recharge (Kongo and Jewitt, 2006) or reduced stream flow because of increased vegetation coverage and increased evapotranspiration (Peel, 2009). It is therefore important to consider both the positive and negative consequences when promoting reforestation of the upper parts of watersheds (Zhang et al., 2003) as part of watershed protection measures.

Watershed protection, by changing temporal and spatial patterns of water availability and land use, can lead to unequal distribution of costs and benefits, in particular where there is a large proportion of landless households who depend disproportionally on common pool resources (e.g. grazing land, access to firewood) (Farrington, Turton and James, 1999) and between upstream and downstream users (Batchelor, Rao and Rao, 2003). Focusing on water management systems in the lower slopes privileges those (i.e. the better-off farmers) having reliable access to agricultural land. The notion that the poor, who are denied access to the land in the upper parts of a watershed during the rehabilitation period, can benefit from casual employment opportunities created by construction requirements in the lower slopes is appealing, but requires close monitoring; and there are important questions surrounding the sustainability of any of these gains. In addition, better-off farmers – usually landholders – often benefit much more from watershed protection investments through an increase in available soil moisture or groundwater than landless ones (Kerr, Pangare and Pangare, 2000; Turton, 2000).

Whether watershed management approaches are successful also depends on the legal and institutional environment, the social capital within the watershed, the financial capital and the technical and administrative capacity of the watershed managers (Francisco and Rola, 2004), and the specific local conditions, including hydrogeology and variability and intensity of precipitation (Gale et al., 2006).

To sum up, some caution is appropriate with regard to the expectations of watershed protection investments in achieving food security through addressing resource degradation and water scarcity, mainly because their potential depends highly on different climatic, agro-ecological, hydrogeological and socio-economic conditions. Nevertheless, they are a contribution to enhance resilience, and over the longer term allow adaptation to and mitigation of climate change in contexts where people depend on natural resources and primary production for their livelihoods (TerrAfrica, 2009; Woodfine, 2009).

When farmers adopt unsustainable land management practices they do so because there are usually a range of pressures that do not allow them doing otherwise. Such pressures relate to: policy; wrong economic incentives; population increase; lack of access to assets, production factors, markets, technology and information; insufficient support to innovate; or institutions, entitlements and governance systems that undermine equitable and sustainable resource management systems (Levine, Ludi and Jones, 2011). Overcoming these obstacles alongside improved land management and resource conservation investments will be crucial to support farmers and herders to adapt to conditions with either higher, lower or more variable precipitation. The right mix of most appropriate land management practices will have to be determined based on local biophysical and socio-economic contexts, such as land tenure system, farm size, assets, governance systems or local institutions, which may make certain practices ill advisable or less feasible (Woodfine, 2009).

3. WFP and water

3.1 Key WFP strategies and policies that guide water-related interventions

3.1.1 WFP Strategic Plan

WFP's objectives are derived from WFP's mandate and mission statement[3] and the Millennium Development Goals (MDGs), and they reflect the changing nature of food aid and hunger and WFP's history, experience and comparative advantages (WFP, n.d. (b)). WFP-supported interventions are guided by the organisation's Strategic Plan, which lays out the framework for WFP's actions. The 2008–2013 Strategic Plan's goal affirmed the need for WFP to reduce beneficiaries' dependency and to support governmental and global efforts to ensure long-term solutions to the hunger challenge. It stresses the importance of partnerships with national and local governments, other United Nations organisations, NGOs, the private sector and, most importantly, local communities. It also marks a historical shift from WFP as a food aid agency towards a food assistance agency, with a more nuanced and robust set of tools to respond to critical hunger needs in relief and recovery settings (WFP, n.d. (b)). The current Strategic Plan (2014–2017) focuses the organisation's emphasis on resilience building, disaster risk reduction and climate change adaptation (WFP, 2013c).

3.1.2 Enabling development

The Enabling Development Policy (EDP) document (WFP, 1999) is specifically aimed at sharpening WFP's focus in the use of food in support of developmental activities (as opposed to humanitarian interventions). It suggested that WFP food aid should play a different but unique role: not to promote development but to enable marginalised people and communities, through the provision of food assistance, to take part in the development process and benefit from it in the longer term. One of the aspects covered under the EDP relates to supporting households that depend on degraded natural resources for their food security to make a shift to more sustainable livelihoods. Besides detailing intervention areas, the EPD also suggested a set of principles and measures to improve the quality of WFP's interventions: strengthening partnerships, enhancing community participation, better targeting, increased understanding of beneficiaries' circumstances, demonstration of results and enhanced attention to gender considerations (BMZ, 2005). An evaluation of the EDP (BMZ, 2005) specifically noted that it contributed to increasing the overall relevance of WFP interventions in a number of areas. With regard to food for assets, it noted "[a]n increased degree of consistency of WFP development projects with beneficiaries' priorities, particularly in food-for-assets activities [...]. These have in fact moved away from the promotion of large infrastructure towards the creation of assets more relevant to poor people's circumstances (e.g. basic social facilities, income-generating activities)."

3.1.3 Disaster Risk Reduction

Recognising the links between disaster risk, poverty and food insecurity, disaster risk reduction (DRR) is a central priority for WFP. Disasters have profound impacts on the food security status of poor people and specifically on food-insecure and vulnerable populations. Exposure to disaster risk and a lack of capacity to manage these, compounded by additional factors such as poor access to markets and information, lack of income-generation opportunities or wrong policy incentives, trap poor people in a cycle of food insecurity and poverty that can quickly deteriorate into a food crisis when a disaster occurs. WFP's DRR policy is thus aimed at building the resilience and capacity of vulnerable people, communities and countries to ensure food and nutrition security while reducing disaster risk and protecting and enhancing livelihoods. The policy builds on the Strategic Plan 2008–2013, the Enterprise Risk Management Policy and the Gender Policy (WFP, 2011e). In 2011, WFP and its partners implemented activities aimed at addressing disaster risk in 65 of the 83 countries where WFP was active.

The DRR interventions and those using cash/food for asset (FFA) to support asset building to enhance food security, livelihoods and resilience are reported to have led to positive outcomes. In 2011, over 23 million people were reported to have gained access to food, built resilience and reduced risks through programmes that supported specific asset-building activities, including soil and water conservation, rainwater harvesting, rehabilitation of degraded natural environments, or infrastructure

3 For details, see http://www.wfp.org/about/mission-statement.

rehabilitation and capacity development programmes such as food for training (WFP, 2013a). Few impact evaluations of DRR and FFA projects are available, but those that tried to assess impacts (in Ethiopia and Kenya) found beneficiaries reporting increases in their food security, which they attributed to WFP-supported asset-building programmes. In Bangladesh, nearly 1.2 million people have benefited from the construction of agricultural infrastructure and disaster reduction assets thanks to the Enhancing Resilience to Disasters and the Effects of Climate Change programme (LGED and WFP, n.d.).

3.1.4 Gender

There is ample evidence that men and women are affected very differently by disasters. Generally, women are more vulnerable to natural disasters than men because of socially construed gender roles and behaviours that affect access to assets. WFP's Gender Policy (WFP, 2009a) aims to promote gender equality and empowerment of women in addressing food and nutrition challenges. A range of DRR interventions are therefore targeted specifically at women and women-headed households, who are often among the poorest and most vulnerable within a community.

3.2 From food for work to food assistance for assets

An important reorientation has taken place within WFP as part of its institutional shift from food aid to food assistance, which is at the heart of the Strategic Plan (2008–2013 and 2014–2017), and which is of relevance to water-related activities – the shift from food for work (FFW) to food assistance for assets (FFA), which includes food and/or cash transfer modalities. WFP has been engaged in FFW activities for several decades. FFW aimed at addressing the immediate food needs of vulnerable people by engaging them in labour-intensive public works programmes, such as rural road construction, afforestation or large-scale soil conservation, that were thought to support the livelihoods of poor people instead of just handing out free food aid. Under the FFA approach, the emphasis shifted from the public works nature and the focus on employment generation towards increased attention on creating household and community assets that support livelihoods, climate change adaptation and resilience building. FFA-supported interventions have been introduced as it became clear that in many situations the end of one disaster became the precursor of the next one, because the first shock has undermined the capacity of communities to cope with subsequent ones, since vital assets have been destroyed or due to a low level of disaster preparedness in the first place.

The move from FFW to FFA can also be viewed as a shift from addressing symptoms of protracted livelihood crises to an attempt to address underlying causes. And finally, it also marks a shift in thinking about the value and sustainability of the assets: whereas under FFW assets were largely considered as a deliverable and proof that the work has been carried out, assets under FFA have clearer roles to play with regard to enhancing food security and strengthening household and communal resilience to stresses and disaster shocks. FFA programmes are designed to achieve multiple objectives: they may be selected to offer employment and rebuild community infrastructure, support access to markets, restore the natural resource base, protect the environment, or reclaim marginal land to provide productive assets to land-poor and food-insecure households, assist marginalised groups and women to improve and diversify income sources and promote skill transfers. Many of these interventions are also considered important for reducing disaster risk and increasing the capacity of households to manage shocks and in some cases to support climate change adaptation (WFP, 2011f).

The shift from FFW to FFA has consequences for programming, as FFA requires a longer engagement (for a detailed discussion on aligning FFA to different WFP programme categories, see also WFP (2011f), Annex A-1). As project duration increases, WFP and its partners can potentially engage in a more thoughtful and participatory project design and implementation process, allowing WFP and communities to focus on activities beyond recovery, increase the scale and sise of assets created, support existing and alternative livelihoods, and gradually shift the measure of success from outputs to outcomes and impacts (Collins, n.d.).

The shift from food aid to food assistance can be conceptualised as follows:

- In the short and medium term, food is used to bridge food gaps while at the same time investments in natural resource management activities are made and household and community assets are created. Food is used as an incentive for labour-intensive investments that are aimed at improving the resource base on which rural livelihoods depend (e.g. soil and water conservation on cropland, water harvesting, area closures).
- Once the resource base has regenerated sufficiently, water and land productivity is further enhanced through the initiation of income-generating investments, e.g. irrigated horticulture, animal fattening.

3.3 WFP activities related to water management

WFP has been engaged in supporting water-related activities over a long period. WFP's Policy, Programme and Innovation Division has produced an assessment of water-related activities supported by the organisation based on project documents and data from the Standard Project Reports for the periods 2002–2009 (WFP, 2011g) and 2010–2011 (WFP, 2013b). Projects that contained a water management component were identified and classified

under four main categories: (i) nutrition and health; (ii) soil and water conservation; (iii) food production; and (iv) hazard protection. According to the 2010–2011 analysis (WFP, 2013b), among the projects with a water-related component, 61% aimed at addressing drought impacts and 46% flood impacts; 19% dealt with internal and cross-border conflict; 12% with increased food prices; 5% with storms; and 14% with other natural hazards (earthquakes, crop infestations and environmental degradation). Interventions were implemented as response measures or as risk-reduction measures depending on the country and operational context (WFP, 2013b).

Between 2002 and 2009, 275 out of 732 WFP projects (or 38%) involved water-related activities. These activities took place in 69 countries (WFP, 2011g). In 2010/2011, 113 of the 341 WFP projects globally (or 33% of the total) included water activities, taking place in 63 of the 83 countries in which WFP is engaged. In the 2010/2011 period, most of the activities – 72% – consisted of asset creation through conditional food transfers (FFA schemes); cash transfers in FFA schemes and asset creation activities within school meal programmes accounted for 1%; 7% consisted of capacity development through food-for-training programmes; and the remaining 20% were implemented through the school meal programme and projects for prevention of acute malnutrition, prevention of stunting, mother-and-child health and nutrition, and emergency preparedness (WFP, 2013b).

According to the 2010–2011 analysis, five countries and projects stand out in terms of water-related activities: Myanmar (mainly focusing on domestic water), Kenya (water for food production and soil and water

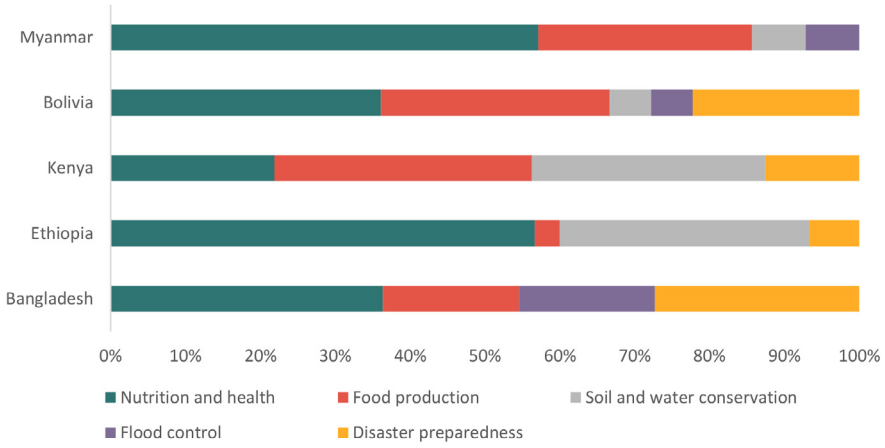
Table 4: Main water-related activities supported by WFP in 2010–2011

Water for nutrition and health **38%**	Springs and shallow wells
	Water storage
	Sanitation facilities
	Training
Soil and water resource conservation **27%**	Physical soil conservation
	Biological soil conservation
	Physical water conservation
	Biological water conservation
Water for food production **20%**	Water storage
	Shallow wells
	Irrigation systems
	Aquaculture
Hazard protection **15%**	Flood protection infrastructure
	Infrastructure above flood level
	Land rehabilitation
	Disaster Preparedness Training
	Disaster Preparedness Tools

Source: WFP (2013b).

Figure 2: Projects with most water-related activities supported by WFP in 2010–2011

Country	Project no.	No. of activities
Myanmar	200032	28
Bolivia	108360	18
Kenya	106660	16
Ethiopia	104300	15
Bangladesh	104100	11



Source: WFP (2013b).

conservation), Ethiopia (domestic water and soil and water conservation), the Plurinational State of Bolivia (similar shares of activities on domestic water, water for food production and hazard protection) and Bangladesh (hazard protection and water for food production) (WFP, 2013b). Water activities in Ethiopia, Kenya and Bangladesh will be further analysed in the next section.

3.4 An overview of water-related interventions in Ethiopia, Kenya and Bangladesh

3.4.1 WFP in Ethiopia

WFP has been engaged in supporting Ethiopian government programmes addressing hunger and vulnerability in various forms since the devastating famine in 1973/1974. The current country programme (CP) 200253[4] covering the period 2012–2015 builds on a long history of WFP programmes that have evolved through collaboration with the government, and are based on humanitarian food assistance to address urgent food and nutrition needs and development-oriented assistance focusing on the most food-insecure groups and areas. It concentrates on five main areas, two of which are particularly relevant to water-related interventions: (i) increasing the capacity of Ethiopia's disaster risk management system; and (ii) enhancing natural resource management in food-insecure communities and resilience to weather-related shocks. These objectives are also in line with the government's Policy and Investment Framework as part of the Comprehensive Africa Agriculture Development Programme (CAADP), focusing on: (i) agricultural growth; (ii) sustainable land management; and (iii) disaster risk management and food security, and giving priority to supporting value chains and marketing and to community-based natural resource management (WFP, 2011b).

The United Nations Development Assistance Framework (UNDAF) for Ethiopia (2012–2015) has identified four strategic objectives, namely: (i) sustainable economic growth and risk reduction; (ii) enhanced quality of basic

Box 1: Food insecurity and vulnerability in Ethiopia

Ethiopia is prone to natural disasters, especially weather-related shocks. Vulnerability is predominantly rural and linked to demographic pressure, historical legacy, inefficient food distribution and marketing systems, inappropriate policy, topography, land degradation, variability of rainfall and the effects of climate variability and change. One reason for this high vulnerability is Ethiopia's high dependence on primary commodities and rainfed small-scale agriculture – agriculture accounts for 43% of GDP and 85% of employment. While agriculture remains the largest source of growth, land degradation and small farm sizes place limits on productivity growth.

