



# FANRPAN

## Policy Brief

Issue no. 2: Volume XIII

June 2013



### *Appropriate Climate Smart Technologies for Smallholder Farmers in Sub-Saharan Africa*

#### **Key Messages:**

- Climate Smart Agriculture (CSA) offers an integrated and systemic response to the combined challenges of food security, adaptation and adoption of smallholder farming practices, and natural resource conservation.
- Policy responses to climate change should identify and support out-scaling of known best practices and technologies for smallholder farmers
- Appropriate measures and practices (*e.g above three*) are available that optimise soil and water conservation at farm level. They may underpin sustainable smallholder productivity across ecologies
- Policymakers need to work more collaboratively with implementers in national and local extension services and farmers' organisations to better understand and overcome barriers to wider adoption of key technologies
- Better targeting of finance and investment for farmer-generated climate change responses requires deeper understanding of adaptation and mitigation benefits that come from sustainable agricultural technologies.

- *In-Field Rain Water Harvesting ( IRWH)*
- *Small Reservoirs*
- *Zai Pits*

Nearly 70 per cent of the population in Sub-Saharan Africa (SSA) live in rural areas and rely mainly on agriculture for livelihood security. Low agricultural productivity in the region keeps this population under constant pressure, even though investment in agriculture is a proven way to reduce regional poverty. Studies have shown that Gross Domestic Product (GDP) growth in agriculture is at least twice as effective in reducing poverty as GDP growth originating outside agriculture. It is therefore necessary to develop and implement appropriate agricultural policies to support proven practices to alleviate poverty in this region where the majority of the population live on less than US\$ 2 per day .





### Climate Smart Agriculture in Practice

**Climate Smart Agriculture (CSA)** is an applied set of farming principles and practices that increases productivity in an environmentally and socially sustainable way (*adaptation*); strengthens farmers' capacities to cope with the effects and impacts of climate change (*resilience*); conserves the natural resource base through maintaining and recycling organic matter in soils (*carbon storage*); and, as a result reduces greenhouse gas emissions (*mitigation*). Climate-smart agriculture includes proven technologies

and practices — such as water management, intercropping, conservation agriculture, crop rotation, mulching, integrated crop-livestock management systems, agroforestry, and improved pasture and grazing management. Through an enabling policy environment, coupled with accompanying measures to take appropriate technologies (existing and newly adapted) to scale, CSA centers on preparing smallholders for productive change and sustainability in their farming systems and practices across the region.

Climate Smart Agriculture (CSA) has been identified as an alternative that can increase agricultural productivity in the region, while at the same time mitigating the multiple effects of climate change. At local level, this means promoting tested and proven practices such as intercropping, conservation agriculture, crop rotation, mulching, integrated crop-livestock management systems, and agroforestry.

Generations of researchers and practitioners have sought appropriate ways for smallholder farmers to increase their production and productivity, given their resource constraints. A number of technologies have been developed, tested and adopted by smallholder farmers across SSA, yet not all technologies are appropriate or productive under all conditions. Among the technologies successfully adopted by smallholder farmers are: In-Field Rain Water Harvesting (IRWH), Small Reservoirs and Zai Pits.

**In-Field Rain Water Harvesting (IRWH)** promotes the capture and retention of rainfall runoff within fields. With this technology, rainfall runs off compacted strips or bunds and is collected in rectangular basins running along crop rows and infiltrating deep into the soil beneath the surface evaporation zone. The basin areas are covered with locally available mulch to further retain soil moisture. Water harvested and stored in this fashion is then available for crop, fodder, fruit or vegetable production.

In-field rain water harvesting is considered a climate smart approach because it increases the plant availability and productivity of rainwater. In semi-arid areas, IRWH:

- conserves limited rainfall for longer periods allowing farmers to grow crops despite low and erratic rainfall.
- helps conserve nearly 10% more carbon than traditional tillage methods.
- significantly reduces run-off and therefore soil erosion and nutrient depletion.

