

## Conservation Agriculture in Zambia

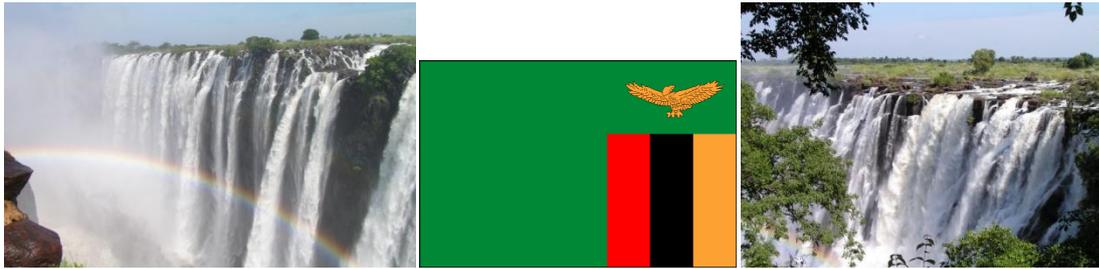


Fig. 1: A Zambian Heritage of World Fame: Views of the Victoria Falls.

### 1. Introduction

Despite global fame as a copper producing country also hosting one of the Seven Wonders of the World (Victoria Falls), Zambia has emerged as one of the pioneers in promoting conservation agriculture (CA) in Africa. Of the 600,000 ha estimated to be under CA in Africa it can be estimated that close to 25% of it is practised by Zambian farmers and land users (approximately 150,000 ha), some large scale (86) but mostly small-scale (285,000), i.e. those producing less than 1 ha per household.

### 2. Status of CA Practice



Fig.2: PPB Land Preparation (left); Planting Basin with Placement of Seed (right)

Initial CA practices started with the promotion of **minimum tillage** which disturbs 10-15% through a combination of field-based practices that involved making of permanent planting basins (at 30cm long x 15cm wide x 15-20 cm deep) spaced at 90cm inter-row, using a Teren rope (with bottle-top marks at every 70cm, and also with a 90cm inter-row marker at one of the rope ends), hand/Chaka hoe and some pegging sticks. Development of the animal draught powered Magoye ripper for breaking the common plough pan especially in the traditionally maize-dominant growing areas opened new opportunities to increase land hectarage under CA, and to further reduce the amount of land disturbed per unit area. These minimum tillage practices are the most common in Zambia. Some motorised ripping activities have been taken up by Cotton farmers in the Mumbwa area. Use of direct seeders and direct planting remain a challenge among both commercial and small-scale land users from Use of direct seeders and

direct planting remain a challenge among both commercial and small-scale land users for variety of reasons ranging from pricing to environmental conditions.



Fig. 3: Soil Cover with crop residues in a livestock/fire free environment (left), and a velvet bean cover crop (right)

CA practices as recommended also desire maintenance of a **permanent soil cover** through a crop residue management regime or planting of usually N-fixing leguminous plants. Reported farmers adhere to this mostly using crop residue management (CRM) tactics. However, amounts of CRM vary from place to place. Some monitoring work to assess common practices would be required. CRM remains a challenge among other rainfall-dependent land users whose usual practises also include keeping of a variety of livestock that also require crop residues for food. The annual green cover crops last only during the growing season and thereafter die off during the long 7 month dry period. With the exception of some evergreen herbaceous legumes such as *Gliricidea sepium* or incorporation of trees such as *Faidherbia albida* in some of the agro-ecological regions the challenge is to find permanent soil cover materials/practices. Irrigated winter wheat/rain-fed soya practices commercially could be a viable CA practice once the conventional tillage of the irrigated crop is resolved. Such development would significantly increase hectarage under CA.

Need for **crop rotation** is well known by many but a subject of different responses among the many adopters. Challenges of good crop rotation regimes have restrained both the amount of land and numbers of CA adopters. Continued follow ups and action planning is required to consolidate this practice.



Fig. 4: Crop rotation of Soya bean/maize (mostly large-scale) or groundnuts/maize (mostly small-scale) all with characteristic challenges.

### 3. Research into CA

A number of institutions have been involved in different aspects of CA research or trials notably GART, ZARI, CIMMYT, CIAT, CFU, and ICRAF.

(1) **MACO: Magoye/Palabana Farm Mechanisation Centres** - Developing of the Magoye ripper in 1987 at the Ministry of Agriculture's **Magoye Research Station**, designed for a reduced tillage system using animal draught power that has over time been improved. This work also saw other tillage implements designed, such as the Palabana ripper-planter, Palabana subsoiler, adjustable cultivator and Ripper-ridger. At present, these centres are not very active due to financial constraints and structural reasons - no strategic place for these institutions in agricultural development.