Historically, Ethiopia has been prone to extreme weather variability. Rainfall is highly variable; most rain falls with high intensity and there is a high degree of spatio-temporal variability. Since the early 1980s, the country has suffered seven major droughts – five of which have led to severe food insecurity – in addition to dozens of local droughts. Natural resource degradation, in particular soil erosion (72% of the population live in areas that suffer from human-induced degradation), deforestation and overgrazing contribute to undermining food security. Overall, the annual costs of land degradation are estimated to be at least 2–3% of agricultural GDP. Another contributing factor to high levels of vulnerability is the extremely low level of water resource management, both in the form of watershed management and investment in water infrastructure and storage adequate to mitigate both drought and floods.

Despite the fact that Ethiopia's economy has grown substantially over the last five years, it remains one of the world's poorest nations – it is currently ranked 173 out of 187 countries in the 2014 Human Development Index. Combined gross enrolment rate is only 55% and illiteracy among adults above 15 years is still 70 percent. Under-5 mortality stands at 104 per 1,000 live births and undernutrition contributes to 58% of the deaths of children under 5. In rural areas, access to improved water sources is 34% and access to improved sanitation only 19%.

Twenty-three million people have insufficient income to meet their food needs. Food insecurity is highly regional, with food market systems functioning poorly and markets unable to shift surpluses to deficit areas. Despite the critical role of women in marketing and agriculture, gender inequality remains widespread and women farmers have limited access to resources and services.

Sources: CGD, 2010; Byerlee, Spielman, Alemu, and Gautam, 2007; Access Capital, 2010; Gebreselassie, 2006; World Bank, 2010; UNDP, 2014; Ludi, 2004; MoARD, 2008; Grey and Sadoff, 2006; Ludi, Terefe, Calow and Birhane, 2013; UNICEF and WHO, 2014; Nedessa and Wickrema, n.d; WFP, 2011e.

4 CP 104300 mentioned in Figure 3 is the predecessor to CP 200253 and covered the period 2007–2011.

social services; (iii) governance and human rights; and (iv) support to women, youth and children (United Nations, 2011a). WFP's water-related interventions, in particular, contribute to the first objective – sustainable economic growth and risk reduction – and include two components:

Under Component 1 WFP supports the Government of Ethiopia's Disaster Risk Management and Food Security Sector of the Ministry of Agriculture through capacity development at the national, regional and district levels on analysis, disaster preparedness and response. WFP is also engaged in the National Social Protection Platform, which ensures that social protection systems address hunger-related risks through social safety nets such as the Productive Safety Net Programme and further strengthening linkages between the relief programming and the broader development agenda.

Component 2 focuses on disaster risk reduction through improved natural resource management in food-insecure communities. Under the umbrella of the Sustainable Land Management Platform of the Natural Resource Management Sector of the Ministry of Agriculture, WFP supports the MERET programme both through capacity development to the extension system and food assistance to food-insecure communities in degraded watersheds. Best practices and experiences gained over the years in implementing MERET are being documented to enhance the Productive Safety Net Programme and to support the Natural Resource Management Sector to process and disseminate information on successful watershed rehabilitation methods and approaches. Lessons learned will be shared through the Sustainable Land Management Platform and will help raise awareness on the importance of natural resource management and the risk of climate change (WFP, 2011b).

Characteristics of MERET

MERET is a national programme implemented by the Ministry of Agriculture, and for which WFP has provided food assistance and capacity development for many years. MERET grew out of "Project 2488", which started in the early 1980s to support the Government of Ethiopia in rehabilitating forests and grazing and agricultural lands as a response to drought and conflict (Nedessa and Wickrema, n.d.). At the watershed level, MERET is implemented through the extension system of the Natural Resource Department of the Ministry of Agriculture. Technical MERET experts at the *woreda* (administrative district) level play a crucial role in the implementation process together with development agents stationed at the *kebele* (community) level. MERET is led by a National Project Coordination Committee, chaired by a state minister of the Ministry of Agriculture. Its executive arm is the National Project Support Unit (NPSU) within the Natural Resource Department. At the regional level, MERET is executed by a Regional Project Support Unit (RPSU). Experts from the regional Bureau of Agriculture and Rural Development and the *woreda* Office of Agriculture provide technical support and oversee the implementation of MERET activities in the selected watersheds. Technical WFP country and sub-office staff support the NPSU and RPSU, provide backstopping and supervision, and facilitate the exchange of knowledge and learning across sites (Nedessa and Wickrema, n.d.).

MERET is now in its third phase – MERET through Partnerships and Land Users Solidarity (MERET-PLUS) – and aims to increase the ability of rural food-insecure households to better manage shocks, meet food needs and enhance livelihood strategies through improved, sustainable land management practices. It continues to focus on watershed-based natural resource management supplemented by income-generating activities, but now also includes a strong component of community solidarity and empowerment. MERET is currently focusing on 72 food-insecure *woredas*, which the Government and WFP identified jointly by using vulnerability analysis and mapping (VAM), agro-ecological and farming systems evaluations, and evidence from the field. Besides the food, the programme provides an extensive package of technical support and capacity development through development agents. MERET has also been involved in capacity development and training of *woreda* experts, who make their expertise available throughout the *woreda*.

Through its investments in natural resource rehabilitation and asset creation at the household and community levels, MERET aims to build the required enabling environment for other initiatives towards poverty reduction and income generation. It also places great emphasis on the role women play in community empowerment, thus seeking to enhance their decision-making role and access to knowledge, reduce hardship and promote income-generating opportunities.

Participatory planning occurs at various levels, but the most important focus of MERET is at the watershed level. Once the watershed has been selected, watershed development plans are drawn up by locally elected planning teams, which comprise 50% women, and are supported by development agents and *woreda* experts. Watersheds are mapped, main problems identified and appropriate natural resource conservation activities proposed. Main interventions include soil and water conservation measures (physical and biological), small-scale water harvesting, reforestation and nursery management, community-level access roads, productivity and income-generating packages, capacity development and technical backstopping, as well as results-based management. Implementation plans detail roles and responsibilities of stakeholders involved in implementation, identifying and mobilising resources including assessing the amount of self-help contributions, developing organisational arrangements at the watershed and community levels, and capacity development of community members through appropriate training and experience sharing. Participatory monitoring and evaluation plans are also developed.

Increasingly, WFP works in collaboration with a range of different partners who focus on different aspects of an increasingly integrated rural development approach. In some sites, for example, tasks are divided among several partners, whereby MERET focuses on natural resource conservation, while partners – for example the Relief Society of Tigray (REST) or *Deutsche Gesellschaft für Internationale Zusammenarbeit* (GIZ, Germany Agency for International Cooperation) in Tigray – focus on income diversification or support to communities to develop user associations.

3.4.2 WFP in Kenya

WFP has been supporting the Government of Kenya since the 1980s in addressing food insecurity and vulnerability, especially in the arid and semi-arid lands (ASALs). In the 1990s, a paradigm shift took place that replaced FFW with asset-oriented programmes, emphasising the use of food assistance for community-based asset creation. The long-lasting effects of FFA are achieved not only through creating assets, but also through building adequate skills to help people plan and manage micro-initiatives and to continue to invest in their futures (Diang'a and Ngigi, 2009; WFP and Government of Kenya, 2010).

Characteristics of PRRO 106660 and 200294

The FFA activities in Kenya are in line with government priorities such as Vision 2030 and the Poverty Reduction Strategy Paper in general, and in particular the Agricultural Sector Development Strategy (2009–2020) and the draft Arid and Semi-arid Land Policy, especially as they relate to natural resource and environmental management (Diang'a and Ngigi, 2009; WFP and Government of Kenya, 2010). Activities are aimed at supporting and strengthening the resilience of communities to shocks through safety nets and asset creation, including adaptation to climate change.

Initiated under PRRO 10666 until April 2012 and continued under its successor PRRO 200294 (May 2012 to April 2015), a shift in operation can be observed away from general food distributions (GFDs) and supplementary feeding programmes (relief phase) towards FFA activities (recovery phase) and supporting early warning systems and contingency planning (preparedness phase) (WFP, 2012). Another important shift relates to the increasing use of cash transfers instead of food in FFA. The appropriateness of the different types of transfers depends on how effective the market and financial systems are in a given area (e.g. where financial systems or markets are not working well, food is preferred to cash), but it has also been influenced by the presence of crop diseases. In such cases, WFP has decided against using cash transfers, which would be used to buy local maize that can be affected by aflatoxin, and continues to distribute disease-free food.

Under the asset creation component of PRROs 106660 and 200294, WFP supports activities with food, cash or

Box 2: Food insecurity and vulnerability in Kenya

Eighty percent of Kenya's population of 42 million live in rural areas. The economy is predominantly crop and livestock based, with about 80% of the population relying on these for their livelihoods, contributing 24 percent of the GDP, 45% of government revenue and more than 50% of export earnings. Despite significant recent GDP growth resulting from the Economic Recovery Strategy launched in 2003, the proportion of the population living below the national poverty line has increased from 42 to 52% over the same period, and 7.5 million live in extreme poverty. Kenya is a low-income, food-deficit country ranked 147th out of 187 countries in the 2014 Human Development Index.

Eighty percent of Kenya is classified as arid and semi-arid land (ASAL), and characterised by harsh and variable climatic conditions. ASAL is home to about 10 million people (of whom at least 3 million are pastoralists), and host about 70% of the national livestock population and over 90% of wild game that supports Kenya's tourism industry. These areas have the lowest development indicators and the highest incidence of poverty: over 60 percent of ASAL inhabitants live below the US$1 a day poverty line and fail to meet their daily food requirements. Poverty is the major cause of food insecurity, exacerbated by frequent droughts, floods, inefficient food distribution and marketing systems, weak governance, inappropriate policy, conflict and insecurity, population growth and HIV/AIDS. Specific problems, needs and potentials of ASALs have never been fully appreciated, neither by the Government nor the development partners, leading to low attention and neglect in the best case and wrong interventions in the worst.

Although there is substantial potential for ASAL development in Kenya, the current picture is rather grim. Natural resource degradation in ASAL is prevalent in many areas. Particularly in the pastoral arid areas, droughts and conflicts significantly affect both lives and livelihoods, resulting in loss and wastage of livestock resources through disease, death and raiding. ASALs are subject to climatic shocks, including recurring droughts and floods. Kenya has suffered from six major droughts since 2000. ASAL regions are most severely affected by food insecurity, which has its root causes in a range of factors, including poverty, poor economic performance, droughts and floods, human conflict, degradation of natural resources, population growth, inefficient marketing, rising fuel and food prices, poor governance and aid failures.

Sources: UNDP, 2014; Government of Kenya, 2004; WFP, 2011c; Kiome, 2009.

voucher transfers in arid and semi-arid lands, focusing on water conservation and storage, which is among the main concerns of the population. Interventions include communal water pans and dams (in arid areas such as Turkana) and farm-level ponds (in marginal farming areas such as Makueni), as well as different bunds and terraces including trapezoidal bunds, *zaï* pits, semi-circular bunds and *fanya juu/fanya chini* (terraces) on farmland. Other activities aim at promoting dryland agroforestry and fodder production, particularly in pastoral areas, and rehabilitating irrigation systems and degraded lands to enhance food, fodder and tree crops, complementing partners' efforts to assist agropastoralists and marginal farmers (WFP, 2012).

The Kenya Food Security Steering Group, a multi-agency group of development partners under the lead of the Government of Kenya, conducts assessments to identify vulnerable populations. Rainfall effects on agriculture and pasture and interactions with other factors (pests, diseases, human health status, water availability and quality, conflict, market access and prices, etc.) are the basis for determining likely impacts on food security and the number of people facing potential food gaps and requiring assistance until the next rains or cropping cycle. At the county level, the County Steering Group, chaired by the county commissioner and composed of representatives from line ministries, United Nations agencies and NGOs, provides a detailed assessment of the situation in the county. While working relatively well in technical terms and being considered credible in predicting the number of people in need of food assistance, the assessments do not provide an adequate analysis of and information on non-food responses (Diang'a and Ngigi, 2009).

Once the number of beneficiaries is known, the share of GFD and FFA is agreed between the County Steering Group and WFP. The number of beneficiaries to include in longer-term FFA interventions depends on: (i) recommendations made by County Steering Group; (ii) the potential of the area and its inhabitants to carry out relevant FFA activities; (iii) the political will of local leaders to support FFA over a longer period and mobilise the population; and (iv) the capacity of WFP and the Government to ensure longer-term technical support, supervision and backstopping so as to ensure quality of investments. Once areas for FFA have been identified, WFP and partners usually adopt community-based targeting to identify those households that should benefit from GFD and/or FFA. Communities, with the help of village-level relief committees, publicly select households eligible to receive food aid. Selection of the most vulnerable households is made on the basis of vulnerability criteria defined by the community themselves, and facilitated by the cooperating partner.

Planning of activities in some areas is supported by the Seasonal Livelihood Programming. This tool is increasingly used to bring together cooperating partners to create joint development plans based on the information collected on the livelihood activities of beneficiaries, but also of typical problems encountered, such as market price fluctuations for livestock, water shortages or human illness during the year. Such livelihood analysis is complemented by an overview of natural resource management activities already undertaken by partners in a specific area as well as a proposed plan for undertaking additional activities over the year.

Involved in the project design are the selected cooperating partners, usually a local NGO or specific government department, and the technical steering group of the County Steering Group representing government line ministries, such as agriculture (crops and livestock), water and public health. The Kenyan FFA manual (WFP and Government of Kenya, 2010) stresses the importance of ensuring that community members be involved in the planning, implementation and monitoring process at all stages so as to ensure ownership and sustainability.

3.4.3 WFP in Bangladesh

WFP has been assisting Bangladesh since 1974 to address food insecurity and vulnerability, originally with a strong focus on relief assistance. Over the years, WFP-supported operations have transitioned from relief to rehabilitation, and today they are increasingly focused on development and enhancing livelihoods. The most recent country programme (200243, 2012–2016), guided by WFP's country strategy for Bangladesh and in line with the UNDAF 2012–2016, is designed to support the Government in improving the long-term food security and nutrition situation of ultra-poor households and specifically contributes to the achievement of MDGs 1 to 5. Gender is mainstreamed into all activities in order to reduce gender inequalities and promote women's empowerment, in line with the WFP Gender Policy. Activities are focused thematically and geographically in 15 of the 20 priority UNDAF districts (United Nations, 2011c).
Working in disaster-prone areas of Bangladesh, WFP has concluded that focusing only on supporting physical assets through FFA schemes is not going to provide value for money, as regular setbacks in terms of loss of development results and resources invested in communal infrastructure or material assets at the household level have to be expected. WFP's approach in Bangladesh has therefore always included a strong component of human capacity development and skill enhancement in addition to the creation of physical assets (WFP, 2006). Life-skills training is also complementary to government-funded cash-based activities with a view to enabling households to make positive choices on dietary diversity and infant feeding (WFP, 2011d). The value of the transfer amounts to two thirds of the average monthly income of ultra-poor households, is in line with other employment-generation programmes run by the government. A combined food and cash approach gives households greater flexibility in spending and insulates them from food price fluctuations. The current country programme 200243 has four

Box 3: Food insecurity and vulnerability in Bangladesh

Despite considerable increases in per capita income since its independence in 1971 and achievements in poverty reduction (from 57% in 1992 to 31.5% in 2010), Bangladesh is among the poorest countries in South Asia and is ranked 142 out of 187 countries in the 2014 Human Development Index. At least 45 million people, almost one third of the population, live below the poverty line. Poverty is more widespread in rural areas (36%) than in urban areas (28%), and especially persistent in the northwest (affected by drought and river erosion), the central northern region (prone to seasonal flooding), and the southern coastal zone (affected by water logging, inefficient water management, soil salinity and cyclones). The agricultural sector accounts for less than 20% of GDP but for 44% of the labour force, which is often engaged in informal, low-income jobs with limited productivity. Landholdings are small, and close to 5 million people are absolutely landless.

