Improving Food Production and Sustainable Livelihoods in Sub-Saharan Africa

Food, water, sanitation challenges

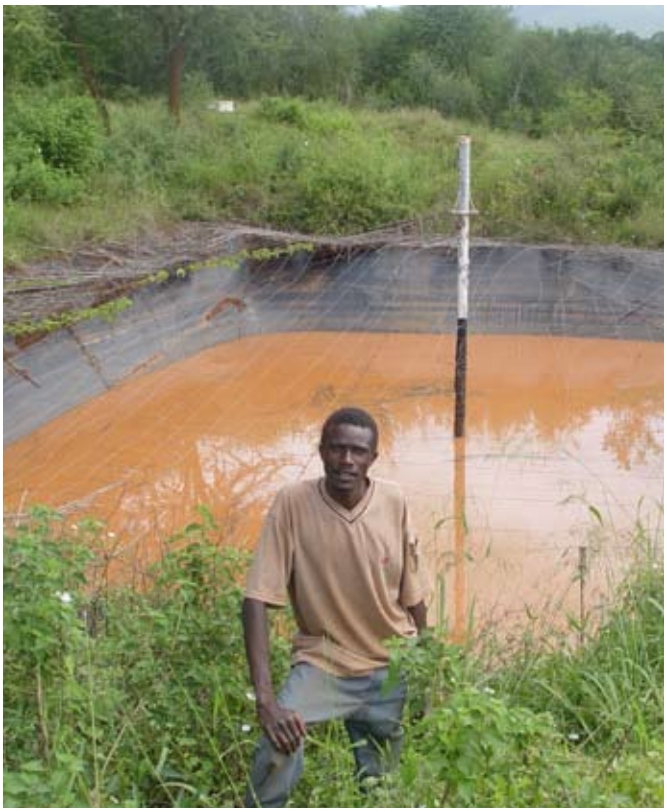
Millions of smallholder farmers worldwide face a number of serious challenges, including malnutrition, lack of soil fertility, unaffordable chemical fertilisers, drought and dry-spells, and dysfunctional and non-existent sanitation services. Sub-Saharan Africa (SSA) has been identified as a future hotspot for food shortage due to low agricultural yields, high dependence on agriculture, costly agricultural inputs, weak economies and high population increase. Moreover, climate change is expected to negatively impact food security in the region. In SSA innovative measures are required to meet both the challenges of today and those envisaged.

Opportunities for increased crop yields

Currently, yield levels in SSA commonly are below 1 ton/ha compared with 5 ton/ha levels elsewhere. This apparent yield gap is partly related to mismanagement of water and nutrients, due to inherently low-fertility soils, droughts and dry-spells in the sub-humid and semi-arid zones. Africa suffers a loss of between 30 – 60 kg of nutrients per ha each year, while only using a tenth of the average application of fertiliser if compared with the rest of the world. More than 93% of agriculture in SSA is rainfed and the main water supply to the crops is the amount of the rainfall that infiltrates into the soil forming soil moisture. On average nine out of ten years offer rainfall that is sufficient to produce adequate crops in the dry sub-humid and semi-arid zones, but rainfall is erratic and often unevenly distributed over the cropping season. On-farm experiences show that it is possible to double or even triple yields by improving soil, nutrient and water management.

Integrated approach to nutrient and water management for food production

Unlocking the potential of small-scale, rainfed agriculture in SSA in the sub-humid and semi-arid zones involves the implementation of a combination of water and nutrient management measures. Dry-spells can be bridged with technologies that more efficiently use the available soil moisture by decreasing non-productive evaporative losses or augment the soil moisture by irrigation. Water management also includes conservation agriculture, mulching and water harvesting to enable supplementary irrigation. Productive sanitation systems, i.e. the collection of and safe reuse of human urine and faeces as a fertiliser for increased food production, could theoretically result in a doubling of current agricultural nutrient inputs (NPK) in SSA, if all excreta is collected and reused. These systems, also referred to as ecological sanitation systems, safely recycle excreta and other organic products to crop production in such a way that the use of non-renewable resources is minimised. This also reduces the nutrient losses of the food production – human consumption chain.



Water harvesting dam for supplemental irrigation Photo: A Oduor, ICRAF

Smallholder farmers calculating the amount of fertiliser to be derived from excreta and comparing to the cost of commercial fertilisers Photo: L. Dagerskog, CREPA

Building resilience in the agroecological system

An opportunity to transform the large yield-gaps in rainfed agriculture in SSA, where food security is a recurring threat to survival, is to combine interventions in an innovative manner to build resilient communities able to produce higher yields. Productive sanitation systems combined with soil and water management interventions may hold the key to unlocking this potential in a sustainable way and to strengthening the resilience of these agroecosystems. Considering that there are many millions of potential smallholder farmers that can be targeted, the combination of such strategic interventions could contribute to the essential regional climate change adaptation and mitigation agendas through the potential increase in carbon sequestration.

