



# Capacity building on the Water-Energy-Food-security Nexus through research and training in Kenya and Uganda: Policy brief

Jeninah Karungi and Jakob Lederer

## 1 Background

Population and economic growth in the Kenya-Ugandan border region has led to an increasing demand for water, energy, and food resources. The result is a high pressure on the area's natural resources like land, soils, forests, rivers, and lakes. Ambitious irrigation plans may impact other water users in the area. Decreasing soil fertility is aggravated by erosion of top-soils rich in nutrients and biodiversity, reducing river water quality and irrigation efforts due to sediment-based silting of reservoirs. This indicates a lack of soil and water conservation measures applied. With respect to energy, charcoal which is the main energy source, leads to deforestation, and alternatives have to be found. One of these is producing biogas from cattle manure. However, studies found that the implemented schemes are often not successful, and alternative improved manure management technologies to increase food production have to be considered for farmers not willing or able to use biogas.

The effectiveness of mitigation measures designed to solve these challenges of the Water–Energy–Food-security (WEF) nexus requires i) a good knowledge base on these challenges and mitigation measures to ii) build-up capacities to design sound mitigation measures to overcome these challenges.

## 2 The CapNex project

The research and training project "Capacity building on the water-energy-food security Nexus through research and training in Kenya and Uganda", funded by the Austrian Development Cooperation through the "Austrian Partnership Programme in Higher Education and Research for Development" (APPEAR), aimed to build-up the knowledge and capacities to mitigate WEF nexus challenges in Kenya and Uganda, using the border regions between the countries as case study area. Carried out by an interdisciplinary research team from Uganda, Kenya, and Austria, the following activities were carried out:

- Building-up the knowledge WEF nexus by literature review and research case studies
- Training of students to investigate WEF nexus challenges and mitigation measures
- Discussing WEF nexus challenges and mitigation measures with stakeholders, thereby enhancing the dialogue for a mutual trans-sectoral capacity building

## 3 Water-Energy-Food-security challenges in Kenya and Uganda

### 3.1 Water availability: a question of management

There is, in general, sufficient water in the Kenya-Uganda border region for the most important uses. However, a challenge particularly for agriculture is the seasonality. For this reason, a number of irrigation projects are planned in the area. For these, not only a good management, but also a sound strategy is required. If irrigation water is used as back-up to rainfall uncertainties, it can be expected that the water resources will not be under a big pressure under current irrigation plans. If the water is used to introduce a third or even a fourth planting season between the traditional planting during the two rainy seasons, the water levels of rivers may decline to a level that may threat other users, as well as the ecosystem.

### 3.2 Soil erosion: a threat to agricultural production and water quality

Some parts of the area are prone to erosion. This affects both, agricultural production (as fertile top-soils are washed away) and water quality of rivers and lakes (by increasing immisions from erosion). The latter is not only a problem for ecosystems, but also for water supply. High loads of sediments from eroded soils often block the filter systems of water works, resulting in a

blackout of the supply of drinking water. However, the mechanisms are not clear, and for this reason, a better knowledge on the links between erosion – soil fertility – water quality – water supply is required. The addressees are not only researchers, but also authorities, NGOs, operators of the water supply, farmers and farmer associations, and water users' associations.

### **3.3 Soil and water conservation: overcoming soil erosion**

Many of the measures (intercropping, mulching, terracing, etc.) to mitigate soil erosion at plot level are known by farmers. However, the adoption of many of these measures is limited. If farmers adopt, it often takes a long time. This so-called adoption lag is influenced by a number of interrelated factors like income, education, and sex of the household head. Furthermore, some households lack the financial, labour, and land resources, while others are challenged by the comparatively long time it takes until the measures pay-off, for instance in higher yields. Also, existing laws for the protection of rivers and wetlands, are not strictly enforced.

### **3.4 Manure management: there is no one-technology-fits-all-users**

Manure is a valuable nutrient resource for cropping systems. However, in the area, it is often not efficiently used. The last years have shown an increasing engagement by development organizations and NGOs to use this source not only as fertilizer, but also in biogas plants. The biogas can be used for cooking, which reduces firewood consumption and deforestation. However, many studies show that more than 50% of these biogas plants are not functioning after 2 years of operation. Also, many farmers don't use the biogas slurry on their crops.

## **4 Water-Energy-Food-security mitigation measures**

### **4.1 Water availability: not management – strategic management!**

Water management plans are already state of the art. However, water management strategies are not, and these must be developed, but also at local level.

### **4.2 Soil erosion: building-up the knowledge base – together!**

More research and training is required on the link between erosion – soil fertility – water quality – water supply. Obviously, this needs a trans-sectional approach, bringing agriculture, water management and technology, water users, environment and conservation together.

### **4.3 Soil and water conservation: from knowledge to action!**

Training by agricultural extension should be strengthen and target-group specific (late / non-adopters; wealthier / poorer households; sex of household head). As conservation technologies pay-off in the long-rung, systems of support for farmers should be elaborated (incentives, cost-sharing). Water protection laws should be enforced. This package of measures benefits both, the farmers and the population by improved food and water security.

### **4.4 Manure management: different solutions for different users!**

The challenges with biogas plants means that there is not one technology for all farmers. Thus, alternative manure management technologies should be promoted for different farmer profiles, aiming to improve the current practices. These can range from collecting the manure for storage, covering manure heaps to protect them from rain water, and vermicomposting systems. The latter not only produce vermicompost rich in nutrients, but also earthworms, which are a good protein source for commercial and domestic chicken production.

## **5 The WEF-Nexus: towards integrated resource management**

The WEF-Nexus is a valuable concept for integrated resource management, brining together the most important stakeholders. Nevertheless, it is important to elaborate the particular WEF-Nexus challenges and mitigation strategies in a region. All sectors, including policy, practice, research, and training, can contribute to that, but only if they work together. This means a mutual sharing of ideas, data, and results.