Many people have an inadequate diet and suffer from periods of food shortage. Half of all rural children are chronically malnourished and 14% suffer from acute malnutrition. Poverty and food insecurity are influenced by factors such as exposure to natural disasters, distribution and quality of agricultural land, environmental degradation, social inequality, access to education and health facilities, level of infrastructure development, employment opportunities, and dietary and caring practices. Poverty is both a cause and an outcome of food insecurity. Households that are poor lack the means to acquire sufficient and nutritious food; people who are food-insecure may have to sell or consume their productive assets to satisfy their immediate food needs, undermining their longer-term income potential and leading to poverty.

Bangladesh is vulnerable to many climate-related extreme events and natural disasters such as increased and more erratic monsoon rainfall, resulting in higher flows in the river system during the monsoon season and rising sea levels (by 0.18 to 0.79 metres). Two thirds of its territory is less than 5 metres above sea level. Nearly a third of the country is susceptible to tidal inundation and salt water intrusion and close to 70% can be affected by flooding during severe monsoons. Early evidence of climate change impacts on the agricultural system has been already reported: erratic rainfall and temperature, occurrence of extreme weather events and salinity intrusion are key indicators. It is estimated that climate change could affect more than 70 million people of Bangladesh, especially those living in coastal areas. It is predicted that a 45 cm rise of the sea level may inundate 10–15% of the land by 2050, resulting in over 35 million climate migrants from the coastal districts.

Sources: UNDP, 2014; IFAD, n.d.; World Bank, n.d.; WFP, Food Security Atlas for Bangladesh, n.d. (a)) (www.foodsecurityatlas.org/bgd/country), IRIN, n.d.; Rahman, 2009.

components, of which Component 3 is particularly relevant to water-related activities: Enhancing Resilience to Disasters and the Effects of Climate Change (ER) programme.

Characteristics of the ER programme

The ER programme started under CP 10410 (2007–2011). The current CP 200243 (2012–2016) spells out the following expected outcomes: (i) enhanced resilience among vulnerable communities to natural disasters and the effects of climate change through the creation of community assets; and (ii) improved food and nutrition security of ultra-poor households (WFP, 2011d). The ER programme remains a priority for WFP, with around one third of the country programme budget allocated to it. The disaster risk reduction and response component is based on a comprehensive resilience-building approach, focusing on: (i) physical and environmental resilience (reducing the risk and exposure of vulnerable groups to shocks by building protective assets such as embankments); (ii) economic resilience (protecting existing livelihood assets and creating short-term employment opportunities through food and cash for work during the agricultural lean seasons); and (iii) social resilience (enhancing community cohesion through a participatory approach to decision-making about the assets created).

The ER programme is implemented jointly with the Local Government Engineering Department (LGED) under the Ministry for Local Government, Rural Development and Cooperatives and partner NGOs. The LGED is responsible for providing technical support and advice to the reconstruction activities and ensures that building works are carried out to the required technical standards. It is also LGED's responsibility to include the newly built or rehabilitated infrastructure in the government inventory so as to ensure that ownership is shared between the beneficiaries and the government, and that infrastructure is maintained when required. NGOs, operating from local offices at the *upazila* (county) level where technical staff is located, follow up on project implementation on a day-by-day basis together with LGED technical experts and experts from the Ministry of Agriculture. According to stakeholders, this partnership and the specific arrangement of responsibility between WFP, a partner NGO and LGED is working well, and is further supported by WFP through training provided to partners.

Partnerships with other development partners are established to provide longer-term food security and livelihood opportunities through homestead gardening, animal husbandry and income-generating activities. WFP and its partners also trained local stakeholders in

disaster risk reduction and climate change adaptation, particularly local government agencies, community-based organisations, NGOs and upazila Disaster Management Committees. WFP works with a number of additional partners besides the LGED, including the Ministry of Food and Disaster Management, the Ministry of Water Resources and its associated Bangladesh Water Development Board, and the Ministry of Environment and Forests.

Districts for WFP interventions are selected using vulnerability analysis and mapping (VAM) poverty maps and other vulnerability indicators. The upazila Disaster Management Committee identifies unions (groups of nine villages) for ER implementation based on vulnerability criteria (e.g. food insecurity, nutritional status of the population, disasters). In selected unions, a local-level planning process is initiated under the lead of the Disaster Management Committee, facilitated by the WFP partner NGO and overseen by LGED to identify risks, prioritise investment needs including capacity development needs, and to determine the range of community-based assets that might help in resilience building for disaster risk reduction and climate change adaptation. The plan also specifies roles and responsibilities of partner organisations, including the government and NGOs.

Community assets such as embankments, coastal tree plantations and drainage canals to protect communities from flooding and tidal surges, roads to improve market access and link communities to essential services, and ponds and irrigation canals to strengthen agricultural production and food security are created during the November to June dry season, generating temporary employment for ultra-poor households. Life-skills training is provided during the rest of the year. Beneficiaries must agree to carry out earth works and participate in training over a period of two years.

Gender mainstreaming is a cross-cutting theme in the ER programme. At least 70% of all participants are ultra-poor women and women-headed households. They are prioritised because not only do they face additional socio-cultural barriers in accessing income-generating opportunities, but they are also more vulnerable than men to the consequences of natural disasters. To ensure that food rations and cash benefit women and the entire family, beneficiary cards are issued in women's names, a practice which has increased their decision-making role and social status. To support women during the asset-building periods, child care assistance, private spaces for breastfeeding and separate toilets for women and men are provided at building sites (LGED and WFP, n.d.; WFP, 2011d).

4. Findings from the study sites

4.1 Ethiopia

4.1.1 Community-based participatory planning and implementation

Beneficiaries reported that the success of natural resource management activities depended to a large extent on their direct involvement in planning, implementation, and monitoring and evaluation of activities. They all expressed a great sense of ownership of investments, and reported that because interventions resulted in tangible benefits most farmers adhered to rules and regulations on the use of specific areas or natural resources. The success of the planning and implementation approach, as well as the contribution of MERET interventions to improved livelihoods, is augmented by work done through unpaid self-help as part of the national soil and water conservation (SWC) campaign. Up to 60 days of unpaid labour are invested during the dry season to expand conservation activities geographically.

It was also mentioned that MERET activities and planning approaches have contributed to enhance the government capacity for watershed protection through MERET's hands-on support provided to the Ministry of Agriculture at various levels.

4.1.2 Natural resources availability

In all sites, respondents reported that natural resources had become more abundant since the start of MERET. Over the last 10 years, all sites have seen a range of different resource conservation or rehabilitation activities, including area closures and hillside terracing for natural or supported revegetation, physical and biological SWC structures on cropland, water harvesting structures, tree and fodder grass planting, and gully rehabilitation and

Hand-dug well in Abreha Atsbeha. Photo: E. Ludi, 2012.

small-scale irrigation from hand-dug shallow wells or ponds. In addition, homestead development packages were promoted to enhance household income and to support women through home gardens, fruit and fodder production, small-scale dairy and livestock fattening, apiculture and fuel-saving stoves. Specifically, respondents mentioned increased availability of water for irrigation from hand-dug shallow wells and ponds, increased soil moisture, increased soil fertility, and reduced soil erosion and sediment deposition on cropland further downslope. Assets created by MERET are mostly of good quality and are appreciated by beneficiaries, who are generally willing to invest additional labour to enhance initial investments and to maintain them.

Water availability and soil moisture

At the watershed level, area closures and vegetation rehabilitation at the top of the watershed were implemented usually in conjunction with hillside terraces, micro-basins or eyebrow terraces to enhance water storage and plant growth. Similarly, on arable land, stone and soil bunds and terraces were constructed, sometimes combined with trenches and tie ridges. All these interventions have contributed to increasing infiltration of rainfall, slowed down runoff and reduced soil erosion and silt deposition further downslope. Farmers in all sites visited reported reduced soil erosion and increased soil moisture as a result of SWC investments on cropland leading to improved yields.

Respondents also mentioned that four to six years after natural resource conservation activities were initiated in the watershed, springs reappeared. Depending on hydrogeology, resource conservation across the entire watershed has also contributed to increased availability of shallow groundwater in some sites, which can be accessed via hand-dug shallow wells at the footslope of hillsides.

Animal fodder

Generally, area closures in the upstream part of the watersheds are among the first interventions implemented in target areas. Although usually heavily degraded, these areas were mostly used as grazing lands for livestock, and closing them off can imply a considerable loss in terms of fodder availability, while also implying dramatic changes to well-established livestock grazing patterns. Community agreement for area closure has been secured by distributing small parts of the closed areas to individual households where they are allowed to cut grass and carry it back to their homesteads for their livestock or for selling. According to beneficiaries, after a few years the benefits of cut-and-carry systems outweigh the losses. An associated problem with area closures is that usually some households depend disproportionally on communal areas for livestock grazing, for collecting wood or for other products. These are usually the most marginalised and poorest households of a community – women-headed and landless households who lose most from area closures. These households are compensated by organising them into specific user groups and supporting them with income-generating activities such as apiculture or livestock fattening, through which they can still benefit from the closed areas.

4.1.3 Livelihood and food security improvements

All MERET sites were classified as food-insecure and households suffered from structural and recurrent food shortages for a number of months; in some sites, food gaps for some households were reported to have been up to nine months. FFA interventions focusing on natural resource management were therefore combined with income-generating activities, including apiculture, poultry, livestock fattening, dairy, horticulture cash crop production, livestock fodder production and timber production.

Reduced time to collect water

Improved water availability is of great concern to women and girls, who often have to spend long hours walking to water sources and waiting for their turn. Having water close by reduces drudgery and frees time that can potentially be used for education, productive or reproductive work. According to women participants in the focus group discussions, time spent collecting water has reduced due to increased water availability from nearby shallow wells and springs: from two hours (Abreha Atsbeha) or six hours (Bahire Tseba) round trip to less than one hour. They also pointed out that there was an additional time saving as water was now available for livestock as well. They reported that improved water availability and abandoning free grazing for cut-and-carry systems had reduced the labour burden on children.

Income-generating activities

Respondents indicated that income-generating activities, combined with improved crop yields and revenues from livestock, have led to increased household incomes. Exact figures on how much incomes had increased could not be obtained, but beneficiaries estimated that in the best situations income might have doubled. They also mentioned that food security, measured in terms of food availability from their own production, had improved, and that the time during which households either had to rely on markets to purchase food or on support systems such as safety nets had shortened for most to a few months.

In terms of increased production, some farmers estimated that in favourable locations yields had doubled since MERET interventions were initiated. Reasons mentioned for yield increases were improved soil moisture due to SWC, reduced soil erosion and thus reduced declines in soil depth, and reduced sediment deposits/flooding of cropland downslope. According to the results-based report for Hintalo Wajerat Woreda, self-reported food insecurity was reduced by two months for 89% of all respondents across the five active MERET sites. But as with income changes, because no baseline data had

been collected (e.g. crop yields measured before MERET interventions were initiated), it is impossible to triangulate farmer's perceptions against measured crop yields, or discount other (non-MERET) influences such as increased use of fertiliser on production and income.

Some farmers also reported decreased yield variability from year to year. However, other farmers pointed out that variation of crop yields was primarily a result of rainfall (amount, length of dry spells, start and end date of rainy season). They also noted, though, that yield variability was probably less on land with SWC than on land without.

Enabling women to gain an income has been a central concern for MERET. Specific income-generating activities were targeted at women (i.e. poultry, animal fattening), and women's associations were usually formed. Some of these enjoyed access to closed areas for planting trees for timber, cutting and selling grass, and planting fodder for livestock fattening.

Creating income-generating opportunities for landless youth was another MERET intervention. MERET supported the formation of youth groups for apiculture and livestock fattening. In some sites, it was even reported that income from honey production was so high that high school graduates returned to the village to become part of the youth association.

Impacts on food security

As a result of participating in FFA activities, some previously food-insecure households were able to improve their own production and income sufficiently to "graduate". In other words, they no longer depended on external support provided through safety-net programmes such as the Productive Safety Net Programme. None of the watersheds or communities visited were reported to have graduated and become food-secure as a result of MERET interventions. Estimates of beneficiary households graduating were reported highest in Abreha Atsbeha (90%), while in other sites it was said that the share of households graduating from MERET catchments was larger than for the rest of the *kebele* (community). In one *woreda* (Werebabo), experts estimated that at least 15% of households who previously were engaged in MERET activities and were given 3 kg of grain (worth approximately ETB 21–30, or US$1–US$1.5) per day no longer needed this kind of assistance, either because they became food self-sufficient or because they had better income-earning alternatives (wage rates for unskilled labourers can be anywhere between ETB 30 and 100 per day – US$1.5–US$5 per day).

Despite positive reports of increased production and income, improved livelihoods and increased ability to deal with stresses, the majority of respondents still considered themselves vulnerable or food-insecure. These findings reflect the conclusions of a recent evaluation of MERET (Sutter et al., 2012): while generally MERET households and communities are more resilient to shocks and employ a wider variety of preparation and coping strategies than control groups, MERET is essentially a stand-alone project in few *woredas*, often implemented over a prolonged period of time with little attempts to phase out of existing watersheds and scale out to new ones. Overall, MERET was seen as not having been fully managed to make use of synergies and realising its potential impact, primarily because of its limited integration with other programmes and sectors.

4.2 Kenya

4.2.1 Community-based participatory planning and implementation

Once food-insecure sub-counties and divisions are identified and the County Steering Group decides to use FFA in specific areas, communities identify and prioritise problems affecting their livelihoods. Beneficiaries mentioned that because they are involved in project identification right from the start, they feel a strong sense of ownership of interventions. Beneficiaries also said that cooperating partners are well established in the counties and well regarded. Collaboration between communities and cooperating partners in prioritising on-site or off-site rainwater harvesting projects was reported to be very good. Once key projects are identified, cooperating partners prepare project proposals with inputs from the communities and the government line ministries represented in the County Steering Group, and submit them for approval to WFP and the Ministry of State for Development of Northern Kenya and Other Arid Lands.

4.2.2 Natural resource availability

In all areas visited, respondents mentioned that natural resources have become more abundant since WFP-supported interventions were initiated. A number of off-site (e.g. pans, dams, ponds) and on-site (e.g. terraces) water-harvesting structures have been constructed under FFA schemes. Respondents said that the measures have increased water availability for livestock, irrigated crop cultivation and domestic use, and enhanced grain crop, vegetable and fruit production, all of which are contributing to improving food security and nutrition, reducing drought risk and enabling additional income-generating activities.

Water availability

Access to water in both pastoral/agropastoral arid lands (Turkana) and marginal semi-arid agriculture areas (Makueni) is vital for the viability of livelihoods. In pastoral areas, traditional water sources include rivers, shallow wells and seasonal ponds. Many of these water sources have diminished in recent decades, leading to decreased water availability and longer dry periods. A number of previously mobile pastoral communities started to settle after serious droughts (in 1980/1981, for example) led to a loss of livestock. Once settled, such communities

lost their livelihoods and became increasingly dependent on general food distribution.

As a means of reducing the number of people depending on general food distribution, WFP started to use FFA in pastoral/agropastoral areas for the construction of water pans to support crop production and livestock. Pans vary in size, but in the best case they can hold water for 12 months. The majority of pans, however, are smaller in size and store water for four to six months after the rainy season. The size of water pans depends on whether only human labour is used in the construction or whether machinery can be brought in to deepen them. The pans visited for this study were only recently finished (2011 or 2012), and it could not be established what impacts a drought, such as the one affecting northern Kenya in 2008/2009, would have on water availability, access rights and intergroup relations.