IRWH helps increase agronomic productivity, decreases production risks due to dry spells or low rainfall, conserves natural resources and is economically viable when linked to functioning markets. Yield increases due to IRWH will vary but research results suggest that under optimal conditions, implementation can nearly double yields. Once established, this technology has low maintenance costs and is reasonably easy to maintain and duplicate.

However, labour availability and technical skills are critical to proper implementation of IRWH.



Source: <http://historiesofgeography.files.wordpress.com/2013/02/zai-farming-techniques.jpg>

By storing water that is harvested during the rainy season, small reservoirs:

- allow use of water beyond the period of the normal rainy season
- support adaptation to climate change and mitigation of its effects.
- allow smallholder farmers a buffer against shocks such as droughts and sometimes floods.

Competition for stored water must be managed around small reservoirs. Weak governance, lack of regular maintenance, and siltation from up-stream sources are constant threats to small reservoirs. Water quality in these systems must also be closely monitored. In order to maximize and equitably share benefits as local climates become less predictable, water resources managers need better information on the location, condition and capacity of such reservoirs.

Faulty design, inappropriate location, and poor governance and management can be major threats to existing small reservoirs.

**Zai Pits** are an indigenous practice used to rejuvenate degraded soils by breaking up the soil crust to improve water infiltration and adding manure to improve soil fertility. The practice consists of a grid of dug holes roughly 15 x 15 centimetres, which are then filled with manure to improve soil fertility. Zai pits can increase soil water holding capacity by up to 5 times while collecting up to 25% Of the runoff in the immediate area surrounding the hole.

This technique:

- reduces both runoff and soil erosion and reduces risks linked to erratic and declining rainfall.
- stores water from rainfall for longer periods as a buffer against mid-season dry spells.
- helps increase the efficiency of water and nutrient use by plants, thereby increasing productivity.



Under optimal conditions, Zai pits can double yields as compared with those from unimproved local soils. Constructing and maintaining Zai Pits can be labour intensive. In addition, securing and applying manure may be an additional constraint.

## Conclusions

As a matter of urgency CSA needs to be integrated into national agricultural development policy and planning processes. This will facilitate a system-wide approach to engaging with the agricultural sector, including smallholder adaptation and mitigation to climate change.

The smallholder farmer needs to be at the center of a renewal of farming practice and performance -- through system wide approaches that replace historical compartmentalized patterns. In this context, two key areas need to be addressed:

- (1) the CSA policy support environments at regional and national levels and
- (2) the quality of dissemination and training in appropriate knowledge and practice for CSA to smallholder farmers by public extension agencies, NGOs and farmers' organizations.

Critically, the three technologies described and advocated in this brief are within the capabilities and resource endowments of many smallholders throughout the region. Based on experience, those technologies can contribute significantly, and have in the past, staved off hunger, assured threshold household food security, and reduced rural poverty.



Source: [http://farm8.staticflickr.com/7232/7175750825\\_dcbf9046f8\\_o.jpg](http://farm8.staticflickr.com/7232/7175750825_dcbf9046f8_o.jpg)

*Zai pits: indigenous practice used to rejuvenate degraded soils*



It is essential, in revisiting policy and practice, to address the constraints to the wider adoption of these and similar technologies. There are three principal areas of constraint:

1. *Labour Availability.* The age structure (mostly old or aging heads of households) of many smallholder family farms in the region, coupled with the prevalence of debilitating diseases such as HIV/AIDS, can inhibit adoption of these technologies. Research over the past 20 years by FAO and others on labour requirements and availability for smallholder technologies found that many of the most cost-effective and practical technologies were inherently labour-intensive, with limited potential for alternative, labour-saving approaches.

