ISSN 1020-4555

Integrated Crop Management Vol. 17 – 2012

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A Zimbabwe Case Study

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Integrated Crop Management Vol.17-2012

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A Zimbabwe Case Study

Lungowe Sepo Marongwe[1], Isaiah Nyagumbo[2], Karsto Kwazira[3], Amir Kassam[4], Theodor Friedrich[4]

[1]Conservation Agriculture Coordinator, Ministry of Agriculture, Mechanization and Irrigation Development, Harare, Zimbabwe

[2]Regional Cropping Systems Agronomist for Southern Africa, CIMMYT, Harare, Zimbabwe

[3]Assistant Crops Officer, FAO Emergency Unit, Harare, Zimbabwe

[4]Plant Production and Protection Division, FAO, Rome

PLANT PRODUCTION AND PROTECTION DIVISION
FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS
Rome, 2012

ISBN 978-92-5-107448-0

FOREWORD

Plant Production and Protection Division (AGP) in the Agriculture and Consumer Protection Department has elaborated its vision and concepts regarding sustainable crop production intensification that follows an ecosystem approach in which the enhancement of output and productivity go hand-in-hand with the delivery of ecosystem services. This is elaborated in the book *Save and Grow: The New Paradigm of Agriculture* launched by FAO in July 2011 as a policymaker's guide to the sustainable intensification of smallholder crop production.

The theme of sustainable crop production intensification is also embedded in the Objective 'A' in FAO's strategic framework for enhancing food security, alleviating poverty and addressing other global challenges such as environmental degradation and climate change. Conservation Agriculture (CA) is considered to be a core element of FAO's strategy for sustainable production intensification, and more field projects dealing with small-scale farmers are introducing CA as an essential production system base for enhancing production of crops and livestock, livelihood and quality of life.

As a result of increased demands for food due to growing population, agriculture in Sub-Saharan Africa (SSA) needs to grow by four percent per year to meet the food requirements of the growing population. The expansion of cultivated areas to compensate for low yields, exploitation of low nutrient status soils without restoration of soil fertility, changing climatic patterns including low and erratic rainfall and the lack of well-adapted technologies are identified as some of the major problems of soil fertility management in SSA. The conservation, recapitalization and maintenance of soil fertility are therefore essential to improve efficiency of input use and increase productivity.

Future food security relies not only on higher production and access to food but also on the need to address the destructive effects of current agricultural production systems on ecosystem services and increase the resilience of production systems to the effects of climate change. CA addresses the problem of low and erratic rainfall through the use of practices that reduce water losses and increase infiltration, and low soil nutrient status by increasing soil carbon and nitrogen through the use of organic soil cover and legumes in rotations and interactions. CA enables the sustainable intensification of agriculture by conserving and enhancing the quality of the soil, leading to higher yields and the protection of the local environment and ecosystem services.

This publication describes the experiences of introducing and promoting CA as a practice for sustainable crop production intensification in farming communities across Zimbabwe by various stakeholders such as the Ministry of Agriculture, NGOs, FAO, CIMMYT and ICRISAT. The case study explains the adoption process and shows the impact of CA in terms of agricultural production, environment and ecosystem services, livelihoods and other socio-economic factors. The case study is directed to policy makers, scientists and environmentalists and should help decision making towards sustainable intensification concepts for agriculture.

Shivaji Pandey
Director
Plant Production and Protection Division (AGP)

ACKNOWLEDGEMENTS

This paper is the outcome of findings from activities implemented by many stakeholders working in the area of food security who have been involved in CA work in Zimbabwe. The Department of AGRITEX in the Ministry of Agriculture, Mechanization and Irrigation Development is highly recognized for the financial and logistical support provided for data collection and availing of data from previous work.

The FAO, Zimbabwe office deserves special recognition for hosting the CATF, which has been the platform through which most of the information in this paper has been shared and for providing financial and technical support for data collection and other CA-related work to stakeholders.

The continuous efforts to promote CA in Zimbabwe by the following individuals are highly valued and recognized:

Dr. Kizito Mazvimavi (ICRISAT), for his commitment in leading the annual CA panel study surveys, whose findings form a major source of data for this paper.