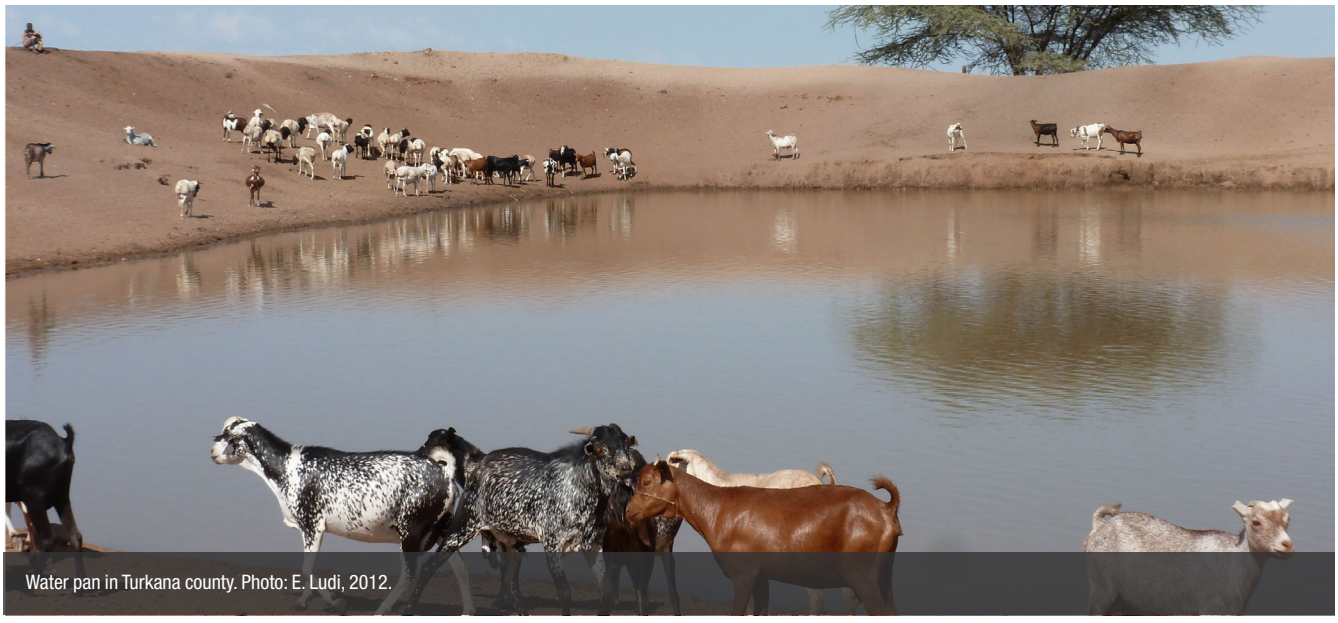
In most pastoral/agropastoral areas where pans and dams were built, bunds – usually large trapezoidal bunds enclosing an area of up to 2 ha – were constructed for rainwater harvesting to initiate crop farming. Crop yields are generally shared among the extended family, including those still migrating with livestock, and will last for around one month. For the rest of the year, settled people engage in FFA, receive support from relatives with livestock, and generate cash income from the production and sale of charcoal, gathering of wild food for their own consumption and sale, brewing, and sale of livestock.

In semi-arid areas, various interventions have been implemented through FFA, including: area closures, construction of macro-basins and semi-circular bunds for pasture and browse rehabilitation, trapezoidal bunds, terraces and *zaï* pits to improve rainwater harvesting on cropland, construction of community dams and farm ponds, construction of check dams and planting trees for environmental rehabilitation, rehabilitation and construction of rural feeder roads to improve market access, and a number of different capacity development activities. This, according to respondents in Makueni, has led to increased water availability from shallow aquifers or ephemeral streams as a result of increased water infiltration. It was also reported that thanks to increased water infiltration into shallow aquifers, the salinity of groundwater was reduced.

In both areas, respondents stated that the distance to water points for livestock has reduced since pans, dams or ponds have been constructed. In some cases, distance to water has decreased from 20 km to 1 km, which has led to less livestock loss from raids and cattle rustling, and shorter walking distances to access water. The possibility to access water more frequently resulted in less wastage of animals, and this in turn translates into more milk and better selling prices.

Besides the positive impacts of natural resource management interventions, WFP beneficiaries and technical experts also mentioned some challenges that need to be addressed to enhance the positive impacts of water harvesting structures:

- Although pans were designed to cater for livestock and supplementary irrigation only, people also fetch water from them for domestic purposes.
- Since pans and dams became operational, a higher incidence of malaria was reported, as well as incidences of water-borne diseases as a result of insufficient protection of water from contamination.
- Being in arid and semi-arid environments, open waterbodies lose large amounts of water through evaporation; according to the estimates by the Ministry of Water and Irrigation (MoWI) experts up to 50 percent of the initially collected water can be lost.



Water pan in Turkana county. Photo: E. Ludi, 2012.

- Water pans and dams are constructed to collect runoff, which often carries high sediment loads leading to siltation, which reduces storage capacity and life span of pans.
- Constructing permanent water sources in areas largely inhabited by mobile pastoralists attracts herds to stay longer in the vicinity or even to change migration patterns, leading to: (i) more animals than originally planned using the water pan; (ii) overgrazing and degradation of adjacent rangelands; and (iii) conflicts among different groups of people claiming access rights to both water and pasture.

Soil conservation and soil moisture

Soil and water conservation structures were constructed on cropland with the aims of: (i) reducing soil erosion and runoff; and (ii) enhancing runoff infiltration as a means of increasing soil moisture, particularly during dry spells, as well as recharging shallow groundwater. In semi-arid Makueni visual impressions indicate that SWC structures are now covering large tracts of cropland in FFA areas. Respondents generally reported that soil moisture had increased, which in turn had positive impacts on crop yields; according to beneficiaries, these had doubled, although greater use of compost, manure and artificial fertiliser would also have contributed.

In Turkana, because the population had no experience with crop farming before trapezoidal bunds and sorghum were introduced a few years back, no reference was made with regard to changes in soil moisture, soil erosion rates or soil fertility. Respondents here mentioned that without the bund that holds water back across the entire field and allows for a slow infiltration rate, no crop cultivation would be possible.

4.2.3 Livelihood and food security improvements

All sites visited are classified as food-insecure, with households suffering from food shortages for a number of months per year. In particular, in Turkana, 12-month food gaps were reported for those pastoral households that had settled due to the loss of livestock during previous droughts. Although reasons for food insecurity are manifold, WFP, together with government partners and beneficiaries, identified water insecurity as one of the major reasons and a good entry point for getting involved with labour-intensive FFA activities.

Increased yields

Respondents indicated that water harvesting increased yields and that the introduction of horticulture contributed to increasing incomes. Exact figures on how much production or incomes increased could not be obtained, but beneficiaries estimated that in the best situations yields might have doubled. They also said that food security, measured in terms of food availability throughout the year, had improved and that their own crop production lasted longer, reducing to a few months, the time during which households had to sell assets to buy grain. An important improvement that respondents mentioned is the livestock health improvements resulting from greater water availability, which translates into higher milk production for either their own consumption or for sale.

Especially in pastoral areas, rainwater harvesting has enabled people to grow grain crops. Around most pans, trees were planted and in some cases even greenhouses were constructed. In both areas, water availability has made growing vegetables and fruits easier, which offers opportunities for income generation and improved nutrition.

Although yields had increased and food gaps could be reduced, in none of the sites were there reports of households having been able to graduate and become food self-sufficient. This can be explained, in part, by FFA interventions having been relatively recently introduced in most of the visited sites; their impacts have yet to be fully felt.

Water access and hygiene

Among the benefits from improved water access, the following were mentioned most often: increased amounts of water used at the household level for different purposes, reduced time spent by women and girls fetching domestic water, and less travelling time spent by men and boys to access water for livestock. It is impossible to say how far these time savings could be translated into productivity gains. Increased school enrolment and attendance of children was reported, as time to fetch water was reduced thanks to nearby water pans and ponds. Furthermore, respondents also mentioned that hygiene had improved as water was now more readily available for washing clothes and for personal hygiene. Finally, having water available in nearby dams meant that queuing times had become much shorter and that it was no longer necessary to depend on dangerous hand-dug wells.

4.3 Bangladesh

4.3.1 Community-based participatory planning and implementation

Beneficiaries reported that the success of the investments depended to a large extent on their direct involvement in planning and implementation. Beneficiaries interviewed during the focus group discussion expressed a great sense of ownership of investments and reported that the interventions resulted in tangible benefits. There were different views with regard to long-term ownership and who should be responsible for maintenance of investments. Often, beneficiaries mentioned that maintenance of investments, because of their size and complexity, is beyond their capacity and therefore the government would need to be involved.

Excavated canal in Barisal district. Photo: E. Ludi, 2012.

4.3.2 Natural resource availability

In contrast to Ethiopia and Kenya, the main focus of investments in Bangladesh is less about increasing water availability and more about water management, especially managing fresh and saline water flows and drainage. WFP-supported interventions enabled re-excavating canals to drain excess floodwater and store freshwater after the monsoon season. Moreover, they contributed to raising embankments and preventing flooding and waterlogging of homesteads and cropland. Alongside the re-excavation of canals, complementary infrastructure such as sluice gates was also repaired. As a result, there was less saline water intrusion and increased availability of freshwater throughout the year.

So far the focus of interventions has been mainly on "hardware" aspects (i.e. infrastructure) of water management and much less on "software" aspects (i.e. establishing and supporting water management committees, building management capacity, strengthening institutions, including conflict resolution mechanisms and benefit sharing arrangements), which is characteristic for Bangladesh's water management system which relies to a large extent on a centralised engineering approach (Saifuddin, n.d.; Rasul and Chowdhury, 2010).

Impacts of canal re-excavations

A common problem in coastal areas is that canals have been silting up over the years, resulting in waterlogging of arable land as drainage is no longer possible. Other canals have silted up as a result of cyclones. Because of the canal siltation, land was flooded for up to eight months as excess monsoon rain could no longer be drained into the nearest rivers. In some cases, drainage also became impossible because river beds were raised over time – in some situations to levels above the surrounding land. Reduced drainage led to flooding with saline water, which caused damage to cropland and reduced rice yields. In some areas, waterlogging caused by broken-down drainage systems had lasted for so long that no paddy rice cultivation was possible at all.

In areas where land was flooded with brackish water, people started to increasingly engage in shrimp farming. A direct result of canal re-excavation was that more land could again be used for paddy cultivation. There were, however, ongoing disputes among stakeholders concerning what was more profitable – shrimp farming or paddy cultivation.

Impacts of repairs and raising of embarkments

Repairs to embankments, many of them built in the 1960s to protect arable land from river floodwaters but since then not maintained, have become necessary especially in the aftermath of cyclones. Repairing embankments has reduced flooding of village areas, and thus the damage to property and flooding of cropland with brackish water. WFP not only supported the repairs, but also supported the raising of embankments by more than 1 m, taking into account recent flood levels. Technical experts stated, however, that embankments should have been raised even further to be better able to withstand the projected effects of increased tidal surges and sea-level rise predicted as outcomes of climate change.

4.3.3 Livelihood and food security improvements

All unions visited were classified as food-insecure, and households suffered from structural and chronic food gaps. Food gaps are caused by many different factors, including poverty, landlessness and dependency on seasonal and low-paying daily labour. On top of structural factors come frequent crises through flooding and cyclones that destroy not only households' vital assets, but also community assets such as embankments and canals that are essential for protecting household assets.

The approach used by WFP in Bangladesh is to engage ultra-poor people in the planning and building of community assets, and in training with the ultimate aim of increasing community and household resilience to disasters and

strengthening agricultural production. Beneficiaries mentioned that the combined effect of food and cash for assets creation, cash for training and increased labour availability had resulted in households becoming able to meet their food requirements. Beneficiaries reported that they could not only meet their caloric needs, but because of their participation in a range of training sessions, they also gained a much better understanding of the importance of different food groups for their nutrition and of the specific dietary and nutritional needs of children and pregnant and lactating women.

Beneficiaries listed the following additional benefits from canal re-excavation and raising of embankments:

- Waterlogging has been reduced and paddy cultivation could again be practiced for two seasons instead of only one. Although not tried and tested yet, people anticipated growing winter crops because freshwater was now available for irrigation. Winter crops (pulses, potatoes, vegetables) were particularly attractive as they fetched higher prices than paddy.
- Agricultural production and intensity of land use increased for those with land, which translated into increased labour opportunities for those without land. In some sites, beneficiaries mentioned that it was mainly the households with land that benefited from canal excavation, but there were better opportunities for landless too, such as leasing land at lower costs and engaging in daily labour.
- Because more freshwater was now available, high-yielding rice varieties could increasingly be cultivated instead of local varieties that are salt-tolerant but low-yielding. Under optimal conditions, high-yielding varieties can produce up to twice as much as local varieties.
- Increasing the availability of freshwater has been mentioned as making livestock-raising easier and increasing tree survival rates along canals.
- Fishing in the canals has also been mentioned as being important, in particular for landless households. Fish from canals was either consumed locally or was an attractive income source.
- Along smaller (tertiary) canals, landless households could cultivate vegetables, and on embankments poor people started to plant trees.
- Villages and homesteads were no longer regularly flooded, limiting loss of and damage to possessions, and households could grow a range of horticultural produce.
- Embankments could be used for transport – access to flood/cyclone shelters, markets, hospitals or government offices had improved. Improved transport infrastructure also increased income opportunities (e.g. for rickshaw pullers).
- Because household income had increased – both through direct assistance and increased daily labour income – and had become more regular, men were less often forced to engage in long-distance migration where they would be away from home for at least three months at a time.
- Water quality in canals had improved, and water could be used for personal hygiene, washing clothes and household activities. Previously, women had to collect all water from tube wells.

Among the concerns reported were the unequal distribution of direct benefits of canals between landless people and those farmers with land. Most landless beneficiaries, however, mentioned that they assumed that indirect benefits in the form of increased employment opportunities were probably equal to the direct benefits farmers with land enjoyed as a result of WFP-supported canal re-excavations. Although there was more freshwater available, it was also noted that the amount of water in the canals was limited and that benefits may accrue mainly to those farmers with land close to the canals. It was also pointed out that the ability to irrigate depended on having access to electricity or on being able to afford fuel to operate a diesel pump.

Because in all sites visited, WFP-supported activities are still ongoing, it could not be established whether people could maintain their food security status over the longer term or whether they would fall back into recurrent food insecurity once the safety-net function of the FFA component comes to an end. In addition, as underlying drivers of poverty are not addressed by WFP-supported interventions and only ultra-poor households are included in FFA creation programmes, the sustainability of interventions and impacts remains questionable.

Gender

WFP focuses its programme activities specifically towards ultra-poor women. Women reported that for them such programmes were important as they offered the only direct employment opportunity besides government safety nets. Previously, the only opportunity women had was to migrate to towns in search for work.

One aspect specifically mentioned by women relates to control over cash income. Payments were recorded in women's names, leading to women having a stronger decision-making position within the household in terms of allocating where the additional income goes. Women said that since they became the main income earner, they were currently able to send all their children to school, buy the required books and pay for private tutors. Other areas where cash was spent included: (i) increased and more varied food; (ii) health expenditures; (iii) investment in small livestock (poultry, goats); (iv) savings; and (v) vegetable cultivation.

Water quality

WFP-supported initiatives in Bangladesh do not have a major focus on providing safe drinking water. People access water from government-installed tube wells. Where accessing groundwater is difficult because of salinity or arsenic, ponds are constructed to collect rainwater that is then accessed via a sand filter and hand pump. Accessing safe drinking water was only rarely mentioned as a major issue, despite beneficiaries reporting that they are using

unprotected canal and pond water for a range of purposes, including for domestic use. It was mentioned that alum[5] is used to purify water. As alum does not kill microorganisms such as *E. coli*, water still has to be boiled to make it safe for drinking. Accessing firewood, however, was mentioned as being a problem, resulting in insufficient water treatment.