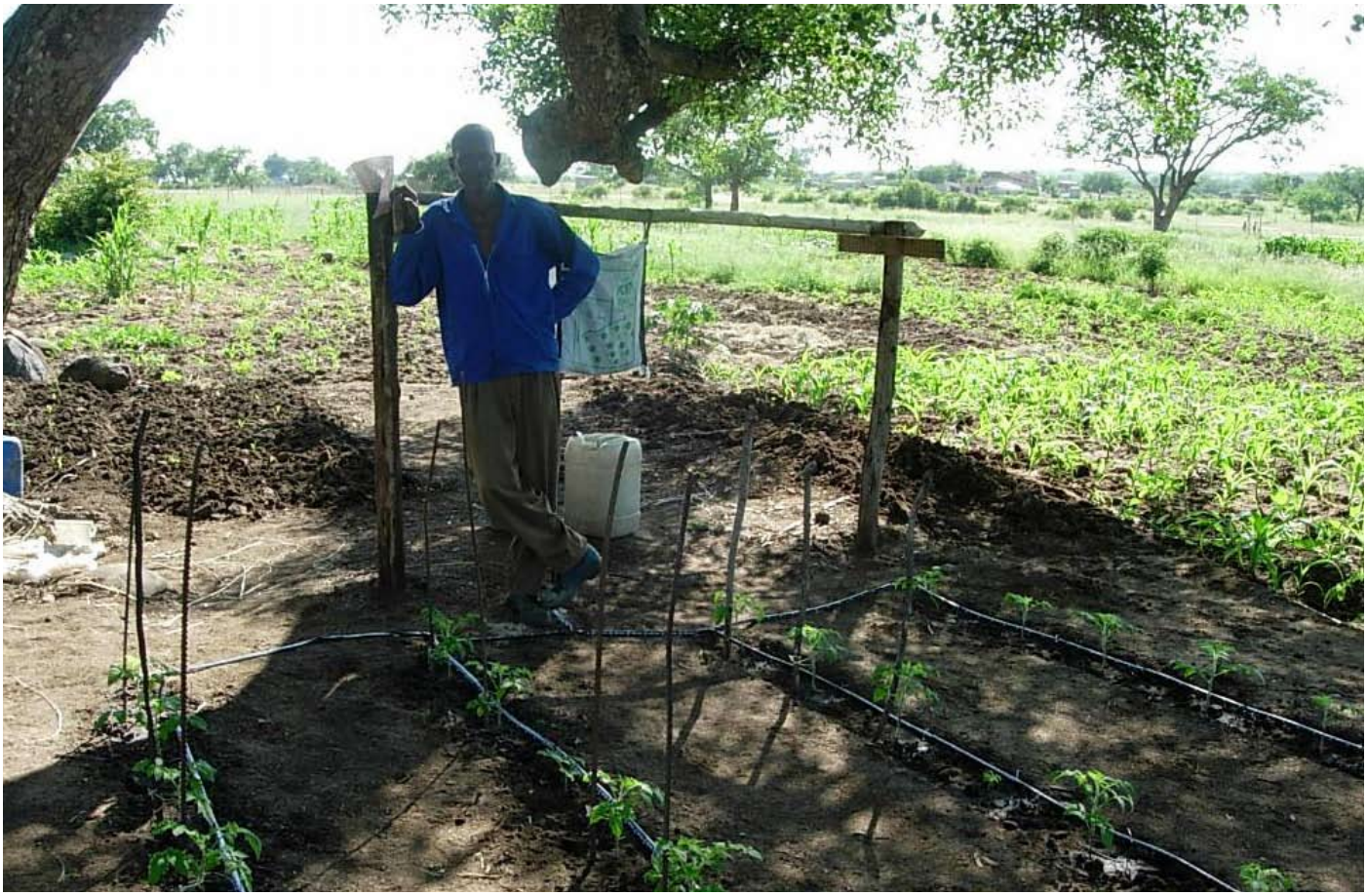
Scientific knowledge is a cornerstone

Policy change and implementation of innovative approaches must be underpinned by scientific evidence. Data from field experiments, literature and stakeholders are collected and scrutinized using various analytical tools, including mathematical models. Thus, it is possible to assess the degree of uncertainty in the results of a study, produce different scenarios (including changes in climate) and identify actions such as new agricultural management practices. In addition to scientific evidence, the quest for yield increases requires efforts in regard to knowledge creation and networking, capacity development of decision-makers and implementers, stakeholder interaction, efficient and supportive policies and institutions, financial resources, and all of the above embedded in a solid communications strategy.

Comparison of crops fertilised with urine and urea Photo: M. Bonzi, CREPA

A systems approach to management

Agricultural water management techniques and productive sanitation systems involve the flow of water, nutrients (NPK) and carbon in the agroecological system. In order to succeed in large-scale implementation, a systems approach is needed. The rainfall over the basin is the renewable freshwater resource. Along its way through the landscape to the sea, it fulfils many ecosystem services, including transpiration and habitat provision. Highly manipulated ecosystems, especially agriculture, will inevitably alter both the quality of the water and quantity of water reaching downstream users and ecosystems. The choice of intervention options within agricultural and sanitation systems impact both in situ and downstream ecosystems. Wide-ranging systems approaches are required in order to achieve the desired benefits of sustainable and increased yields. We propose an innovative approach to water and nutrient management, in which agricultural land- and water management and productive sanitation systems are combined to increase food security and to create sustainable livelihoods around the world, and especially in Sub-Saharan Africa.



A farmer with his low-cost drip-irrigation system for irrigation of a kitchen garden – here tomatoes. Photo: Lisa Andersson

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