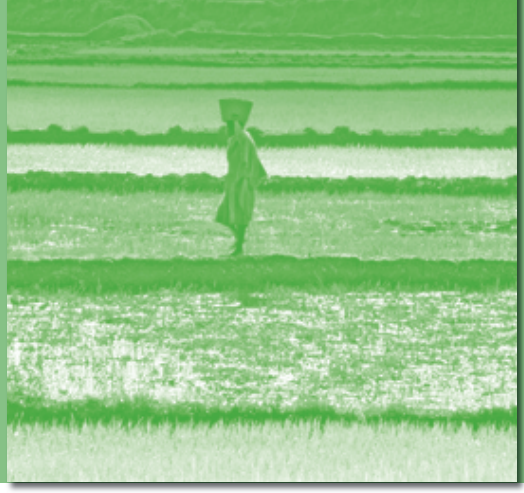

Water and Agriculture in the Green Economy

Information brief

- Agriculture accounts for **70%** of global water withdrawals.
- **2.6 billion people** work in the food and agriculture sector. This is **40%** of today's global population.
- **One-sixth** of the world's population goes hungry today.

Main challenges

Rising food prices

The world currently produces enough food to feed everyone, but **925 million people** go hungry because they cannot afford to pay for it. In developing countries, rising food prices form a major threat to food security. Since 2007, commodity prices in world markets have fluctuated dramatically and have experienced global spikes in 2007-2008 and in 2010-2011. These spikes caused political and economic instability and led to food riots in several countries. Food prices today remain high, and are expected to remain volatile. For farmers, this results in large income fluctuations for which they have little or no recourse, such as savings and insurance. Not only do macroeconomic factors in conjunction with changes in supply and demand contribute to price volatility; speculative behaviour in organized futures markets may also contribute to volatile food prices and at times results in food waste.

- *In developing countries, people spend **50-80%** of their income on food, mostly on raw foodstuffs such as flour and legumes.*
- *Roughly **one-third** of food produced for human consumption is lost or wasted globally, which amounts to about 1.3 billion tons per year.*
- *The food waste per capita of consumers in Europe and North-America is much higher (95-115 kg/year), than in Sub-Saharan Africa and Southeast Asia (6-11 kg/year).*
- *Futures contracts, which involve the formal obligation to sell or buy a given amount of a commodity at a specified time, attract investors who are not interested in the commodity as such, but in making a speculative gain. **Only 2%** of futures contracts end in the delivery of the physical commodity.*

Vulnerability of small-scale farmers

Small-scale farms provide the majority of the global food supply. However, these farmers often occupy marginal land, depend mainly on rainfall for production and make up the majority of the world's rural poor. In many developing countries, irrigation remains the backbone of rural economies. Farmers in developing countries are highly sensitive to changes such as droughts and floods. Agriculture is particularly vulnerable to climate change and will need to adapt to changing patterns of precipitation, temperature and extreme weather events.

- *In many developing countries, irrigation accounts for **90%** of the water used.*
- *There are about **half a billion** small farms in the world. Small-scale farmers account for the majority of South Asia's and sub-Saharan Africa's poor and roughly half of the developing world's undernourished.*

Growing population, food production and dietary habits

The global population is expected to grow from 7 billion people in 2011 to **8.3 billion in 2030**. To feed this increasing number of people, food production will have to **double** within the next 40 years. Agriculture and food production rely heavily on natural resources such as water. The agricultural sector is the predominant water user in most countries. With no change in dietary habits or in the food chain, and with no improvements in land and water productivity, the global water consumption for agriculture will need to increase by 70-90% in the next 40 years. Water will probably be one of the main factors limiting future food production. Currently, already **1.6 billion** people live in areas of physical water scarcity and by 2025 **two-thirds** of the global population is expected to live in areas experiencing water stress.

- *The water required to feed someone, depending upon their diet, varies between **1000 tonnes and 3000 tonnes** of water per year.*
- *Water consumed in agriculture is typically less than **50%** of the water withdrawn due to conveyance losses, on-farm application efficiencies and system losses*
- *There is increasing competition for land and water between use of crops for food versus (bio)fuel. 240 Kg of maize are needed to produce 100 litres of ethanol. With **2500 litres of water** we can produce 1 litre of fuel or feed one person for a year*

Opportunities for water and agriculture in the green economy

Agriculture can play an essential role in achieving a green economy since it accounts for **70%** of global water withdrawals and provides employment for **40%** of the global population. Furthermore, GDP growth generated by agriculture contributes to food security, to raise revenue for the rural poor and is also associated with a great number of employment opportunities. Green growth requires that in the coming decades enough food is provided for an expanding population (mostly in the least developed countries and especially in Sub-Saharan Africa), of which a proportion will be increasingly affluent in Least Developed Countries (LDCs) and Developed Countries (DCs). A green economy requires the achievement of food security, but by using less natural resources. This could be achieved through improved resource efficiency, substantial investments and innovations. It implies increasing crops that ensure a higher efficiency in terms of nutrition per drop of water.

