AGWATER SOLUTIONS
Improved livelihoods for smallholder farmers

NOVEMBER 2010

This briefing note is a summary of the Situation Analysis conducted in Tanzania in 2009-2010. The analysis reviewed existing agricultural water management practices and the conditions within which they took place.

TANZANIA SITUATION ANALYSIS

Introduction

This Situation Analysis is based on secondary data, field observations and interviews with key informants including officials of the Ministry of Water and Irrigation (MoWI) and various nongovernmental organizations (NGOs).

The summary of the Situation Analysis presented here focuses on existing environmental, social and political conditions across Tanzania as well as on the agricultural water management (AWM) solutions currently in use and those that have potential to improve agricultural production and farmers' livelihoods. The AWM solutions described here were shared in a National Consultation Workshop held in Dar es Salaam on 1 March 2010, where all key stakeholders in the sector in Tanzania participated and priority solutions were selected by participants. A summary of the outcomes of the workshop is available in the National Consultation Workshop Brief and will be available on the website shortly. (http://awm-solutions.iwmi.org)

The National Context

The agriculture sector continues to drive economic growth in the country, contributing 45% of the country's GDP and about 30% of its export earnings, while employing over 80% of the nation's workforce. Annually some 5.1 million hectares are cultivated, of which 85% is under food crops. Tanzania has sufficient water resources with three major lakes, nine river basins and groundwater, but there is currently very little irrigation (official estimates show less than 300,000 ha) and, hence, AWM holds the key to stabilizing agricultural production and improving livelihoods.

AWM Solutions

Conservation Agriculture

This is a concept for saving resources in agriculture while maintaining or improving productivity. It encompasses a number of technologies and techniques.

- **Terracing** reduces overland flow and contributes to water and nutrient conservation. It has been traditionally practiced in Tanzania but there have been modifications in techniques. Terraces are labor-intensive and are mostly constructed by men. They may be communally or individually managed, and have tenure implications because they alter the landscape. They are limited mostly to hilly areas.
- **Conservation tillage** reduces labor and promotes soil fertility and soil water conservation by reducing destruction of the soil structure. The main principles are zero or minimum tillage, use of soil-cover crops, mulching, and crop selection and rotation. Some locations where zero tillage is practiced include Arumeru, Karatu and some districts in Mbeya Region, and mulching is practiced in Dodoma and Kagera regions.
- **Pit and trench farming systems** aim to maximize storage of soil moisture but over the years there has been little improvement in traditional systems. Examples of these systems include the Ngoro/Matengo pits in Mbinga District and Uluguru, trench farming in the very dry parts of Dodoma and Ufipa mound/Ntumba systems in Rukwa District.
- **Micro-catchment water-harvesting systems** include various forms of bunds, micro-basins, Zai pits and chololo pits. Many originate in Tanzania but willingness to adopt is low because of the land requirement.

Water-Harvesting and Storage Systems

These operate at a larger scale than the field-level micro-dams. They are usually in the lower parts of catchments and are mainly used for domestic, agricultural and livestock needs. The four main types of water-storage systems used in Tanzania for agricultural purposes are:

- **Ndiva,** which store water overnight, are common in mountainous districts such as Same and Lushoto. They are usually used on a communal basis.
- **Malambo** are man-made ponds, dug on relatively flat land areas and strategically located to harvest as much runoff as possible from the surrounding terrain. They are common in the semiarid parts of the country like in Kilimanjaro, Dodoma, Singida, Tabora, Mwanza, and Shinyanga regions. Minimizing evaporation losses is the main challenge. They may be managed by individuals or communities depending on size and are also used for domestic purposes.
- **Sand dams** are dug in the bottom of seasonal rivers to store water. This is common in Dodoma, Mwanza, Shinyanga and Tabora regions.