2. *Limited Knowledge and Training at Household Level.* This is linked to the absence of robust extension services in the region over the past 20 years. The reduced frequency and quality of interaction between extension agents and farmers has been a factor here. Governments and development partners' reluctance to undertake the necessary reform in public agricultural policy, strategy and fiscal support for more effective extension services has been a recurring barrier to progress. There is a major regional need for capacity development and training in CSA across national institutions, service providers and farmers' organizations.

3. *Support and Incentives for CSA.* Smallholder agricultural systems are in the main technically weak and under-resourced across the region. To be productive and resilient, smallholder agriculture requires transformation in the management of natural resources (e.g. land, water, soil nutrients, and genetic resources) and in the application of appropriate technologies and viable participation in the market-led value chain.

## Recommendations:

1. National policies need to devise, promote and support strategies for out-scaling those three proven technologies in countries across the region.

2. More practical research and innovation is urgently needed to identify barriers (e.g. labour) to widespread adoption of those technologies; propose ways of alleviating them; and develop appropriate approaches to guide investments that will assure improved resilience, productivity and sustainability in smallholder systems.

3. CSA needs to be integrated into mainstream national agricultural development policy and planning processes to facilitate a more holistic and system-wide approach to engaging with agricultural sector challenge and responses.

4. Extension services (public and non-public) need foundation training to acquire core proficiencies in CSA from management levels, through specialists, to local field personnel. Farmer training modules need to have high impact communication and training materials, using innovative and state-of-the-art ICT and media. Youth and schools need to be actively engaged in CSA extension programme strategies to broaden dissemination, bring the next generation on board, and achieve greater impact.

## REFERENCES

- <sup>1</sup>Ligon and Sadoulet 2007, taken from World Development Report 2008: 6
- *Global Climate Change and Smallholder Farmers: Productivity, Adaptation and Mitigation Opportunities.* Fintrac Topic Paper. USA. 2013
- *"Climate-Smart" Agriculture. Policies, Practices and Financing for Food Security, Adaptation and Mitigation.* The Hague Conference. FAO. Italy. 2010.
- How Can Rainwater Management Help Support Food Production And Smallholder Farmers' Ability to Adapt to Climate Variability And Change? <http://waterandfood.org/wp-content/uploads/2011/11/RWMOverview.pdf>
- Small Reservoirs: Water Storage to Cope With Increasing Rainfall Variability <http://waterandfood.org/wp-content/uploads/2011/11/Smallres1.pdf>
- In-Field Rainwater Harvesting: A Climate Smart Sustainable Production Practice <http://waterandfood.org/wp-content/uploads/2011/11/infield.pdf>
- Water for Dry Land Farming with Zai: A Climate Smart Response in Arid Regions <http://waterandfood.org/wp-content/uploads/2011/11/zai.pdf>

This brief was compiled by: Amy Sullivan, Aliness Mumba, Sepo Hachigonta, Mike Connolly and Lindiwe Majele Sibanda



### About FANRPAN

The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) is an autonomous regional stakeholder driven policy research, analysis and implementation network that was formally established by Ministers of Agriculture from Eastern and Southern Africa in 1997. FANRPAN was borne out of the need for comprehensive policies and strategies required to resuscitate agriculture. FANRPAN is mandated to work in all African countries and currently has activities in 16 countries namely Angola, Botswana, Democratic Republic of Congo, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Mozambique, Namibia, South Africa, Swaziland, Tanzania, Uganda, Zambia and Zimbabwe.

The content of this publication can in no way be taken to reflect the views of FANRPAN and its partners. Furthermore, the designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of FANRPAN, representative of FANRPAN or of the cosponsoring or supporting organizations concerning the legal or development status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers and boundaries.

### Copyright

FANRPAN Regional Secretariat

141 Cresswell Road, Weavind Park 0184, Private Bag X2087, Silverton 014, Pretoria, South Africa

Telephone: +27 12 804 2966. Facsimile: +27 12 804 0600. Email: [policy@fanrpan.org](mailto:policy@fanrpan.org). Website: [www.fanrpan.org](http://www.fanrpan.org)