Smallholder farms are essential in the transition towards a green economy. They can contribute to economic growth, poverty reduction and food security. However, without the means to control and effectively manage water, poor farmers are unable to turn agriculture from a subsistence activity into an income-generating enterprise. Water is not the only constraint to improving crop production and nutrition, but if farmers do not have reliable access to water, interventions to address the other constraints will fail. For example, reliable access to water gives farmers the security to invest in inputs, such as fertilizers and improved seeds, and enables them to grow higher-value crops, such as fruits and vegetables.

Highlighting practice

This section outlines several approaches for transitioning to the green economy highlighted by the organizations participating in the conference.

Agricultural practices

- **Efficiency of smallholders** can be achieved by both push (access to techniques) and pull mechanisms (access to markets).
- **Agroecosystem approach.** This approach views agriculture as a set of human practices embedded and part of its own ecosystem that has certain ecosystem needs, functions and services and that interacts with other ecosystems. Agroecosystem management is then the management of natural resources and other inputs for the production of food and other provisioning, cultural, regulatory and supporting ecosystem services.
- **Layered agricultural systems,** such as the rice and fish culture in China, where fish are raised in rice fields, either concurrently with the rice crop or in rotation with rice.
- At farm and larger landscape level, the **integration** of crop, tree and livestock production can lead to resource recovery in the form of manure for soil fertility and crop residues and tree fodder for feed. For instance, in savannah woodlands, farmer-managed natural regeneration helps increase tree cover.
- **Cultivation** of local plants, desert-adapted plants, silvopastures and perennial grasses have the potential to capture benefits from infrequent and erratic rainfall and control erosion in areas too dry to support traditional field crops.
- Use of **innovative technologies** that improve crop yields and drought tolerance; more efficient ways of using fertilizer and water, as well as new pesticides and non-chemical approaches to crop protection; and technologies that reduce post-harvest losses and more sustainable livestock and marine production[1].
- Upscaling of successful **local solutions** (from small-holders).
- Promotion of **urban agriculture**, since it has the advantage of reducing the transmission chain between soil and mouth.

Water harvesting project for water supply and agriculture in rural districts of the Republic of Djibouti

Main challenges: Lack of access to sufficient water for multiple purposes, such as for drinking and agriculture.

Focus and objectives

- Improve access to water for multipurpose uses for the rural nomad populations (2,400 people).
- Improve knowledge of the hydro-geologic conditions in the project zone.
- Increase investments through scaling-up of the new technologies in water harvesting at the country level.

Approaches

- Piloting of innovative run-off water harvesting technologies for drinking water, irrigation and livestock uses in two rural districts.
- Construction of hydraulic structures including underground storage tanks, surface reservoirs and diversion works.
- Capacity building of government water resource engineering departments.
- Sector assessment and preparation of bankable projects for funding.

[1] Although rainwater harvesting is not a new technology it is now being used again and can have an important contribution for agriculture purposes. See Rainwater harvesting: a lifeline for human well-being (UNEP/SEI, 2009) / http://hqweb.unep.org/Themes/Freshwater/PDF/Rainwater_Harvesting_090310b.pdf

- **Capture and reuse of phosphorus.** In both urban areas and in livestock farming, the phosphorus content of human and animal wastes must be recovered for return to the soil.

Food production chain

- **Efficiency improvements** throughout the value food chain: from the resources used and recycled during production, through waste minimization during post-harvest handling, processing, retailing and consumption, to distributional equity and fair trading.

Integrated Water Harvesting Project in Mpumalanga, South-Africa

Main challenges: Lack of water and food security.

Focus and objectives

- Assist communities in the Ehlanzeni District of Mpumalanga Province of South Africa to improve output from their communal food gardens.
- Improve food security and income generation in the communities.
- Demonstrate and stimulate interest in rainwater harvesting technologies and related approaches to secure water for food and income.

Approaches

- Collection and management of surface run-off from precipitation and better management of soil moisture.
- Community capacity building to strengthen food security and income generation.
- Development of learning resources.
- Construction of rainwater harvesting infrastructure and related technologies.
- Outreach and institutional capacity strengthening.

- **Food loss reduction.** Food waste in industrialized countries can be reduced by raising awareness among food industries, retailers and consumers. There is a need to find a beneficial use for safe food that is presently thrown away.
- Attention to the interdependencies between water, food, energy and climate. There is a need to **align** plans, strategies and programs dealing with elements of that nexus and recognize potential tradeoffs between land and water use, biodiversity, green house gas emission reduction, soil, etc.

