

# Conservation Agriculture

**A manual for farmers and extension workers in Africa**



# CONSERVATION AGRICULTURE

A MANUAL FOR FARMERS AND EXTENSION  
WORKERS IN AFRICA



**IIRR** 

# IIRR International Institute of Rural Reconstruction

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The International Institute of Rural Reconstruction is a non-profit, non-governmental organization that aims to improve the quality of lives of the rural poor in developing countries through rural reconstruction: a sustainable, integrated, people-centred development strategy generated through practical field experiences. Based in the Philippines, IIRR has regional offices in Africa (located in Nairobi), Latin America (Quito) and Asia (Silang, the Philippines). IIRR's Africa office is committed to strengthening the institutional capacity of partner organizations through knowledge generation, acquisition and sharing.

## African Conservation Tillage Network



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The African Conservation Tillage Network promotes the sharing of information and experiences and facilitates the adaptation and adoption of conservation agriculture principles and practices in Africa. ACT is a Pan-African, international association, involving private, public and non-government sectors, and including farmers, input and machinery manufacturers and suppliers, researchers and extensionists, with an active conviction to promote, support and apply conservation agriculture to ensure viable and sustainable agriculture productivity while minimizing or reversing the environmental degradation that is devastating the continent. Membership is open to any individuals or groups committed to the development and promotion of conservation farming/tillage technologies for smallholder farmers in Africa.

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# Foreword

Over the last couple of decades, conservation agriculture has gained increasing interest worldwide as well as in Africa. This approach to farming is very attractive for African farmers: it boosts yields, saves labour and money, and conserves the soil and the environment. It appeals to all categories of farmers – from small-scale subsistence farmers to high-tech commercial producers. It can be used in all climates and on all soils where it is possible to grow crops. And it appeals to the general public and to national leaders as a policy to promote and approve.

Conservation agriculture contributes significantly to meet three of the Millennium Development Goals.

- **MDG 1: Eradicate extreme poverty and hunger** Conservation agriculture helps farmers produce more food – for themselves and for the market. It helps stabilize yields, especially during drought. It uses less labour and fewer expensive inputs than conventional agriculture.
- **MDG 7: Ensure environmental sustainability** Conservation agriculture produces a healthy, productive soil, halts erosion, reduces river pollution, increases the amount of organic matter in the soil, and takes CO<sub>2</sub> out of the atmosphere.
- **MDG 8: Develop a global partnership for development** Conservation agriculture is a global movement. It brings development agencies, the private sector, civil society, research institutions, local organizations and farmers together to contribute to the other MDGs.

Conservation agriculture also fits in well with two of the major NEPAD (New Partnership for Africa's Development) sectoral priorities: agriculture and the environment.

This book explains why conservation agriculture has such promise. It shows how farmers and extension workers can do it.

This book is the result of an initiative by a group of people from various institutions across Africa and throughout the world. This group includes farmers and researchers, extension workers and policy makers, governments, non-government organizations and the private sector. A unique alliance for a uniquely promising approach.

They have drawn on their own knowledge, on the work of their organizations, and on the successes of hundreds of thousands of farmers through Africa. They have put all these experiences together into this guide: the first manual on conservation agriculture covering the whole of Africa.

The method used to create this book – a “writeshop” involving more than 90 contributors – is highly appreciated. It shows an impressive will by a large group from many different countries, from different walks of life, and with highly different specializations and interests, to come together and produce a

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product that all agree upon. The feeling of joint ownership will help the message of conservation agriculture spread much more quickly than if a single person had attempted to write this book alone.

It is a special joy to see that the two areas of agriculture and communication have joined hands in a common understanding that a written manual is of little use if its messages are not communicated wide and far.

It is our hope that this book will be distributed widely, and will be read by many. More important, we urge readers to put to use the information it contains. While the book is intended especially for extension workers and other agricultural service providers, we would also recommend that students in schools and universities read it. So should many farmers, and those who represent our peoples in various forums on agriculture and food security.