4.3.4 Skills development and training

As part of the ER programme, WFP and its partners provide a series of training modules for Union and Upazila Disaster Management Committees and beneficiaries. Training for the Disaster Management Committee includes: (i) modules on disaster reduction, preparedness and management (e.g. dissemination of warning signals received from Dhaka to community leaders; overseeing the relocation of people and livestock to cyclone shelters and ensuring proper management of them; ensuring security in the village while people are in shelters; and providing special care for elderly, women, children and disabled people in accessing shelters); and (ii) post-disaster management (e.g. damage assessment, providing advice when it is safe to return back to villages, and ensuring that people have access to safe drinking water).

Training provided to beneficiaries is organised into two main modules – life skills and income generation. Beneficiaries mentioned that they benefit greatly from these trainings, and in particular from learning what to do when a disaster occurs; what the different warning levels mean and what to do accordingly; how to be prepared (e.g. keeping dried food so as to always be able to take refuge in a cyclone shelter); how to care for themselves and the elderly or disabled family members during a disaster; and how to protect assets in and around the homestead (e.g. protect shallow wells).

In terms of diet and nutrition, information was provided on the nutritional value of different food items, as well as practical skills on how to grow horticultural crops, raise poultry, small ruminants or cows, or how to farm fish. Other training modules focus on health, sanitation and hygiene. Specific training modules concentrate on women's rights and empowerment. Women mentioned that such training has helped them increase their dignity and respect in the village, enabled them to use available cash in more productive ways and not just for consumption, and allowed them to buy productive assets.

5 Hydrated potassium aluminium sulphate – $KAl(SO_4)_2 \bullet 12(H_2O)$.

5. Key characteristics of WFP's water-related activities – a discussion

5.1 Water-related activities are aligned with WFP's strategic objectives

WFP's water-related interventions using FFA approaches are in line with its Strategic Plans (see Section 3.1). In the three countries visited, key activities supported by WFP include support to governments in strengthening their capacity to prepare for, assess and respond to acute hunger arising from disasters, and establishing effective early warning systems and vulnerability analysis, paying particular attention to preparedness and disaster risk reduction and mitigation. WFP also supports communities to reinforce their food and nutrition security systems and infrastructure, as well as their adaptability to climate change, through a range of cash- and food-based assets to strengthen their livelihoods and their ability to deal with shocks (WFP, n.d. (b)). These latter interventions in general, and water-related interventions as core contributions towards more resilient livelihoods in particular, are the result of a reorientation of WFP away from food aid and disaster response and towards longer-term development and disaster prevention and mitigation activities, supporting people, households and communities to be better prepared to deal with shocks (e.g. natural disasters, financial and economic volatility, rising fuel and energy prices) and pressures (e.g. degradation of natural resources).

Emergency relief contributes to saving lives, but it has not substantially contributed to saving livelihoods, mainly because it has focused too much on food availability at the expense of other dimensions of food insecurity (e.g. World Vision, 2009; WFP, 2009b; ProVention, ALNAP, n.d.). This is particularly true in chronically food-insecure situations such as the ones encountered in the three case study countries, where food insecurity will not be eliminated unless its root causes – poverty and lacking access to livelihood assets and the political, economic, social, institutional and cultural environment – are addressed as well. Recurrent emergency relief interventions to respond to disasters, often in the same geographical areas, have contributed to the growing recognition that if responses had started earlier or focused on more than just providing food by actually contributing to supporting livelihoods, it would have been possible to reduce the need for relief over the longer term. Livelihoods-centred approaches thus have now become the norm among many relief and recovery organisations, aiming at: (i) stopping a situation from deteriorating before people resort to harmful and maladaptive strategies (e.g. selling productive assets or engaging in livelihood activities that further undermine the natural resource base on which livelihoods depend); (ii) providing support to bridge food gaps and supporting self-reliance; and (iii) promoting sustainable recovery that reduces peoples vulnerability (Young et al., 2001; World Vision, 2009).

The WFP-supported activities in the countries visited largely follow such a livelihoods approach, whereby critical household and community assets are built that address some of the underlying causes of food insecurity and that also contribute to building resilience. By combining the creation of natural assets managed by households and communities with capacity development, skills creation, training and the introduction and promotion of alternative income-generating activities, contributions are also made that target livelihoods in their broader sense. Finally, by improving capacity at the national level to prepare for, assess and respond to emerging crises, an integrated portfolio of activities linking the local with the national level is supported, which can serve as an entry point for other actors to step in and support specific livelihoods and poverty reduction interventions geared towards reducing food insecurity.

5.2 FFA interventions contribute to increasing the availability of important natural assets, food security and resilience

WFP uses food as an incentive to invest in critical natural assets that are assumed to be essential for sustainable and more resilient livelihoods and that would not necessarily be built without the support provided. Although, as

discussed in Section 2.4, rigorous and scientifically backed-up evidence of impacts of natural resource management interventions on production or livelihoods is not readily available, in all sites visited households reported enhanced production and increased income resulting from interventions. Increased income is likely a result of a combined approach, whereby not only natural resource investments are supported, but also a range of income-generation activities are introduced aiming at diversifying the income sources of poor households. In all countries, women, who are often among the poorest and most vulnerable, are specifically targeted and given preferential access to job opportunities during the construction of assets and later on with regard to income-generation support.

Both visual impressions and reports by beneficiaries show that the availability of natural resources has increased, and that this has contributed to improving household well-being, income and food security, and protecting people and their assets from negative environmental impacts such as drought, floods, storms or tidal surges.

Water-related interventions can contribute to strengthening and diversifying livelihoods, enhancing resilience and supporting climate change adaptation. They can also, as discussed in Section 2.2, be a direct contribution to improved health outcomes and food security. Increased water availability in the sub-humid, semi-arid and arid contexts of Ethiopia and Kenya, which are affected by recurrent dry spells and droughts, can support farmers and pastoralists in producing their own food, at least for part of the year, or in producing crops and animals that can be sold to access food. In Bangladesh's monsoon climate, characterised by flooding, storm surges, cyclones and intrusion of salt water, managing water through drainage and flood protection similarly enables poor households to engage in food production or income-generating activities to access food that they would otherwise not be able to access.

As mentioned by a wide range of respondents, increasing water availability has had positive knock-on effects in other sectors (see also Section 4): improvements in food security and nutrition through on-site rainwater harvesting and using off-site sources for irrigation of horticultural crops; increased income from trading surpluses or cash crops; better quality of livestock able to produce more milk and fetch better market prices; additional opportunities to raise animals; increases in sanitation and personal hygiene as water is more readily available close to where people live; and decreases in the disease burden resulting from better nutrition and improved sanitation and hygiene. Spending less time for collecting water has also been highlighted as having a positive impact on women, who have more time to engage in other productive or reproductive activities; on children, who can devote more time to school and homework as time to collect water is reduced; and on men, who have to spend less time for watering livestock. In pastoral areas it has also been mentioned that having water sources closer to villages has reduced incidences of cattle raiding. A special situation is presented in the coastal belt of Bangladesh, where canal reexcavations has increased the availability of freshwater throughout the year and reduced waterlogging with brackish water allowing households to grow paddy rice again.

5.3 Implementation characteristics

5.3.1 FFA used as an incentive for the establishment of labour-intensive natural assets

In comparison to other agencies, WFP has a main advantage – being able to use food (and/or cash) to reach large numbers of people in food-insecure situations. Besides emergency response and other direct food-related interventions such as school feeding or mother-and-child health and nutrition, WFP is using food in chronically food-insecure contexts as an incentive to compensate people working on labour-intensive interventions that might not otherwise be built.

In all countries visited, natural assets were established using food and cash to compensate people for the labour they invested. These food and cash transfers enabled people to complement income and food production from their own sources and be food-secure during the time they participated in the FFA programmes. Food was also used to compensate for people's time spent in training sessions, including modules focusing on specific life skills and modules focusing on alternative income- generating activities.

Natural assets established using food and cash transfers can be important building blocks for further activities that contribute to food security. For example, water harvesting, both on-site and off-site, in Ethiopia and Kenya enhances crop and livestock productivity, thus contributing to food security. Increased availability of water was also mentioned as contributing to the ability to grow nutritious food, to time savings and improved hygiene practices. In Bangladesh, increasing freshwater availability in canals contributed to additional income-generating activities, reduced flooding and waterlogging, and increased labour opportunities.

5.3.2 Working in partnership

WFP-supported asset creation projects are implemented through partnerships with national and local governments. These partnerships are important for the targeting of food-insecure areas, the provision of technical expertise, or for joining funds. A good example of this is the ER programme in Bangladesh, where the government provides nearly half of the required funding to support 400,000 people annually. Another important aspect of collaboration with government partners at all levels is that this helps to ensure that WFP-supported interventions are aligned with existing national policy while at the same time influencing the practice of natural resource management and interventions

supporting food security. In all countries visited, strong buy-in by the government could be observed, as evidenced by significant government contributions, both financially and through technical expertise. This can be attributed to the long-term engagement of WFP in these countries and the established working relations with a range of government departments at relevant levels, including using government technical bodies as cooperating partners.

Another set of partnerships relates to those with other United Nations agencies, especially the other Rome-based agencies (FAO and IFAD). In Kenya, for example, WFP signed an agreement in early 2013 for more focused collaboration and technical contributions in arid and semi-arid lands from FAO related to crop cultivation, livestock, forestry and policy. In Turkana, FAO has established a field office in the same compound where WFP is located to provide technical support to both WFP and the government in the aforementioned areas. Enhanced collaboration with IFAD is also planned. Such collaboration and partnerships with United Nations agencies specialising in agriculture and livestock production are crucial to further increase the value of the assets created through FFA, for example, by increasing the productivity of arable land through small-scale irrigation or by selecting the most appropriate plant varieties or animal breeds.

A third set of partnerships are those with NGOs, community-based organisations and projects implemented by other donor agencies. Such partnerships are established for implementation purposes – in Bangladesh and Kenya, for example, asset creation components are implemented by NGOs, also known as cooperating partners, in collaboration with WFP. Otherwise, partnerships with NGOs or other donor-funded projects are sought for specific activities (e.g. provision of domestic water services in Tigray through REST, the Relief Society of Tigray) or for complementing ongoing WFP-supported initiatives. An example of the latter are the links with the Comprehensive Disaster Management Programme (Phase II) under the Ministry of Disaster Management and Relief in Bangladesh, which, among a range of outcomes, is involved in rural risk reduction activities through structural and non-structural interventions, empowerment of rural communities, and improved awareness of and planning for natural hazards events and impacts of climate change.

The range of different partnerships established at multiple levels – from local communities to local, regional and national governments, NGOs and international organisations – is crucial for WFP to achieve its goals. WFP's role in such partnerships is to provide support to rehabilitate or build natural assets through FFA on which other partners can build. Partnerships are also important in view of handing over investments and exit strategies. The stronger the partnerships developed during implementation of FFA projects, the higher the likelihood that benefits of FFA investments can be sustained and enhanced even without WFP food assistance.

5.3.3 Influencing policy and practice

A result of strong partnerships is WFP's ability to support adapting policy and practice over time to improve its contribution to natural resource management and food security at the local and national levels. In terms of influencing practice, WFP, for example, has been instrumental in developing jointly with governments, other United Nations agencies and bilateral donors a number of manuals and guidelines for participatory and community-led natural resource management planning and implementation. These include the *Community-based Participatory Watershed Development: A Guideline* in Ethiopia (Desta et al., 2005), building on MERET experiences and lessons learned, and *A Guidebook on Planning and Implementation of Local Level Disaster Risk Reduction (DRR) and Enhancing Resilience (ER)* (WFP, 2011a) in Bangladesh, which in the first instance targets the personnel directly or indirectly involved in the implementation of the ER project, but also serves other stakeholders who are involved in DRR activities or activities aimed at building the resilience of people, households and communities.

In terms of influencing strategy, WFP contributed to the development and refinement of the Community-based Targeting and Distribution (CBTD) system in Kenya, aimed at devising a single distribution system for emergency food aid, and reducing duplication of efforts, waste of resources and limited effectiveness and efficiency of food aid. The CBTD differs from previous food distribution systems insofar as all food, whether coming from the government, WFP, NGOs or other sources, is combined and distributed through the same channel, and second, communities themselves, rather than government officials or agency staff, are responsible for the selection of beneficiaries and for food distribution at the community level through relief committees (WFP, 2008).

Other areas of influence include reported changes in the government attitude towards bottom-up and participatory planning and involvement of beneficiaries in all stages of the planning, implementation, monitoring and evaluation cycle of interventions. Results-based management is a further innovation introduced by WFP, which in some countries (e.g. Ethiopia) other related programmes and the government are currently adopting as a management approach and strategy.

An important WFP contribution in all countries visited relates to training and capacity development of government staff at all levels. This is particularly important in view of the outlining lessons learned, best practices and innovative technologies.

WFP is usually strongly engaged in donor platforms, either around the UNDAF or in specific technical working groups as part of the Development Assistance Group, on aspects such as food security, social protection or disaster risk management, both at the national and regional levels. With regard to the Horn of Africa, the Inter-Agency

Plan of Action for the Horn of Africa, jointly developed by FAO, Oxfam and WFP with the support of United Nations Development Programme and the Office for the Coordination of Humanitarian Affairs, is a key area of collaboration, which takes up the recommendations from the Summit on the Horn of Africa Crisis and reflects national priorities, among them that of Kenya. Among the key aims of such national and regional initiatives are: (i) fostering collaboration and partnerships across a range of agencies and government bodies; and (ii) attempting to link emergency response to longer-term development, mitigation and resilience-building measures to reduce the impact of future droughts.

5.3.4 Community-led, participatory planning approach building on identified hazards, risks and opportunities

WFP-supported interventions in the case study countries are, in principle, identified through a community-led, participatory planning approach. The starting point is usually a process aimed at identifying local hazards, risks and opportunities that are considered to contribute to the food insecurity of people, households and communities. By involving beneficiaries right from the start in identifying the most appropriate interventions, a sense of ownership has been achieved in all situations visited, which sets current WFP-supported interventions apart from previous top-down and centralised approaches to natural resource management interventions. Other differences to previous top-down approaches include:

- integration of water conservation activities across a catchment or watershed, thereby increasing the effectiveness of many soil conservation investments;
- integration of biophysical units such as watersheds with socio-economic and administrative units, such as villages or communities;
- enhanced focus on the quality and technical standards of interventions;
- more emphasis on regular maintenance of investments to avoid secondary problems (e.g. concentrated runoff and further gully erosion from insufficiently maintained terraces); and
- integration of income-generating activities into natural resource conservation interventions to make them financially viable.

More attention is required however, as will be further discussed in Section 6.2, to:

- potential implications of natural resource conservation interventions on other aspects of livelihoods, such as, for example, establishing area closures without consideration of institutional arrangements around livestock grazing patterns; and
- distributional implications of resource conservation interventions across different wealth or livelihood groups and gender.

5.3.5 Appropriate quality of technical interventions and ownership

Largely, the quality and design standards of interventions implemented through FFA in WFP-supported programmes – whether they are terraces, water harvesting structures on-site, physical and biological check-dams in gullies, reforestation and area closures, water harvesting structures off-site (pans, ponds and dams) and canals and embankments – are of appropriate quality and generally follow national standards. More emphasis, however, is required, first to put in place or follow existing systems, processes and institutional arrangements that ensure maintenance of investments over the longer term. Second, more attention is required to address domestic water quality issues and strengthen environmental sanitation and disease control around open waterbodies (e.g. malaria control and prevention) (see Section 6.1).

Besides the technical specifications of investments, ownership is a crucial factor for ensuring sustainability. As beneficiaries were involved in a participatory process of problem identification and solution development, there is a sense of ownership of interventions. Beneficiaries pointed out that they felt investments had positive impacts on their livelihoods and felt a great deal of ownership and were therefore willing to maintain them. Unfortunately, no sites were visited where WFP and its partners were no longer active and have handed over the interventions entirely to the local community and/or local administration for them to maintain. It is therefore not possible to make any conclusive statements regarding the sustainability of WFP-supported assets beyond the project lifetime.