- **Tanks** store rainwater harvested from tiled or iron roofs. The method was developed for collecting domestic water but is increasingly being used for irrigation and livestock. As they are family-owned maintenance is usually good. Surface tanks may vary in size from 1 m^3 to 100 m^3. Stored water can be channeled or carried to the field. This practice is found all over the semiarid central zone including Dodoma, Singida, Tabora and parts of Shinyanga. It is also a common technology in the semiarid districts of Same and Mwanga in the northeastern highlands.

Irrigation Schemes

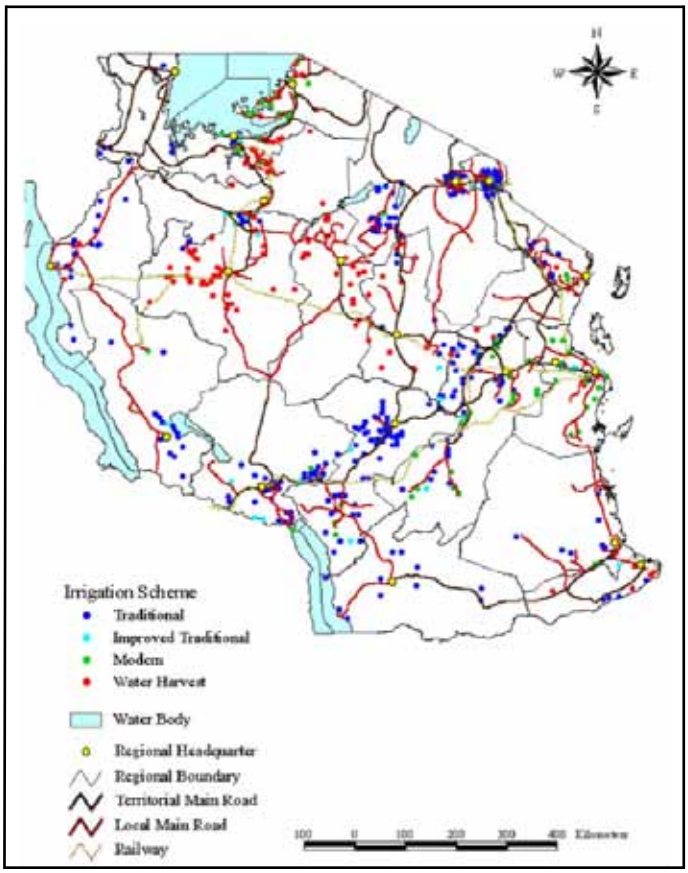
By June 2008, Tanzania had 289,245 ha under improved irrigated agriculture, spread across more than 1,000 irrigation schemes, most of them smallholder-managed. Paddy is commonly grown on these schemes and yields can be as much as four times those of rain-fed areas, although the various types of irrigation schemes and management systems result in a range of 1-6 tons/ha.

Traditional irrigation schemes are initiated and operated by farmers and include schemes based on traditional furrows in the highland areas and simple water diversion schemes on the lowlands. They tend to have poor infrastructure, poor water management, low yields, and salinity and waterlogging problems.

Modern irrigation schemes are formally planned and full irrigation facilities are provided by external agencies. Schemes developed by the government or external agencies for smallholder farmers are logically referred to as smallholder irrigation schemes, and those developed by private entities as commercial irrigation schemes. Both traditional and modern forms are concentrated in the mountainous eastern regions of Tanga, Kilimanjaro and Arusha and also in south western regions of Morogoro, Iringa and Mbeya. There are also water harvesting schemes and flood recession schemes in the arid and semiarid areas of central and western parts of Tanzania in which subsistence farmers have introduced simple techniques to artificially control the availability of water to crops.

Water Lifting Devices

MoneyMaker treadle pumps are promoted by KickStart International and are the most commonly used in Tanzania. The **Super MoneyMaker (SMM)** was launched in 1998, in response to demand by farmers for a pump that can push water uphill. The **Hip Pump** was developed in 2006 to create a lower-cost and lighter-weight, portable pump. The SMM is feet-peddled while Hip Pumps are hand-operated with support from the hips. The pumps can pump water from wells and surface water and can be used to fill overhead water tanks, for sprinkler irrigation, or to pump water through hoses for direct irrigation.