Finally, we want to recognize the international aspect of conservation agriculture. This book is "African". But it reaches even further out. It will be a major input into the World Congress on Conservation Agriculture, to be held in Nairobi in October 2005 under a NEPAD arrangement and with the African Conservation Tillage Network. This congress marks a new beginning for a continent with an increasing will to get together to influence global policies and decision making.

We thank all involved in producing and distributing this book, and those charged with transforming its messages into practical use. Most of all, though, we hope that our farmers will be able to use conservation agriculture to bring prosperity to their families and for their societies.

Hon. Kipruto arap Kirwa  
Minister of Agriculture and  
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Republic of Kenya

Nairobi, August 2005



# Preface

Over 60% of Africans depend on some form of farming for their sustenance and livelihoods. Agriculture remains vital for the continent's development and economic growth. So the recent stagnation or decline in farm productivity in many parts of Africa is a major concern. For many communities and countries, this has translated into chronic food insecurity and growing poverty. Households and communities are increasingly vulnerable, as their only resource – their land – can no longer sustain them.

Africa is witnessing severe degradation to its farmlands. Much of this degradation can be attributed to common, but exploitative, farming practices – ploughing that destroys the soil structure and degrades organic matter, burning or removing crop residues, monocropping, and so on.

Soil and water management practices that sustain and enhance the productivity of arable soils are a **must** for Africa. They are a vital part of the long-term solution to food insecurity and poverty.

**Conservation agriculture** aims to overcome these problems. It consists of three simple principles – *disturb the soil as little as possible, keep the soil covered, and mix and rotate crops*. These principles can be put into practice in many different ways. Farmers throughout Africa, and throughout the world, are beginning to adopt them; they have seen their yields rise, their soil gain in fertility, and their labour needs fall.

But conservation agriculture must be promoted actively if it is to be spread rapidly. Grassroot players (farmers, extension workers, input suppliers, etc...) often lack information on what to do and where to do it. This manual aims to fill this gap.

## This manual

This manual tries to do the following:

- It explains what conservation agriculture is, and why it is important.
- It describes how to use conservation agriculture principles in the field.
- It highlights the issues and challenges that farmers and extension personnel may encounter when they adopt and adapt conservation agriculture.
- It suggests ways to adapt and disseminate this approach.
- It gives examples of experiences with conservation agriculture in real life.

This manual is part of a larger effort to develop and promote conservation agriculture in Africa and worldwide. It is designed to reflect the experiences and views of many conservation agriculture practitioners (farmers, researchers and support organizations) to respond to the looming hunger and environmental degradation in sub-Saharan Africa. It aims to enhance knowledge and awareness on conservation agriculture and promote the adoption and adap-

tation of this approach throughout Africa. It is the first truly Africa-wide manual on conservation agriculture.

African farmers face a bewildering variety of conditions: highland and lowland, tropical and temperate, high and low rainfall, rich and poor soils, large and small farms. They grow a huge range of crops. Some farmers are commercially oriented; others eat everything they grow. It is impossible for one book to cover all the different variations.

Fortunately, this is not necessary. Conservation agriculture is not a single set of techniques – there is no one “best practice”. Rather, its three principles can be applied in different ways in different situations. This book outlines these principles (on page 3), then shows how to adapt them to suit the particular set of circumstances that you – the farmer or extension worker – face. It is up to you to decide on what is best for you. Innovate, test and adapt the techniques in this book, and encourage your friends and neighbours to do the same.

The manual also reflects the character of conservation agriculture – holistic and multi-disciplinary. It also describes how conservation agriculture relates to other key areas that farmers are concerned with: socio-economic issues, culture and traditions, marketing, and livestock.

This manual is intended primarily for Africa’s farmers and extension workers: the people who stand to benefit directly from conservation agriculture. It is written in simple language so it is easy to understand, and easy to translate into local languages. Many of the illustrations can be enlarged or adapted for use on posters or training materials.