5.3.6 Combination of asset building and training component

Training is an integral and important part of all asset creation programmes supported by WFP in the countries visited. Training usually relates to specific areas such as watershed planning or implementation of appropriate SWC technologies and water harvesting techniques. Other training components relate to income generation, thereby making productive use of the natural assets created as part of the FFA approach. In Ethiopia, for example, training with a view to developing small-scale irrigation is an important component of project interventions to enable beneficiaries to make better use of the new assets created. Stronger collaboration with development partners specialising in such activities will be required, as WFP lacks this capacity in-house.

In the coastal belt of Bangladesh, the training component has been taken a step further. In disaster-prone areas, small-scale investments in physical infrastructure will not

be sufficient by themselves in enhancing the resilience of people and communities. This led to an approach in the ER programme whereby infrastructure is built that is assumed to be able to withstand minor crises. But it also became clear that what will most likely survive and help the survival of people and communities in a crisis are not material assets but human and social assets. WFP and its partners are therefore investing heavily in training beneficiaries in a range of topics, ranging from primary life skills (e.g. disaster preparedness and management, food and nutrition, health, sanitation and hygiene, basic rights of women) to technical skills for income generation (e.g. horticulture, animal husbandry). These activities are complemented by establishing local savings and credit schemes that are accessible to landless and ultra-poor people, who otherwise are often excluded from micro-credit, savings and insurance programmes. Beneficiaries have pointed out that the training component has helped them tremendously in managing daily life, dealing with disasters and engaging in activities that contribute to increasing income and well-being. It has also been pointed out that it has led to the empowerment of women and increased the dignity and status of landless people.

6. Recommendations

Interventions aimed at enhancing natural resources in general and those in the water sector in particular were found to contribute to improving food security and household and community resilience, either directly or indirectly. Although the natural assets created are usually not able to solve food insecurity by themselves, they can be an important stepping stone for other interventions towards that goal. To ensure that the positive impacts so far achieved can be maintained over time, are fully embedded in government and development partners' policy and practice, are scaled up and are contributing sustainably to poverty reduction in a changing world, a range of aspects will need further attention. This is not to say that WFP, with its limited financial and technical capacities and within the generally short project duration, can address all these required activities on its own. But it would be welcome if WFP could be more proactively and systematically engaged in leveraging additional support and investments by development partners, including governments, in a range of areas that go beyond its immediate mandate and operational area but that are essential for the natural assets created to become building blocks for others to intervene.

A number of changes could be implemented immediately, discussed in Section 6.1, while others, discussed in Section 6.2, require a longer timeframe, in part because the required expertise is not readily available, further research is required or organisational and implementation modalities would need to change.

Although the case studies are based on WFP-supported projects and WFP's approach is unique insofar as food is used as an incentive for labour-intensive natural resource management interventions, it is believed that the recommendations are relevant for a wider group of agencies and institutions engaged in natural resource conservation and water and land management well beyond WFP.

6.1 Immediate actions to reinforce water-related interventions

6.1.1. Strengthening existing partnerships and establishing new ones

As discussed in Section 5, partnerships with government and non-governmental agencies at all levels, from the local to the international, are a defining characteristic of how WFP operates. Strengthening existing partnerships and establishing new ones, although there might be transaction costs involved, could further support WFP in transforming investments created through FFA into more sustainable assets. That relates to partnerships within intervention areas to further enhance the value and productivity of assets created – for example, to bring in additional technical expertise to improve small-scale irrigation, or establishing working relations with agencies specialising in developing domestic water supply once shallow groundwater has become more readily available as a result of watershed protection investments. It also relates to partnerships that address "downstream" requirements that are necessary to translate outputs (watershed protection, soil and water conservation structures) into positive outcomes in the form of increased yields, for example, having an impact on poverty reduction. And finally, although this is not the primary focus of WFP interventions, important partnerships are those aimed at creating an enabling policy and institutional environment that sustain achievements and transform them into positive outcomes over the longer term, as well as addressing the root causes of poverty and food insecurity.

6.1.2. Embedding water development in broader livelihood and food security systems

Natural resource degradation is one of many drivers of food insecurity in rural contexts, undermining livelihoods and increasing the vulnerability of people. WFP-supported natural asset interventions have been commended for two reasons: first, for their direct contribution to addressing food gaps in the short term by engaging people in FFA activities, and second, for the investments in household and community-based natural assets that in themselves are hoped to support food security, resilience and livelihoods in the longer term.

WFP-supported assets are considered by beneficiaries as achieving positive outcomes in terms of contributing to increased food production through rainwater harvesting, moisture conservation and increased use of water, or enabling the generation of additional income. As the discussion in Section 2.4 has shown, however, watershed protection interventions are expensive and on their own are rarely able to contribute significantly to food security and resilience. Furthermore, natural resource focused interventions generally result in winners and losers, and without the right organisations and institutions in place this might undermine the ecological benefits achieved. Better assessing the biophysical and socio-economic conditions for the most appropriate intervention, including

both "hardware" and "software" components, will be crucial if sustainable contributions to poverty reduction and enhanced resilience are to be achieved.

Some steps have already been initiated to make more productive use of the natural assets created. Ideally, however, better outcomes would be achieved if these assets were embedded in a broader suite of interventions addressing other drivers of food insecurity besides natural resource degradation, and generally be better integrated into broader livelihood systems (Collins, n.d.).

Although addressing environmental degradation is an important contribution to tackling food insecurity, too strong a focus on environmental drivers of food insecurity and vulnerability by investing primarily in physical interventions (for example, terracing to enhance water availability on-site, construction of ponds and dams to store water off-site, or managing water flows by re-excavating canals) misses out on many of the socio-cultural, economic, institutional, governance and political drivers of natural resource degradation itself and of food insecurity and poverty. Food insecurity can equally be a product of unfavourable terms of trade, insufficient infrastructure investments or unfavourable policy not enabling rural households to secure an income sufficiently high to access required food, and the food insecurity levels of different households are affected by different drivers.

For some, for example, food insecurity might have much more to do with entitlements to natural resources such as productive water or production factors (land, labour, animal traction, finance, seeds, information, etc.) than with actual resource availability. Other critical factors contributing to food insecurity include the lack of markets and infrastructure, institutional barriers to sustainable management of natural resources including water governance and policy choices, or conflict. Declining landholdings can be another factor of widespread poverty and vulnerability, such as in Ethiopia, where farm sizes have halved between 1960–1969 and 1990–1999 (Jayne et al., 2003) and where more than 40% of all farms are smaller than 0.5 ha (Gebreselassie, 2006). The situation in Bangladesh is even more critical, with close to 5 million people landless and constituting one of the most vulnerable groups. For landless people, food security will depend on being entitled to safety nets and being able to access decent jobs and income-generating activities, of which only some depend on more sustainable use of natural resources.

Many of the root causes of food insecurity cannot easily be addressed, and certainly are beyond the scope of influence of a single organisation such as WFP, as it lacks the mandate, the required financial resources or the technical capacity to engage in a wide portfolio of long-term rural development interventions. Also, until now, WFP has primarily been a humanitarian organisation that operates short-term projects, and addressing root causes of food insecurity needs a much longer time horizon.

However, if these root causes are not tackled they have the potential to undermine, or even reverse, many of the development gains made with regard to poverty reduction and food security. Ideally, scaling up the achievements of WFP-supported asset-building initiatives would include: (i) a detailed analysis and understanding of the different political, social, economic and legal factors at multiple scales contributing to food insecurity; (ii) working out how they could be addressed and what role food assistance or other support mechanisms play; and (iii) strengthened partnerships that combine a set of complementary interventions that build on the natural assets created through FFA by governments and the development community at large, including other United Nations agencies, donors, NGOs and the private sector. WFP has recognised such issues, and improvements in this regard have been initiated in some WFP countries. Seasonal Livelihood Programming has been introduced, bringing different partners together to carry out a context analysis and plan interventions according to the different strengths of partners. But more needs to be done to expand the approach to cover all countries where WFP supports interventions.

6.1.3. Geographically integrating investments

Many of the water-related investments visited in the case study areas could be further enhanced if they were integrated geographically by adopting a watershed approach to planning, design and implementation. By adopting a watershed-focused planning approach and combining different interventions within a watershed, synergies could be exploited between the different interventions focusing on the rehabilitation of degraded lands through soil and water conservation and reforestation, water harvesting and storage, improving land productivity, infrastructure development, or activities directly targeting food security through improved income generation. Intervention modalities in Ethiopia, which shifted from a soil conservation focus to a much more integrated soil and water conservation focus at the watershed/landscape level, could serve as a good example. Experience in Ethiopia demonstrates that combining a range of different technologies that support on-site water harvesting contributing to increased biomass production, enhanced water infiltration and recharge of shallow groundwater contributed to the adoption of new technologies such as small-scale irrigation, and the production of high-value crops contributed to increased household income and improved livelihoods. There are limits to applying watershed approaches – for example, in Bangladesh – where other ways of spatially integrating activities are required. Here, polders could form a unit of intervention.

6.1.4. Strategic area selection

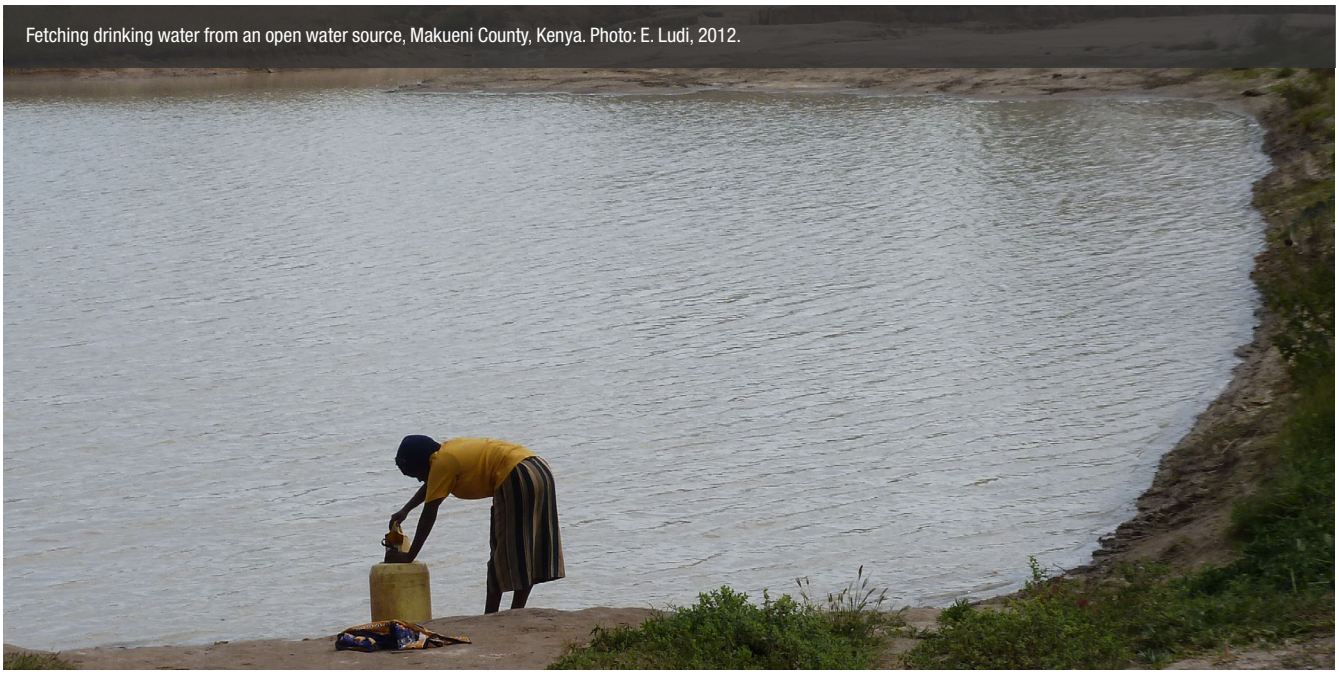
Specific to the coastal belt of Bangladesh where WFP operates is the combination of recurrent natural disasters such as cyclones and storm surges and a number of

slow-onset degradation processes, such as river bank erosion, increasing saline groundwater intrusion, land and water degradation, and pollution of soils resulting from shrimp farming. Many of these processes are influenced by how well – or not – the polder systems operate in terms of protecting the land from storms and tidal surges while at the same time ensuring adequate drainage, flushing of accumulated sediments and thus preventing river beds from rising even further, and regulating flows of saline and freshwater. Starting in the 1960s, polders were established to protect coastal communities from natural disasters and tidal surges, but they have also helped to develop vital arable land for the growing population. Overall responsibility for maintaining polders rests with the Bangladesh Water Development Board (BWDB),[6] but lack of maintenance by BWDB and conflicts among competing users have resulted in insufficient operation and maintenance of the existing infrastructure, including embankments and sluice gates to regulate water flow in and out of polders.

Because polders are not well maintained, the operation of sluice gates is monopolised by those with power, and because of the political economy – shrimp farming, which is usually practiced by wealthier households and relies on brackish water, whereas brackish water destroys paddy on which small and marginal farmers rely – there are competing and mutually exclusive interests with regard to water management, maintaining embankments and the required infrastructure. This means that as long as these issues exist, whatever infrastructure investment WFP supports (such as re-excavating secondary canals) is very vulnerable to how the embankments and primary canals work, how they are able to protect the land from natural hazards and manage to maintain the right balance between freshwater and saline water. WFP should aim to focus its natural resource investments, where possible, in areas where there are clear management rules for rehabilitation and operation of polders surrounding the WFP site. Although it is recognised that this is not easily done as the rationale for the selection of intervention areas is based on food security and vulnerability criteria and done in conjunction with local and national government. Things are further complicated by the fact that achieving proper management, including resolving some of the political economy drivers that undermine adequate management and maintenance of the polder system, will take a long time to accomplish.

6.1.5. Combining productive and domestic water and strengthening the focus on water quality

Integration of all uses of water and of sanitation and hygiene is an essential requirement that needs additional attention by WFP and its partners. Despite a large number of domestic water activities reported in the three focal countries of Kenya, Ethiopia and Bangladesh, in the specific sites visited only limited interventions towards improving domestic water supply alongside water harvesting investments were identified, although the lack thereof is often a key driver of food insecurity (see Section 2.2). This is in large part due to the fact that the majority of activities focusing on domestic water, sanitation and hygiene relate more to training and capacity development than to physical investments. However, it can be observed all over the world that when water is made available



Fetching drinking water from an open water source, Makueni County, Kenya. Photo: E. Ludi, 2012.

6 The general rule is that BWDB is responsible for managing watersheds or projects with a command area larger than 1,000 ha, whereas the Local Government Engineering Department is responsible for those under 1,000 ha.

people use it for multiple purposes even when the source was developed for one specific purpose alone, and this applies also to the sites visited for this research.

Open pans, dams, ponds and most of the wells across sites in both Ethiopia and Kenya were unprotected from contamination, especially because they were used for providing water to livestock, and these sources can therefore not be classified as suitable for domestic consumption, or "improved."[7] Unprotected water sources can negatively impact on the very same areas that a project is trying to address. The spread of water-borne diseases through polluted water can affect nutrient absorption and reverse WFP's efforts in providing food or enhancing crop and livestock production. Furthermore, open ponds can represent a safety risk for people, while in other cases stagnant open waterbodies were identified as a possible source of malaria. Public health officers in all three countries have in some cases promoted the use of chemical water treatment, but such a solution cannot be sustainable in the longer term due to financial costs or the availability of chemicals. Alternatively, it was recommended to boil water, but this risks exacerbating deforestation problems. It was also mentioned that impregnated bed nets were provided through health extension services to protect people from malaria.

Even without specific activities to improve domestic water sources, a more focused approach on improved Multiple-use Services (Adank et al., 2008; Faal, Nicol and Tucker, 2009) could enhance the value of water-related interventions established through FFA. Improving existing water sources that have been established for productive purposes or improving the technical design of new ones to make them safe enough for domestic uses would in many instances not require major investments. For example, water pans should have at least a separate access for humans and livestock to reduce the risk of water contamination. Although cattle troughs have been created in many projects in Kenya, in some they are still missing. Even if such structures are available, there is also the need to sensitise the communities to use them. Secondly, fencing off ponds or water pans should be a requirement, as pollution can also be a result of indiscriminate livestock access to the source. Besides preventing pollution, fencing can also avoid humans and animals to drown in the water pan (WFP, 2013d).