Fig. 5: Appropriate Research to address farmer demand

(2) The **Golden Valley Agricultural Research Trust (GART)** from as far back as the mid-90s, starting with ZNFU trials on permanent planting basins has undertaken a series of research activities to improve conservation tillage techniques such as the Magoye ripper, weed sweep, strip planter, and the Magoye Herbicide Hood. GART has continued with its agronomic and farm research activities to generate appropriate technologies and their transfer to farmers, covering tests and demonstrations on tillage systems, soil fertility improvement, weed management and control, farm equipment development, and including crop residue management.

(3) The **University of Zambia's School of Agriculture** trials of tillage systems and erosion studies, lime studies, and more recently on cover crops addressing typical on-farm problem areas.

(4) The **Zambia Agricultural Research Institute based at Mt. Makulu Research Station**, though coming up in the last 6 years in terms of work on CA plays a pivotal role particularly in holistic research. A number of research areas are being pursued on a relatively long-term basis, looking at tillage, beneficial/ monetary-value cover crops and crop rotations, liming in response to acidified soils, varying fertilisation effects, and weed science in CF systems of pests and diseases.



Fig. 6: Pertinent Research trials and results build farmer confidence and support

(5) **CIMMYT** on various reduced to no tillage aspects including rotations from farmer practices, hand implements (jab planter), animal-drawn implements (Magoye ripper, Fitalleri direct seeder). A number of trials over a period of time have been conducted at Monze Farmer Training Centre.

(6) **CIAT-TSBC** has also made its contribution through the fertilizer manure trials in Monze and Gwembe districts on a CA-based farming system.



Fig. 7: Farmer-level measurement of inputs (farmyard manure on left) vital to effective CA implementation (comparative field application rates)

(7) The **International Centre for Research on Agro Forestry (ICRAF)** on rejuvenating the soil with improved fallows that concluded that two-year fallows with herbaceous shrubs proved most viable in a typical farm situation using *Sesbania sesban*, *Tephrosia vogelii* and *Gliricidia sepium*. Work at Msekera and other sites wound down with phasing out of these project activities but viable agro forestry practices were adequately disseminated especially through ICRAF's publications.



Fig. 8: Improved Fallow with *Tephrosia vogelii* or Alley cropping with *Gliricidia sepium*

#### 4. Lobbying for CA Practice



Fig. 9: Farmer participation as key to CA technology ownership

Notwithstanding all others, effective CA promotion and development in Zambia has been championed by CFU which has influenced the farming community, government, NGOs and donors. This is because CFU has consistently been present and also it has played a **significant role** in sensitisation, implementation and monitoring of CA activities. For example it is now government policy to promote CA as a way of farming, but this requires developing appropriate strategies, implementation and dedicated tangible support. Further, missing in the link is effective farmer-led participation and ownership of the CA evolution and development. Besides the ZNFU administrative gatherings, rarely do farmers meet to discuss and share their successes, challenges and progressive ideas. There also does not seem to be synergies of driving the CA agenda forward. Some lessons from the FEBRAPDP of Brazil could be useful for Zambia in this regard.

#### 5. Up-scaling CA

A continuously degrading environment in the form of valuable loss of topsoil (estimated at 10tons/ha/yr), drought/flood fluctuations, reduced productivity (less than 1.5 tons/ha for maize), costly access to inputs demand change to the way farming. CA offers the best option to positively contribute to carbon sequestration, a better environment and increased income.



Fig. 10: Commercial farmer participation must be part of CA Up scaling

CA promotion among small-scale farmers comes with its timeliness, precision, record keeping, old adages but that got diffused with time and practice. Reduced cost, increased yield, rain water harvesting, erosion control, carbon sequestration and environmental amelioration among other advantages are positive gains associated with CA practice. It is these elements that are attracting CA involvement/participation.

Up scaling of CA is therefore not an option but a must but this shall only succeed once the farmer or land resource user takes up his/her position as leader in the CA 'value-chain.' This is Zambia's challenge that will unroll full participation, development and ownership of the CA principle and practice. Activities of the CA task force, the CA Association together with those of CFU and other stakeholders do not seem to engage on well. This is a challenge that CA farmers need to resolve once they too are more organised.

There a number of up scaling strides through government and partners support under FAO, Nordic countries, and EU support through different programmes. Some NGOs also continue to participate in the CA promotion programme. CFU continues to champion the CA promotion. Numbers of adopters keep rising, but also a demand to track these developments.

### **Way Forward**

CA in Zambia is 'non-farmer' driven and rather by an assortment of NGOs, government and its partners. Effectively, CA must be advocated and demanded by farmers because it is their resource and livelihood that is at stake. Our task must be to create awareness through various media but most important to equip them with knowledge and skills that gives them the confidence to build further and ability to knock on appropriate 'value-chain' doors for action! The Zambian populace cannot be left out but 'built-in' into the CA framework for support, market and health campaign.

Zambia requires to bring its CA partners (CA farmers, agro-chemical representatives, equipment manufacturers, journalists and advocates, researchers, extensionists and trainers, traders, development partners, NGOs) together and periodically to share, discuss, plan, monitor and evaluate.

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