The book should also prove useful for others interested in conservation agriculture: agricultural researchers and policymakers, NGO staff, trainers, teachers and students. It should serve as a comprehensive resource on conservation agriculture in Africa and worldwide.

## How this manual was prepared

The initial idea for this manual came from a meeting in Zambia, when over 40 researchers and field practitioners from Africa met to prepare for the Second World Congress on Conservation Agriculture (held in Brazil in 2003). The large number of papers and posters gathered for this meeting formed a rich potential basis for a comprehensive manual on conservation agriculture in Africa.

The International Institute of Rural Reconstruction (IIRR) developed the concept of a manual further, and discussed the idea with RELMA, ICRAF’s Regional Land Management Unit. RELMA provided a start-up fund. FAO, CTA and IFAD also provided valuable financial support. The resulting manual was to be ready for the third World Congress, held in Nairobi in October 2005.

A small consultative group of key stakeholders was formed into a steering committee, which decided that IIRR and the African Conservation Tillage

Network (ACT) be the lead agencies. IIRR was designated as manager and overall project coordinator.

A group of key stakeholders met in November 2004 in Nairobi to generate a set of themes and topics for the manual. The same group identified various promising practices and suggested organizations that practised conservation agriculture, as well as resource persons and individuals who might generate case materials and manuscripts on various topics. IIRR then invited them to prepare manuscripts on the selected topics and to present them at a “writeshop”.

## The Karen writeshop

The writeshop (an intensive, 2-week workshop) was held in Karen, near Nairobi, on 18–29 April 2005. The contributors brought their manuscripts with them, along with other printed materials, photographs and conservation agriculture equipment. In all, some 60 farmers, extension staff, scientists and practitioners from 14 African countries, as well as from Brazil and Europe, participated. Another 30 contributors were unable to attend the writeshop but submitted manuscripts for discussion by the participants.

The writeshop began with a series of presentations by participants on various aspects of conservation agriculture. The participants were then divided into a number of groups, each focusing on a specific theme, such as “land preparation” or “economics”. These groups were asked to write a draft chapter on their theme, based on the manuscripts that had been prepared for the writeshop and their own knowledge and experience. Each group prepared a draft chapter, which they presented to the plenary.

The other participants commented on the drafts, asked questions, and suggested additions or changes. The individual groups then revised their drafts. A team of editors assisted with drafting and revising the text, and artists drew illustrations to accompany it.

The groups presented their revised drafts to the plenary a second time, along with the illustrations, and the other participants were able to make further suggestions. The editors and artists again helped revise the text and illustrations. By the end of the writeshop, the groups had completed drafts for each of the chapters in the book you are holding.

The groups were fairly fluid: individual participants were able to move from group to group, so contributing to the detailed drafting of more than one chapter.

Throughout the writeshop, participants wrote about their specific experiences with conservation agriculture. These cases appear in boxes in the text. They provide valuable examples of how conservation agriculture works in practice.

After the writeshop, considerable restructuring and rewriting were necessary to eliminate overlap among the various chapters and to ensure the style was clear and consistent. This was done by the chief editor, who also commissioned new artwork to fill in gaps.

Through this process, the initial manuscripts were revised substantially or were completely rewritten. The information they contained was selected, sifted, and combined with ideas from other sources, and was distributed throughout the manual. A single section in the book may contain information provided by many different participants. This means it is not possible to label a particular chapter or section as the work of a particular participant. The “authors” of the manual are thus the contributors listed on page xviii: both those who attended the writeshop and those who provided manuscripts.

## Writeshop advantages

The sequence described above is an adaptation of the writeshop approach pioneered by IIRR at its headquarters in the Philippines. IIRR-Africa has used this approach to produce extension and information materials on a wide range of subjects.