In addition, a more coordinated approach to water development, bringing together domestic and productive uses, would be highly beneficial. This would require enhanced collaboration with relevant ministries with a mandate for domestic water and public health at multiple levels, but also with United Nations partners that have a mandate in supporting domestic water supply – first and foremost the United Nations Children's Fund – and NGOs focusing on domestic water supply. Overall, WFP could consider adopting a strategy whereby water-related projects would only be approved if adequate provisions are made for such complementary measures that ensure adequate quality of water and serve the different productive and domestic purposes. The same goes with regard to the integration of sanitation and hygiene aspects. Attention to providing water of a sufficient quality for different uses needs to be integrated from the outset and be part of any project design, planning and implementation process. Retroactively fitting quality-assurance interventions or additional uses onto existing projects is more expensive and critical entry points might have been missed altogether.

6.1.6. Addressing upstream/downstream conflicts

The more water is harvested and used upstream of the catchment and runoff into streams is reduced, the more upstream-downstream relations will have to be factored into watershed management initiatives. Although current activities supported by WFP are relatively small watershed-scale interventions, where the positive impacts of water recharge and water availability for biomass production are realised and runoff control may even reduce the risk of downstream flooding, a better understanding of the hydrology and the interconnectedness of watersheds is required so as to not deprive downstream users, who often depend very heavily on water for their livelihoods, from accessing sufficient amounts of water at the right time. There is no shortcut to good situational analysis that is able to identify potential conflicts. Such situational analysis should not be sacrificed on the grounds of short design and implementation timeframes, as otherwise there will always be the danger that improvements to the food security and livelihoods of one group are achieved at the cost of the same of another group.

6.1.7. Combining food and non-food items for water development

Although impacts achieved by WFP-supported water-related activities have been commended, it was pointed out that even better impacts could have been achieved had there been a larger share of non-food items (NFI) in comparison with the value of the food or cash transfer. The funds that WFP was able to allocate for the purchase of NFIs (e.g. machinery, tools, cement, pipes, etc.) is limited to 20% of the total project costs, and constrained by the organisation's financial regulations.

It was mentioned that much more could be achieved were more resources for NFI available to complement human labour, especially in terms of increasing efficiency.

7 "An improved drinking-water source is defined as one that, by nature of its construction or through active intervention, is protected from outside contamination, in particular from contamination with faecal matter." (UNICEF and WHO, 2012).

Respondents in Kenya, for example, mentioned that digging water pans entirely by human labour is inefficient, particularly where subsoil is hard and rocky and where manual labour is mainly provided by women, and therefore pans are only reaching shallow depths. Similar observations can be made for Bangladesh, where substituting a small portion of food inputs with NFI would allow hiring machinery so that more canals could be excavated, and thus more benefits to livelihoods generated than currently where everything is done by hand. If additional funding for NFI were made available, FFA investment could be more effectively carried out. There are examples where WFP country offices were successful in leveraging additional funds, including from non-traditional donors such as philanthropic foundations, for NFI to complement its interventions (WFP, 2013d), for example by providing rope-and-washer pumps and lining material for ponds that were dug as part of an FFA intervention in Kenya.

While food or cash provision is the basic means through which WFP operates, many of the interventions are not only labour-intensive, but require substantial investments based on purchased inputs. Examples include gully rehabilitation, where gabions are needed (although there are also successful technologies available that build on masonry and biological measures), or domestic water development, which is only a contribution to improved water supply (UNICEF and WHO, 2012) when springs or wells are capped or otherwise protected and water transported safely to where it is consumed. A more balanced share of food and non-food items will be particularly required if "downstream" activities, such as irrigation improvement, market development or investments towards improving water quality, are becoming part of an integrated approach towards achieving sustainable food security.

6.1.8. Adopting good practice principles for water development in pastoral areas

Interventions towards enhancing resilience in pastoral areas by increasing accessibility and availability of water presents a particularly difficult situation, as fixed and permanent sources of water for livestock have to be understood in relation to the broader natural resource base, mobility patterns, and the specific social, cultural and political context of pastoral areas. Without going into an extensive debate (see for example Nassef, 2012; Witsenburg and Zaal, 2012; Pragya, n.d.), there are a number of crucial issues that need to be considered: because of the non-equilibrium systems of arid and semi-arid pastoral areas, and extreme rainfall variability, water availability and pastures are strongly affected and require management in the sense of adaptive coping rather than optimisation and control (Behnke, 1994 in Nassef, 2012).

While more and reliable water can have positive effects in terms of animal quality, preventing animal losses and allowing households to adopt alternative livelihood strategies, there might also be negative impacts from constructing permanent water sources in areas largely inhabited by mobile pastoralists. These include the risk of attracting herds to stay longer around a specific water source; (ii) overgrazing and degradation of adjacent rangelands; and (iii) conflicts among different groups of people claiming access rights to both water and pasture.

In Turkana, Kenya, beneficiaries and technical experts from cooperating partners mentioned these problems, and suggested as a solution enlarging pans to reduce the likelihood of conflict over access to water. Larger pans, however, do not reduce pressure on rangeland from grazing animals – on the contrary, they may lead to larger livestock numbers accessing water sources. More emphasis should be placed on integrated planning of water pans and rangeland management in order to better balance the immediate needs to provide water for livestock and for nearby communities while ensuring that in the longer term pastures are not degraded and further undermine the livelihoods of mobile pastoralists (Pragya, n.d.).

Along a similar line, developing riverine agriculture is certainly welcome for those directly benefiting, but must be understood in the larger context of other users of river water, including accessing the river itself. Areas around rivers are often important dry season grazing areas for pastoralists or agropastoralists and play a special role during crises. Blocking those areas off with permanent settlements and crop cultivation can potentially lead to tensions that may result in violent clashes between those defending their agricultural investments and those claiming customary access rights to river water.

Where FFA activities focus on the construction of rainwater harvesting structures, such as trapezoidal bunds, these can allow some crop cultivation in good years that may increase household income and can bridge seasonal hunger gaps. If done on a larger scale it might also lead to changes to livelihood strategies and entire livelihood systems, e.g. switching from mobile livelihoods based on livestock to sedentary livelihoods based on crop cultivation. This might lead to significantly altered balances between crop and livestock production in a given region, and thus terms of trade, which may actually increase vulnerability to drought (Collins, n.d.).

Sedentarisation – whether the result of a specific policy or unintentionally because of the provision of services such as year-round water – risks causing maladaptation where it is not based on an analysis of available evidence. For example, during the recent drought in southern parts of Somalia, sedentary riverine agriculturalists and agropastoralists, who were more crop-dependent than livestock-dependent, were more severely affected than mobile pastoralists (FSNAU, 2011). This would suggest that pastoralists might have the better resilience and adaptive capacity, unless this is being eroded by increasing restrictions to their mobile livelihood strategy (Levine, Ludi and Jones, 2011).

If not managed well, new permanent water sources in pastoral areas can lead to resource degradation and conflicts. Photo: E. Ludi, 2012.

Table 5: Good practice principles for water development in pastoral areas

Issue	Good practice principle
Understand the rangeland context for effective planning	Understand the broader natural resource base and grazing patterns before planning and constructing water points – making water development part and parcel of natural resource management and recognising that water availability and use affect the way other natural resources are used and managed. Understand local contexts and dynamics, including social, political and cultural aspects in a given location. Identify existing water points and explore options for rehabilitation to improve what is already there.
Rehabilitate and develop water points with sensitivity to rangeland dynamics and pastoralists' needs	In rangelands, select technologies that do not encourage settlement and adequately space points to alleviate pressure on any single water point. Couple water development with other pastoral development interventions (e.g. access to markets, veterinary health, rangeland rehabilitation). Promote meaningful engagement with water users in the planning and implementation phase of any interventions and promote the use of participatory/consultative methods, avoiding reliance on external agents.
Secure sustainability through capacity development, user contributions and use of customary institutions and practices	Strengthen the management, operation and maintenance capacity of water users and select technologies for which construction materials and spare parts are locally available. Understand existing traditional water management systems and strengthen customary institutions, building on their know-how for water scheme management. Promote user buy-in and commitment by requiring a labour/cash contribution to construct water points.

Source: Nassef (2012).

FFA water-related interventions in pastoral areas of Kenya seem to focus strongly on supporting sedentary crop-farming activities. It was mentioned that this focus was chosen to support food-insecure groups that had already settled because they lost their livestock in previous droughts. A broader portfolio of activities supporting pastoralists in general, and not just those settled, should be considered, and include activities such as restocking, livestock health and livestock marketing, pasture management and conflict resolution alongside interventions that support crop cultivation for those that have dropped out of mobile livelihoods. With regard to the specific situation of Turkana, it has been explained that WFP lacks the specific capacity and expertise in-house to engage in broader livelihood support activities in pastoral areas, and that partners that have the expertise (e.g. FAO) have only recently moved to Turkana. Finally, for livelihood support to be effective, the larger political economy drivers in pastoral areas need to be better understood.

Water development needs to be undertaken within a broader socio-political and ecological landscape context, recognising the relationships between water, pasture

and pastoral mobility and the risks of water-related environmental degradation and conflict. That translates into a set of good practice principles (see Table 5) on water development in pastoral areas that are based on a comprehensive assessment of water and pasture resources, their interrelations and use by different groups across different seasons and years. In addition, a detailed assessment of existing institutional mechanisms regarding water management, access and use by different user groups at different times will be required to better understand the role of water within the broader livelihood system of pastoral communities.

6.1.9. Collecting baseline information and strengthening monitoring

More attention is needed to collecting baseline information as one major requirement for evaluating the effectiveness and impact of WFP-supported water interventions and for providing evidence on where and how interventions can be improved. Lacking baseline data does not allow a rigorous assessment of whether WFP-supported interventions in the water sector had the impacts in terms of water availability, and household food security, income, well-being and resilience as suggested. In Ethiopia, for example, two evaluations were carried out (2002 and 2005) that used a mixed-methods approach combining qualitative and quantitative methods. Among others, household interviews were carried out to collect information from beneficiaries and field technicians on a range of variables, including quality and quantity of natural resources, food security status and well-being of households. Both evaluations have produced a wealth of insights and reported on the many benefits and improvements to the natural environment and to households as a result of WFP-supported interventions as recalled and perceived by beneficiaries. However, as reported in the 2005 evaluation (WFP, 2005) "Lack of baseline data meant that the assessment focused on *perception* of change of community members and field technicians." (emphasis added by author).

There is nothing wrong with such an approach. However, having biophysical and socio-economic baseline data would help tremendously in demonstrating the impact of water-related activities over time (before/after assessment) and in comparison with neighbouring areas (with/without assessment).[8] Having a better understanding of the impacts of FFA investments on the availability of natural resources, livelihoods and resilience would help refine interventions and select the most effective ones, but it would also point to those non-technical investments required in the institutional realm, for example, that are required to allow the assets to "come to life". Finally, it would also enable to supply the donor community with the evidence of the value added of natural resource-focused interventions in view of securing sufficient future funding.

6.2 Longer-term priority areas for sustainable food security

6.2.1 Increasing the duration of interventions

A two-to-three-year project, which is the current duration of asset-building programmes supported by WFP in the three countries visited, can already achieve noteworthy progress. Overall, adopting a longer timeframe over which interventions in both physical and natural capital as well as human and social capital could be implemented would allow making much more headway in terms of enhancing resilience – as the situation in Ethiopia demonstrates where WFP has supported the MERET programme for over ten years in some of the sites visited.

While food and wages transferred to poor households during the time assets are built certainly contribute to meeting daily needs, the verdict is open whether sufficient assets (natural, physical, financial, social and human) can be accumulated over two to three years and invested in productive enterprises that are able to withstand a crisis. In particular, as the target population of WFP is usually very poor and highly vulnerable to a range of crises – personal ones at the household level (e.g. sickness or death of an able-bodied household member), economic shocks (e.g. price increases), or natural shocks (e.g. droughts and floods) – and in light of limited safety nets, savings and insurance systems, assets, some of which can be converted relatively easily into cash, are a key resource on which households can fall back. The issue then is if a household could, over the duration of the project, accumulate enough resources that would provide sufficient buffering to prevent it from being thrown back to "square one". WFP itself observed that in hazard-prone areas investing in material assets is a risky business and needs to be complemented by investments in human and social capital that offer better prospects of being able to survive a shock. Representatives of one NGO in Bangladesh, for example, estimated that in order to have a long-lasting impact an engagement period of at least 15 years is required to support people not only in terms of building up physical and natural capital, but also in building human and social capital and in strengthening formal and informal institutions.

There are thus strong arguments in favour of a longer project duration that would allow building a natural asset base for further livelihood improvements and longer-term efforts to supporting human and social capital, especially in light of: (i) the depth of poverty and the magnitude of disasters – as exemplified by the case of Bangladesh; (ii) the seriousness of resource degradation – as exemplified by the

8 For further information on the importance of rigorous impact evaluations that generate high-quality evidence in the context of development to improve policy and the lives of poor people, see http://www.3ieimpact.org/ - the International Initiative for Impact Evaluation.

level of resource degradation in the Ethiopian highlands; or (iii) the protracted nature of food insecurity driven by a complex web of interrelated drivers – as exemplified in the arid and pastoral areas of northern Kenya. A longer project duration is furthermore required once future threats, such as those posed by climate change, are considered that require transformational adaptation.

WFP's mandate is to save lives in emergency situations, to improve the nutrition of vulnerable people at critical times and to support long-term resilience building, including through conditional food and cash transfers. It will always be necessary to strike a balance between how to address these different needs and where to allocate food and funds. As WFP is increasingly engaged in supporting developmental activities as an important component of longer-term livelihood improvement, this must be reflected in the duration of support provided. There is no shortcut. Unless funding can significantly be increased, hard choices will need to be made to find the right balance between more in-depth and long-term interventions that sustainably contribute to food security, poverty reduction and resilience building, versus the need to provide emergency relief, and establishing the most appropriate linkages between those two different phases of intervention. Strategically positioning WFP in this context will be crucial, since it will also influence the type and quantity of financial support that the organisation will need to attract from bilateral and multilateral donors.

6.2.2 Adopting a focus on downstream investments to increase effectiveness and sustainability of water-related interventions

The FFA-supported water-related investments are contributing to increasing food security and livelihoods, but more could be achieved if they were better integrated into overall socio-economic contexts. Outcomes of current water-related interventions could be further improved if WFP improved linkages with other existing programmes or entered into partnerships with developing partners that specialise in addressing "downstream" investments. Having access to water for people and animals and irrigated crops in itself will contribute to food security. More could be achieved in terms of income generation, poverty reduction and diversifying livelihoods, however, if downstream investments such as infrastructure or market development were to receive more attention. Irrigated horticultural crops, for example, can contribute to increased household nutrition and income generation if sold locally, but much more could be achieved if crops could be sold on better integrated and competitive markets.

Building strong partnerships with government, United Nations and NGO partners and the private sector that could turn WFP-supported water-related outputs into viable outcomes would go a long way in adding value to the investments. Initial steps have been initiated, both in terms of investments (e.g. using FFA to rehabilitate rural roads) and partnerships (e.g. stronger collaboration with FAO on enhancing irrigated agriculture), but there could be a more robust and streamlined strategy for engaging partners from the outset of interventions. The Seasonal Livelihood Programming (SLP) tool, which has been piloted in the Kenya case study (see Section 3.4), is increasingly used in WFP operational areas to bring different partners together around a shared agenda building on each partner's specific expertise and comparative advantage. The SLP and similar approaches could be further spread to other countries, as well as strengthened to analyse in detail the various drivers of food insecurity and how and by whom they could be addressed, in addition to those natural resource-related drivers tackled through FFA. The SLP could also bring in the required expertise to work along the "chain of investments", with regard to both inputs and outputs to enhance their sustainability. Taking the example of horticulture, this would relate, on the input side, to ensuring that farmers have better access to information and appropriate planting material and can choose what best suits them. On the output side, it would relate to supporting marketing by linking producers with markets, facilitating access to credit, or supporting producers to set up their own cooperatives to sell their produce at better terms. Similar chains of support are required around livestock in pastoral areas.