Distribution of irrigation schemes in Tanzania
Source: National Irrigation Master Plan (NIMP) 2002.

KickStart's design work is mostly done in Nairobi and the prototypes are tested to ensure performance, cultural acceptability and durability. The pumps are manufactured in China and sold to distributors just above the cost price. They are used throughout the country but are more concentrated in Mbeya, Dar es Salaam and Morogoro regions. By early 2009, KickStart International estimated that it had sold 37,100 MoneyMaker pumps in Tanzania.

The **Concrete Pedal Pump (PeP)** was introduced by the NGO, Water for the Third World (W-3-W) in 1997. The PeP can be used for irrigation, domestic purposes and livestock. It can draw water from a depth of 8 m and a horizontal distance of 400 m. The discharge rate can reach 100 l/minute. The device does not rust and is easy to produce locally. The platform base is built by the farmers, with assistance from the manufacturer.

Small-scale entrepreneurs are encouraged to produce the pumps, which supports local maintenance. It is estimated that about 1,200 pumps have been manufactured and installed in Tanzania. Pumps are also sold to farmers directly by W-3-W or through NGOs and even district programs. Collaborationwith

Savings and Credit Cooperative Societies (SACCOS), which provide loans for pumps, has increased uptake.

A Super MoneyMaker and a Hip Pump

Concrete Pedal Pump (PeP)
Source: W-3-W

Motorized pumps are becoming increasingly common in smallholder farming systems. They are mostly imported from Asia, and cost US$200-450, while the cheaper ones are Chinese pumps. The popularity of motor pumps is growing and most of the farmers interviewed plan to buy one when they have enough money. However, there was a general mismatch between pump capacities and land sizes, as farmers bought whatever they could afford or get in the market, regardless of land size. Despite these issues financial indicators are good.

Other water-lifting devices used in Tanzania are **electric pumps**, **hydrum** and the **rope and washer** system: electric pumps are limited to areas where electricity is available; the hydrum is popular in the highlands as it can push water to very high levels; and rope and washer systems are traditionally used in Njombe.

Other Systems

Drip irrigation enables farmers to make use of limited amounts of water. The system requires a small pump to get water from an underground source into a storage tank and then gravity to deliver it to the crop. This technology is imported from Israel and Germany by Balton Tanzania Ltd., which markets the product and assists farmers with installation. It costs about US$200 for a 500m^2 system. There are also much cheaper low-head drip kits for even smaller plot sizes.

Drip irrigation seems to be gaining in popularity, because of its low water use and minimal labor requirements and many districts in Iringa Region have ambitious plans to promote it.

Power tillers, also called rotary tillers, are spreading all over, especially for rice farming. They are simple to use, cost-effective and reliable motorized cultivators that are either self-propelled or drawn behind a two-wheel tractor. They are especially beneficial where land preparation, not water, is the limiting factor but because good land preparation facilitates better water management they are considered an AWM solution. The initial cost of buying a power tiller is high enough to bar the majority of resource-poor Tanzanian farmers from owning one but they have potential for use on around a million hectares of wetland in Rufiji, Ruvu, Ruvuma, Wami, Pangani, Msangasi, Sigi, Manonga and Umba river basins, as well as Lake Victoria Basin, Luiche Delta and Mto wa Mbu inland drainage swamp.

Bag (tower) gardening takes place in many towns, especially Dar es Salaam, and is designed to use household greywater in an economical way to grow vegetables in limited spaces.

The Policy and Institutional Environment

The policy setting within which these technologies are being developed and used can significantly impact on who has access to them and how much they improve livelihoods. The Government of Tanzania has formulated a number of strategies and policies to guide interventions in the agricultural and water sectors, and in rural development and poverty alleviation.