Dr. Isaiah Nyagumbo, (CIMMYT), whose research work on CA in Zimbabwe has provided answers to many research questions, has contributed immensely to the information in this paper.

Dr. Christian Thierfelder, (CIMMYT) whose efforts in promoting mechanized CA have enlightened many stakeholders on the adaptability of CA to different farming sectors and has been a source of data on the performance of mechanized CA option.

The contributions of all CATF members and stakeholders, and the interactions during meetings are highly appreciated as these have provided direction for CA activities in the country and have directly and indirectly contributed to the information presented in this paper.

Valuable assistance with editing of the report by Mr. Alastair Stewart and with graphic design and formatting by Ms. Magda Morales is gratefully acknowledged.

ACRONYMS AND ABBREVIATIONS

ACT	African Conservation Tillage network
AGRITEX	Agricultural, Technical and Extension Services Department
AMID	Ministry of Agriculture, Mechanization and Irrigation Development
ARC	Agriculture Research Council
AU	African Union
CA	Conservation Agriculture
CAADP	Comprehensive African Agriculture Development Programme
CADS	Cluster Agriculture Development Services
CAPNET	Conservation Agriculture Promotion Network
CATF	Conservation Agriculture Task Force
COMESA	Common Market for Eastern and Southern Africa
Contill	Conservation Tillage
CTDT	Community Technology Development Trust
CIMMYT	International Wheat and Maize Improvement Centre
EMA	Environmental Management Agency
FAO	Food and Agriculture Organization
FCTZ	Farm Community Trust of Zimbabwe
GTZ	Germany Agency for Technical Cooperation (now GIZ)
IAE	Institute of Agricultural Engineering
ICRISAT	International Crop Research Institute for the Semi-Arid Tropics
IOM	International Organization for Migration
IRCS	International Red Crescent Society
MLARR	Ministry of Lands, Agriculture and Rural Resources
NEPAD	New Partnership for African Development
NGO	Non-governmental organization
SAT	Sustainable Agriculture Trust
SSA	Sub-Saharan Africa
ZCFU	Zimbabwe Commercial Farmers' Union
ZFU	Zimbabwe Farmers Union
Zimpro	Zimbabwe Project Trust

SUMMARY

Agricultural productivity in Zimbabwe, like in many other countries in SSA has been declining over the years despite the numerous advancements made in agricultural technology development. Yield levels usually averaging below 1t ha^{-1} have resulted in persistent cereal deficits despite the large area put under production each year. Declining soil fertility, erratic precipitation patterns, high input costs and unstable market conditions have all affected the profitability and therefore the sustainability of the small holder farming sector, which provides livelihoods for the majority of the rural population.

Conservation Agriculture is increasingly being seen as a farming system that can reduce the negative impacts of some of the factors that are limiting agricultural productivity. Its component technologies of minimum soil disturbance, maintenance of organic ground cover and the use of suitable crop rotations and interactions have shown the potential to mitigate some of the production constraints experienced in the country's agricultural production. The potential for CA to reduce soil erosion and water runoff and increase economic returns in production systems have been shown by local research.

Several initiatives to increase and sustain agricultural productivity have been reported in the past and provide an important reference point for current CA programmes. The early work by Brian Oldrieve in North Eastern Zimbabwe, The Contill project by AGRITEX and GTZ from the late eighties to early nineties and the "Conservation Tillage for Sustainable Production" workshop in Harare in 1998, all provide important reference points for current CA programmes.

Current CA initiatives were initiated in the country as humanitarian intervention programmes around 2003 as a response to donor calls for the need to improve food security among communal farmers. As a result the focus of these early programmes were vulnerable farming communities, hence the concentration on manual CA systems. This approach meant that more resource-endowed households as well as other farming sectors were not catered for in the CA programmes, resulting in farmers and other stakeholders perceiving CA as a technology for the poor. Uptake of CA has been slowed through perceived high labour demands in manual CA systems and challenges in maintaining adequate mulch cover due to competition between livestock and CA fields. As a result of these challenges, many farmers in the country are unable to implement the full CA package, thereby reducing the benefits that they can derive from the system.