6.2.3 Strengthening institutions

A central characteristic of FFA interventions is their focus on building assets at the household and community levels. These assets are assumed to result in positive income streams that would become part of a virtuous cycle and ensure sustainability. To enhance those links between assets and income, physical interventions are usually accompanied by capacity development and training, for example, in view of additional and new income-generating activities. What is less apparent is an equally strong focus on interventions towards supporting (or building if they do not already exist) the institutions that are required to "make assets coming alive" (Levine, Ludi and Jones, 2011).

The FFA-supported interventions so far have largely focused on "hardware" (i.e. infrastructure) aspects of water management and much less on "software" (i.e. establishing and supporting water management committees, building management capacity, strengthening institutions, including conflict resolution mechanisms and benefit-sharing arrangements) aspects. More emphasis is needed by WFP and its partners around strengthening or building social organisations and supporting or developing the required institutions, including sanction mechanisms, that are capable of regulating access to, managing competing interests over, and sharing costs and benefits of newly created assets equitably among different groups. Such institutional arrangements are required to enhance the value of assets created, for their sustainability and as a contribution to building resilience.

Institutions are at the heart of sustainability – they are especially required to manage communally held assets (e.g. area closures) – to ensure that resources are used according to agreed rules, and that the most vulnerable and voiceless benefit. Often, the poorest groups within a community depend most heavily on common pool resources and are affected most if new rules are introduced. Examples include establishing area closures without considering institutional arrangements around livestock grazing patterns on which the poorest groups within a community often depend. More emphasis needs to be placed on engaging communities and government agencies in the development of institutions and by-laws specifying the use of specific areas and resources; the provision of compensation through preferential inclusion of those people losing or not benefitting from natural resource conservation investments in income-generating activities; and addressing distributional aspects of resource conservation interventions across different groups (wealth, livelihood, gender, etc.).

Institutions are also required to solve disputes or conflicts that may arise over how to use assets or between upstream and downstream users. Newly built physical or natural assets usually create winners and losers, and institutions are needed to ensure equitable access to these and prevent elite capture. Finally, establishing appropriate institutions to operate and maintain assets, especially communally owned ones such as area closures, during and, most importantly, after project implementation is a key ingredient, together with handover of assets to communities and government, to pave the way to a project's exit strategy and sustainability.

For natural assets and technical interventions to contribute to achieving the intended outcome and impact and for their sustainability, maintenance is crucial. In countries where WFP and its partners have been involved for a long time, such as in some of the MERET sites in Ethiopia, and where initial investments could be improved over time to mature (restored vegetation cover, developed terraces, gully rehabilitation, etc.) and demonstrate their positive impacts on natural resources and water availability, ensuring sufficient maintenance by beneficiaries is less of an issue. Where investments are rather recent, such as in Bangladesh and Kenya, and where the principal beneficiaries are not necessarily the people who built the structures as part of FFA support systems – in Bangladesh landless people were involved in excavating canals, but many of the direct benefits accrue to farmers who own land, or in Kenya where mainly women were involved in the construction of ponds, but livestock as one of the main beneficiaries of additional water is often owned by men – issues around maintenance still need to be resolved. In Bangladesh, for example, FFA participants feared that the canal they were re-excavating would silt up in a few years' time and the benefits to them (aquaculture, assumed increased daily labour opportunities, etc.) would cease, mainly because they were not confident at all that farmers with land, who mainly benefit from the canal, would invest the required labour (or money to pay for daily labourers) in maintaining it.

6.2.4 Revisiting design specifications to climate-proof interventions and enhance resilience

Climate change will place additional pressure on already limited and unevenly distributed water resources (e.g. Ethiopia, Kenya), or will further enhance requirements for water management and protection of people, land, infrastructure and housing from sea level rise, tidal surges and flooding (e.g. Bangladesh). Current WFP-supported interventions aim at enhancing the resilience of households and communities to current levels of weather-related stresses, for example, through water harvesting on-site to enhance green water availability and off-site to retain runoff to bridge dry spells, or managing water from increased storm surges, or changing river flows (which can also be the result of climate change adaptation measures further upstream).

Improved water resource management is pivotal to ensure sustainable development in general, and even more so under climate variability and change, as it affects all activities including food production, health, domestic water supply and sanitation, energy and industry, security, environmental sustainability and ecological services (see Section 2.1). This will require a range of measures towards mainstreaming adaptation into water sector development, including strengthening governance and improved water management, improving knowledge and information on water availability, use and accessibility, building resilience through stronger institutions, appropriate investments in infrastructure (e.g. both natural and built water storage), and well-functioning ecosystems (UN Water, n.d.). However, climate variability and change is only one among many factors affecting water availability for both productive and domestic needs; other pressures, including demographic shifts, urbanisation, economic development, changing patterns and levels of consumption, resource degradation and pollution, will affect the supply and/or demand of water at least as much as, if not more in the short term, climate change (Calow et al., 2011).

Adapting to these changes requires changes to how water is managed. Current infrastructure, resource management organisations and institutional frameworks are not well prepared to deal with more extreme events, but will need to be strengthened to do so. This will require sound land use planning, enhancing groundwater recharge through watershed protection and protection of coastal areas, in particular mangroves. It will also include measures to diversify livelihoods in view of reducing exposure to hazards. Moreover, there will be a need to repair and rehabilitate existing infrastructure and water supply systems that are able to deal with greater pressure. And finally, it will necessitate strengthening adaptive

capacity not only through water governance that is flexible and coordinated with other sectors, but also with increased investments in natural and built water infrastructure such as appropriate storage and conveyance. In practice, for WFP this might imply screening the investments it supports to ascertain whether they can deal with additional climate risks and identify strategies for incorporating climate change impacts into projects and for risk minimisation (Calow et al., 2011).

Given the uncertainties surrounding climate change impacts, a major component of the climate-screening process will include making the right technological choices that can deal with increasing uncertainty, or as Calow et al., 2011, conclude be "robust of uncertainty", i.e. appropriate to a range of different rainfall and runoff conditions. That will imply that WFP should consider carrying out a risk-screening process for resilience across its portfolio that would show what might happen to specific investments in specific areas under different climate scenarios, but also under different scenarios resulting from adaptation to a changing climate. Such an activity would not need to be carried out for each project intervention, but for carefully selected illustrative situations that would shed light on ranges of impact of climate change that could better inform technological choice or design criteria. For example, before designing rehabilitation of embankments in Bangladesh, the latest information on sea-level rise and storm surges would have to be considered to make sure embankments can cope with future events.

In more semi-arid or arid climates such as parts of Ethiopia and northern Kenya, where rainfall events are predicted to become more intense, the water retention capacity of soils will be exhausted more quickly and more rainfall is predicted to be "lost" through runoff. More storage (natural and built) will therefore be needed to mitigate these effects. Interventions need to be designed so that they can cope with extremes and more frequent droughts and floods resulting from climate change. As far as droughts are concerned, this will require a balanced approach combining capturing seasonal rainfall (on-site and off-site water harvesting). There is a clear role for water harvesting, but this will also require considering the risks livelihoods will be exposed to, particularly if dry spells become longer and droughts more frequent and shallow groundwater is not recharged on a seasonal basis. Here, deep groundwater drawing on many years of recharge might offer an alternative source for water as it is to a large extent isolated from short-term fluctuations (Calow et al., 2011).

While water harvesting under current climatic conditions is effective in reducing runoff, enhancing soil moisture, contributing to recharging shallow aquifers and mitigating variability of rainfall, it is less clear what the impact of water harvesting systems will be under more severe climate change impacts. Different technologies will be differently affected by impacts of climate variability and change – most likely, extended dry periods, more intensive rainfall and higher evapotranspiration. Generally, surface water and shallow groundwater will be more likely affected. Therefore, it is recommended that sources, which exploit these resources, require greater site investigation and built-in redundancy to ensure they are sustainable (Calow et al., 2011).

As a result, further investigations by WFP and its partners, including governments, are required to assess the hydrogeology and the permeability of aquifers in WFP sites that will help explore opportunities to design the most appropriate and climate-proofed interventions and tap deeper and better buffered aquifers. This will come at a cost. Therefore, careful assessment of costs (for bringing in required technical expertise, drilling boreholes, maintaining expensive infrastructure, running costs, etc.) and benefits (uninterrupted access to safe drinking water, secure access to productive water, higher amounts of water than what can be achieved by rainwater harvesting, etc.) will be required.

Not only do physical interventions need to be screened for their ability to deal with climate variability, extremes and change, but communities' adaptive capacity needs should also be assessed to make sure the right interventions are supported that actually enhance adaptive capacity and resilience and not unintentionally undermine them. A detailed assessment of the adaptive capacity of a sample of representative communities which WFP supports will be required that will shed light on:

- *the assets* required to deal with more pronounced spatio-temporal variability and extreme climatic situations;
- *the institutions and entitlements* that allow people to access assets and that are required to manage water and other natural resources equitably and sustainably;
- *the knowledge and information* available on water availability, management and use by different people across different seasons for different uses, but also the new knowledge and information required to be able to deal with changing situations;
- *the innovation* that is required to come up with new solutions including technology, management, organisations and institutions; and
- the development of *flexible and forward-looking governance* systems that are able to anticipate, incorporate and respond to change (for a detailed discussion on adaptive capacity see Levine, Ludi and Jones (2011).

7. Conclusions

The degradation of natural resources is an important driver undermining the food security and livelihoods of many rural people and contributing to their vulnerability to a whole range of stresses and shocks. WFP and its partners – but also many other bilateral and multilateral development partners and NGOs – have identified investments in natural resource assets as an important requirement in the fight against hunger and a stepping stone to support people to move out of poverty. In the case of WFP, instead of only providing food or cash to bridge food gaps, these are used to build assets that are assumed to contribute to enhancing people's food security and strengthening resilience over the longer term.

Across all sites visited, respondents highlighted the positive outcomes water-related interventions had on the availability of natural resources, which, according to their perception, translated into improved food security, more diverse livelihoods and increased income. They often also mentioned that they felt more secure and were less affected by weather variability such as longer than usual dry spells. Of course respondents also pointed out the positive implications of the food (or cash) they received during project implementation in terms of shortening food gaps or making cash available that could be used for purchasing food, paying for children's education, health expenditures, paying back loans or investing in productive assets.

According to respondents, water availability has increased since natural resource conservation measures have been introduced. Soil and water conservation measures on cropland, for example, in some areas combined with agroforestry measures, have increased soil moisture, which has had positive impacts on crop growth and reduced the risk of crop failure due to moisture stress or insufficient rainfall. Water harvesting in ponds, pans and dams has been reported as having had positive impacts on water availability for a range of uses for productive (livestock, garden irrigation, brick-making, etc.) and domestic (drinking, cooking, washing, personal hygiene, etc.) purposes. Watershed protection at large, particularly in Ethiopia, seems to have contributed to higher water availability in shallow aquifers, which has led to increased and more stable yields of springs and easier accessibility of shallow groundwater through hand-dug shallow wells. Canal re-excavations and repairs to embankments in Bangladesh have reduced flooding of arable land and homesteads, which enabled households to grow paddy rice and a range of horticultural crops besides protecting their houses and possessions from flooding.

Although respondents reported of a range of positive contributions of water-related interventions, both directly and indirectly, they also reported that only few households could escape poverty and food insecurity entirely, even in parts of Ethiopia, where support has been provided over more than ten years in some sites. This points at two crucial areas: firstly, poverty and food insecurity in many of the areas where WFP is working are deep-seated and protracted and difficult to solve. Secondly, natural resource availability in general, and water availability in particular, is only one of many factors that are required to make people more food-secure and resilient to stresses and shocks. Using food to bridge food gaps and to remunerate investments in natural assets are an important initial step on which to further build by integrating them into a web of other interventions that strengthen livelihood systems more broadly and that address the range of interconnected causes of poverty. This is a long-term process and needs strong partnerships with government, development partners, United Nations agencies, NGOs and the private sector.

While the previous Section 6 has identified a range of very specific recommendations for actors supporting natural resource management aimed at strengthening livelihoods and food security, a number of more general principles might help to guide how to further strengthen such interventions in the water and natural resource sector towards enhancing overall resilience (UNISDR, forthcoming; Jones et al., 2013):

- Greater acceptance that the common goal of increasing the capabilities of societies and systems to cope with shocks and stresses needs to be better integrated across the whole spectrum of development activities. While this can be addressed principally through long-term sustainable development efforts, it will often be a blend of different approaches and sectors, requiring an increasing harmonisation of activities to help ensure recovery and resilience over the long term. In the context of delivering and managing natural assets as a basis for more resilient livelihoods, this relates not only to the delivery of "hard" infrastructural and technological options, but also to "soft" institutional and governance-related investments. It will also require integration of services, especially water services for domestic and productive purposes, and integration and coordination across sectors, such as bringing together water, agriculture and public health when designing and implementing water-related interventions.

- A need to reassess how programmes offer viable and sustainable livelihood choices to those they seek to serve. This will require a better appreciation of the knowledge, capabilities and potential of stakeholders, and a more meaningful appreciation of the local and national (political economy) drivers of poverty and food insecurity as well as the adaptive capacity of communities and people.
- An emphasis on longer-term engagement. This is especially important in view of the extent of resource degradation, protracted conflict, unsupportive economic and political environments, and exposure to hazards as well as the depth of food insecurity and poverty. This will require more long-term programming that strategically covers a wider range of cross-sectoral activities and engaging both public and private institutions. Especially for bilateral and multilateral partners, this will require a move away from "traditional" programme funding – usually provided in the form of two-to-five-year cycles focusing on relatively isolated projects. Doing so requires much greater emphasis on communication and coordination among funding agencies.
- Making efforts to understand and predict future risks and the threats they pose is inherently uncertain. Projections of impacts of climate change on the water sector are not precise, especially at the sub-national and local levels, and economic and social trends and their interactions with the water sector are complicated. A "resilience" approach means working with communities, organisations and governments as they make difficult decisions in an uncertain environment. There are tools and methods to help, for example, by integrating scenario planning into strategy conversations, building redundancy into systems, and ensuring project staff has multiple skills.
- In practice, this means being better informed about emerging risks, experimenting with different approaches, documenting and learning from such experiments, and refining interventions as a result. This will mean that development actors have to be more accepting of the possibility of a range of outcomes from investments, including those that show ways in which systems behave even if they do not achieve what is intended ("instructive failures"). An iterative approach is seen as an important way of managing risks and threats successfully, of which information about future water use, demand and the likely future impacts of various changing threats is crucial.

While it may appear to be relatively straightforward to identify ways of making investments in natural assets in general and in the water sector in particular more resilient, putting these reforms into practice is much harder. The kinds of change needed to have positive impacts on local communities' resilience will often not occur through incremental change (i.e. small adjustments in ways of working). Rather, they require system-wide transformation in the way that development actors coordinate, implement and, most importantly, incentivise their actions (Folke et al., 2002). It is, however, clear that change towards fully embedding the priorities listed above on the transformative scale needed has yet to materialise. Fortunately, interest in "resilience" is rapidly gaining momentum, not only in relation to the water and natural resource sectors, but also among development and humanitarian actors. Scaling it up and capitalising on this momentum will largely depend not only on the level of sustained pressure (and incentive structures) at the international, national and sub-national levels, but also on the extent to which evidence of the benefits of a "resilience approach" can be translated into concrete and tangible recommendations for policy and practice on the ground.

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ISSN: 2052-7209

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Cover photo: E. Ludi, 2012. A well-managed MERET watershed in Wello, Ethiopia.

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