The two most recent policies developed in 2009 that support the sector are "**Kilimo Kwanza**," the Presidential initiative seen as a green revolution to transform Tanzania's agriculture into a modern and commercial sector; and the **Draft National Irrigation Policy** (NIP) which guides growth in the sector. These support more established policies and plans such as the **National Environmental Policy** (1997); the 2001 **Agricultural Sector Development Strategy** (ASDS), which built on the **Agriculture and Livestock Policy** (1997); the 2001 **Agricultural Sector Development Programme** (ASDP) which is revised annually; the **National Water Sector Development Strategy**

(NWSDS) and the **National Water Policy**, both of 2002; and the 2006 **Water Sector Development Programme** (WSDP).
The legal framework for land and water management in Tanzania considers them to be public goods which the State regulates. For example, water resources management is provided for under the **Water Utilization (Control and Regulation)** Act No.42 of 1974, and its Amendment Act No.10 of 1981, which declare that all water in the country is vested in the United Republic of Tanzania. It sets conditions on the use of water and authorizes the Principal Water Officer to be responsible for setting policy and allocation of water rights at the national level. Unfortunately, in practice many authorities regulate water and land resources, such as the MoWI; Water Regulatory Authorities; Basin Boards; and Local Authorities, which can lead to confusion and conflicting practices.

Key Stakeholders

In addition to the stakeholders in the policy arena, there are several other groups that have considerable interest in, or are influenced by, AWM. These include academic and research institutions, principally Sokoine University of Agriculture (SUA), University of Dar es Salaam (UDSM), Ardhi University, Dar es Salaam Institute of Technology, Ministry of Agriculture Training Institutes (MATIs), Ministry of Agriculture Research Institutes (MARIs), Water Development and Management Institute (WDMI), Tanzania Official Seed Certification Agency (TOSCA), the Tropical Pesticides Research Institute (TPRI), Tanzania Bureau of Standards (TBS), the Commission for Science and Technology (COSTECH), and the Vocational Education Training Authority (VETA).

NGOs, including faith-based NGOs and community-based organizations (CBOs) play a prominent role in the sector, for example, in the provision of knowledge and information, capacity building and mobilization of resources at the grassroots level. They provide independent fora for establishing dialogue between smallholder farmers and other stakeholders.

The private sector has an important role in providing services in construction, consultancy, production, operation and maintenance of irrigation facilities and equipment, and processing and marketing, in order to develop the irrigation sector. A pioneer in the sector is Balton Tanzania Ltd., which is among the largest importers and distributors of fertilizers, agrochemicals, irrigation and water treatment technologies, poultry feeds, sprayers and greenhouse technology. Karam Engineering Works Ltd. is a workshop involved in repairing agricultural machinery. Alongside these are hundreds of smaller companies and workshops all of which are required to support the agriculture and irrigation sectors.

Making the Most of These AWM Solutions

There is evidently a wealth of AWM solutions already present in Tanzania and there are many more that are not yet being implemented but could offer interesting and new opportunities. This review of existing practices has highlighted that different solutions will be applicable to a variety of circumstances including climate, terrain, crop and the financial situation of the farmer. Marrying the needs of farmers with the ideal solution and the set of factors that can make that possible - such as the policy environment, cost, availability of technology and people who can service them - is an essential next step. This project aims to do that by undertaking further analyses of the AWM solutions through case studies in multiple locations. The findings will be developed into policy recommendations and business models with practical suggestions for increasing uptake of some of the most promising AWM solutions and improving the benefits they provide.

Next Steps

Since the Situation Analysis was conducted a number of case studies have been undertaken on specific AWM solutions. These will be published as briefs on the project website as soon as they are completed, and stakeholder consultations are established to share findings and receive comments.

This briefing note is based on a report by Bernard Keraita, Henry Mahoo, Charlotte de Fraiture and Hamisi Tindwa.
The report is internal but if you would like to request a draft please contact AWMsolutions@cgiar.org

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