Continued support of CA programmes by both government and the donor community have started to yield results with farmers now seeing the benefits

of CA in terms of intensification of production through improved management (early planting, improved weed management), increased resilience to dry spells and more efficient use of both organic and inorganic fertilizers. Current statistics indicate a total of over 300,000 communal farmers implementing some components of CA over an area just above 100,000 hectares. In recognition of the increased uptake it is important for current CA programmes to recognize and address the challenges in implementing CA to enhance the benefits and increase the impact on food security at household and national scales.

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CHAPTER 1
Overview of the case study

The case study has four parts as follows:

BACKGROUND AND CONTEXT

- The role of agriculture in Zimbabwe and physical characteristics of agro-ecological zones I-V.
- The link between extensification and tillage based farming to land and soil degradation.
- Erratic rainfall and high water loss leading to water stress in rain-fed farming systems.
- High cost, inaccessibility and ineffectiveness of agricultural inputs including fertilizer and pesticides.

DETAILS OF THE CASE STUDY

- Objectives of the case study.
- Objectives of the promotion of Conservation Agriculture in Zimbabwe, and approach and methodology.
- The history of Conservation Agriculture in Zimbabwe, and recent developments in areas of sustainable intensification.
- Key stakeholders involved in promoting Conservation Agriculture in Zimbabwe.

ANALYSIS

- Restoration of degraded lands and preservation of land that is still fertile.
- Increased resilience of agricultural production systems, especially from the threat of climate change.
- Increased efficiency of resources used in production.

CONCLUSION

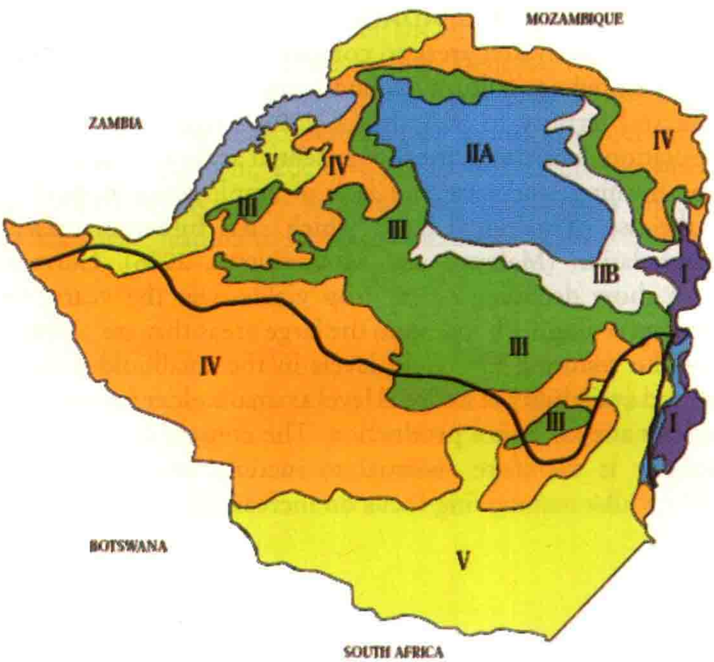
- Review of the main outcomes of the case study.
- Barriers faced and suggestions for future up-scaling.

CHAPTER 2
Background and context

2.1 AGRICULTURAL PRODUCTION IN ZIMBABWE

Zimbabwe has a diversified agriculture sector with 11 to 20 percent of the country's annual gross domestic product being generated by agriculture as well as 45 percent of exports. Over 70 percent of the population directly and indirectly depend upon agriculture for employment and among those who are directly linked to farming about 75 percent rely on rainfed farming systems. The agricultural sector is composed of large scale commercial farming and small scale farmers, with the latter occupying more land area but located in regions where land is less fertile with more unreliable rainfall. Zimbabwe is a tropical country which generally experiences a dry savannah climate. There are a range of notable micro climates within the country that make it possible to divide the country into five agro-ecological zones known as Natural Regions I to V (Figure 1). These are classified with regard to rainfall amounts, temperature and soil types (Table 1) (Vincent and Thomas, 1962).