Markets

- Farmers in developing countries (mostly smallholder) need **better access to markets** to make their small business more profitable. Generating more income enables greater investment in improving productivity.
- Use of soft technologies such as mobile phones to get **information on market** prices may help improve the profitability of farmers.
- Access to microcredit and drought insurances can be a powerful mean to break the barrier of limited access to finance and excessive risk bearing of small holders.
- Ensure that well-functioning markets provide the **right signals:**

  - Prices reflect the scarcity value of natural resources as well as the positive and negative environmental impacts of the food and agriculture system will contribute to resource use efficiency.
  - Further integration of domestic and global markets, bearing in mind the impacts of production trade on the environment and of environmental policies on production and trade.

- Application of the polluter pays principle through charges and regulations.
- Provision of incentives for the supply of environmental goods and services.

Land management

- Improvement of **land use efficiency**. Awareness-raising of challenges and available options, and leadership to adapt the best practices at all levels.
- **Joint assessment of land and water productivities** for optimization of natural resources use.
- Establishment and enforcement of well defined **property rights**. Property rights help ensure optimal resource use, in particular for marine resources, land and forests, greenhouse gas emissions, and air and water quality. When resources are essentially free to private participants it can encourage over-exploitation, resulting in environmentally and socially sub-optimal outcomes.

Water management practices

- **Improvement of irrigation efficiency** in agriculture. Consider rain fed agriculture including small dams and water harvesting.
- Small scale **irrigation technologies** (e.g. treadle pumps, drip irrigation techniques). Investments in 'green' irrigation models (drip irrigation) can help address the increasingly unsustainable water withdrawals for irrigation.
- Measures to **increase water productivity** in agriculture and reduce the gap in water productivity between farms in different areas (supply).
- **Account for volumes of water** in the food supply chain. Currently the food supply chain is water value blind.

Community water management improvement project for traditional farmers in Mkushi, Kapiri Mposhi, Masaiti and Chingola districts (Zambia)

Main challenges: Food insecurity and poverty.

Focus and objectives

- Improve food security and reduce poverty.
- Improve production and income generation.
- Create enabling environment for smallholder self-supply investments.
- Increase availability of affordable irrigation equipment.
- Improve knowledge on low-cost irrigation options among farmers and major stakeholders.

Approaches

- Promotion and use of improved on-farm water resources management methods and low-cost irrigation technologies by smallholder farmers through access to micro credits.
- 1000 smallholder farmers investing in self-supply solutions.
- Institutional capacity-building and empowerment of farmers.
- Improving water access for enhanced productivity.
- Credit access and investment facilitation.
- Knowledge dissemination.

- Shift in focus from **supply-side to demand-side** approaches to agricultural water management. The current focus on physical infrastructure-based 'supply-side' solutions should shift towards a greater emphasis on the sustainable use of water and 'demand-side' economic solutions.
- **Combination** of new technologies and improved land and water management practices, such as

efficient collection of runoff and soil-based storage of moisture, to increase water productivity in cropped areas and restore degraded rangelands.

- Decisions based on **impact assessments** to ensure water management is sustainable.
- Separation of **pollution streams** at source.
- Promotion of **localized** wastewater treatment techniques.
- **Energy** can be saved by optimizing the use of gravity water supply, while reducing the need for pumping and conserving water quality across the basin.
- Adoption of **new filtration technologies** (such as nano-technology) to reuse grey-water (waste water from the urban sector) for agriculture.

Improving knowledge, building capacity

- Consumer **education and public awareness** on water efficiency, water quality concepts and certification in order to change consumer behaviour and build a green society.
- **Learning and knowledge-sharing** on management practices such as conservation agriculture, nutrient management, integrated pest management, groundwater management and irrigation scheduling.
- Involvement of **local people** – both men and women- and creation of local economic opportunities. Building of local capacity for planning, implementation and management of forestry and replanting programs. There is a need for education and information on how to make best use of forests and how to cultivate crops sustainably.

Water governance

- A **dialogue** between water managers, agricultural planners and stakeholders is needed to identify and properly implement solutions.
- A **holistic** water governance framework is required whereby water is managed across sectors, with appropriate institutions that have the authority to take this holistic approach.
- The ecosystem approach to water management is needed to understand that aquatic ecosystems are also users or water consumers (for example, Paraguay's Water Resources Act ranks the water needs of aquatic ecosystems as second only to humans and ahead of water for agriculture, power generation and industrial uses[2].
- International negotiations that recognize the importance to preserve transboundary river basins can result in mutually beneficial and self-enforcing agreements to preserve water resources as well as in effective incentives for countries to show their commitments with water conservation in a transparent way.

[2] The greening of water law: Managing Freshwater Resources for People and the Environment (UNEP, 2010 / http://www.unep.org/dec/PDF/UNEP_Greening_water_law.pdf

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