FIGURE 1
Map of Zimbabwe showing Natural Regions I-V



Source: ZCATF (2009)

TABLE 1
Physical characteristics of Natural regions I-V in Zimbabwe

Natural Region	Soil type	Average annual rainfall (mm)	Rainy season	Number of growing days
I	Red clay	1000+	Rain in all months of the year, relatively low temperatures	170-200
II	Sandy loams	750-1,000	Rainfall confined to summer: October/November to March/April	120-170
III	Sandy, acid, low fertility	650-800	Relatively high temperatures and infrequent, heavy falls of rain, and subject to seasonal droughts and severe mid-season dry spells	60-120
IV	Sandy, acid	450-650	Rainfall subject to frecuent seasonal droughts and severe dry spells during the rainy season	60-120
V	Sandy, infertile	>450 mm	Very erratic rainfall. Northern low veldt may have more rain but the topography and soils are poor	>70-135

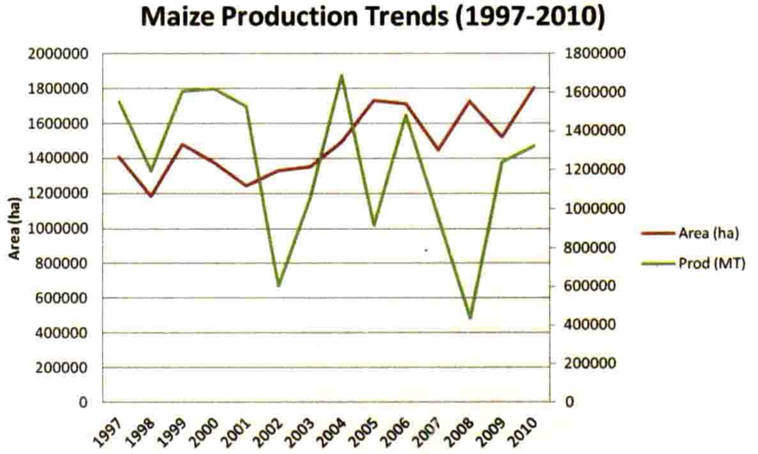
Source: ZCATF (2009); Vincent and Thomas (1962)

Large scale commercial farmers generally focus on export production whereas the small scale farmers are the major food producers and account for over 80 percent of staple crop production (Moyo, 2005). The agriculture system is highly diversified with the production of a wide range of crops and livestock. Crops include maize, tobacco, cotton, a variety of horticultural crops, coffee, tea, groundnut, soybean, barley, wheat and livestock. Over the years there has been a decline in crop productivity that is strongly associated with rainfall deficits and reduced soil fertility.

2.2 SOIL AND LAND DEGRADATION

The expansion of cultivated areas to compensate for declining yields and the lack of well-adapted agricultural technologies are identified as major factors in declining soil fertility in SSA (FAO, 2001; Marongwe *et al.*, 2010). The higher population densities in the low potential areas as a result of population growth, diminishing land base and lack of employment opportunities have increased the use of marginal lands which has futher increased the rates of land degradation (Mahretu and Mutambirwa, 2006). Current evidence continues to show declining cereal crop yields over the years, with annual averages not exceeding 1 t h^{-1}, despite the large areas that are planted each year (Figure 2). The resulting low yield levels in the smallholder farming sector impact on food availability at national level as smallholder farmers produce over 60 percent of national maize production. The conservation and maintenance of soil fertility is therefore essential to increase and sustain productivity (FAO, 2001) whilst maintaining focus on increasing yields per unit area.

FIGURE 2
Total production (metric tonnes) and area planted (hectare) for the main staple cereal in Zimbabwe



Source: Adapted from Ministry of Agriculture, Mechanization and Irrigation Development (2010)

2.3 WATER STRESS

Annual rainfall in Zimbabwe is between 450mm and 1500mm but more than 60 percent of the country is situated in Natural Agro-Ecological Regions IV and V, which are characterized by low rainfall (below 650 mm) and poor soil fertility (Table 1). Though theoretically sufficient, this rainfall is not capable of sustaining crop growth over the growing season as much of the precipitation falls over a short period of time (Dennett, 1987). High water loss in rain-fed agriculture results in only 10-30 percent of seasonal rainfall being used productively and up to 50 percent lost as non-productive evaporation (Falkenmark and Rockstrom, 2005). Low moisture content within the soil means that the crops have very little moisture reserves to tap from during prolonged dry spells, leading to increased incidence of crop failure.