Writeshops have several advantages over conventional methods of producing a publication. They speed up the production process, taking full advantage of the participants’ expertise. The process of writing, getting comments, revising and illustrating takes place at the same time, considerably shortening the often-difficult process of writing, editing and publishing. A large number of participants contribute to each topic: in effect, the writeshop provides an opportunity for technical peer review by a large number of reviewers, as well as pretesting for understandability and field relevance by a group of the intended readers.

In addition, writeshops bring together a large number of people from various institutions and walks of life, each with different perspectives and expertise. They are an excellent training and networking opportunity, with individuals learning about each other’s work and exchanging ideas and experiences that will be of value for them when they return home. It is hoped that the relationships and networks forged during the writeshop will continue long into the future.

## Structure of this book

This book is divided into 14 chapters.

**Chapter 1**, *What is conservation agriculture?*, explains the principles of conservation agriculture, and describes the benefits it can bring to farmers who adopt it. It compares conservation agriculture with conventional farming practices, and tells readers what to expect in the first few years after they adopt it. It also briefly describes the history of the approach in Africa and worldwide, and outlines some challenges facing its rapid spread.

**Chapter 2**, *Converting to conservation agriculture*, guides readers through the challenges of starting out with this new approach to farming. It lists some questions farmers should ask, and describes how to find the answers.

**Chapter 3, *Field preparation and planting***, describes how to prepare a field for conservation agriculture, various ways of planting crops, and how to work out how much seed and fertilizer to use.

**Chapter 4, *Keeping the soil healthy***, introduces the concept of soil health – which depends on the amount of organic matter in the soil. It shows how to tell whether your soil is sick, and what to do to nurse it back to health.

**Chapter 5, *Soil cover***, discusses the importance of keeping the soil covered, and the two main ways of doing so: using cover crops and mulch. It especially addresses a major problem that many farmers face when they first adopt conservation agriculture: the choice of a cover crop and how to obtain seeds.

**Chapter 6, *Crops and cropping systems***, discusses various types of cropping systems (intercropping, sequential cropping, and so on), the benefits of crop rotation, and factors to consider when choosing which crops to grow.

**Chapter 7, *Controlling weeds***, discusses the vital topic of how to control the weeds that will take over the fields unless the farmer manages them properly. It describes various ways to control them: by maintaining soil cover, by mechanical weeding, or using herbicides. It gives special attention to using the right amount of herbicides, in a correct and safe way.

**Chapter 8, *Conserving soil and water***, describes various soil and water conservation technologies that can be combined with conservation agriculture.

**Chapter 9, *Livestock***, covers three issues relating to livestock and conservation agriculture: feeding animals, protecting fields from livestock, and training animals to pull conservation agriculture equipment.

**Chapter 10, *Harvesting, marketing and input supplies***, addresses issues that farmers are likely to encounter in harvesting, storing, processing and marketing their produce, and in obtaining inputs and credit for their conservation agriculture operation.

**Chapter 11** is entitled *Should you adopt conservation agriculture?* It poses (and answers) some questions that farmers may have about conservation agriculture before they adopt it: How does it benefit me? How much does it cost? Is it profitable?, and so on. For each question, it shows how farmers can work out the answers themselves so they can make an informed decision on what to do.

**Chapter 12, *Conservation agriculture and people***, explores the social and cultural dimensions of this approach. It looks at five areas: the roles of women and men, cultural beliefs, HIV/AIDS, farmers with disabilities, and young people.

**Chapter 13, *Encouraging adaptation and adoption***, is aimed primarily at extension workers, researchers and policymakers. It suggests various ways to test and adapt particular conservation agriculture practices in a participatory way with groups of farmers. It also provides ideas on how to promote conservation agriculture through various extension approaches.

**Chapter 14, Resources**, includes the profiles and contact details of the contributors, a list of resource organizations and websites, manufacturers of conservation agriculture equipment, and publications with further information on this approach.

Throughout the manual, boxes describe how farmers, projects and research institutions have applied conservation agriculture. These cases are drawn from the experiences of the manual's contributors, who represent a wide range of countries and farming conditions from throughout Africa. For further details on the individual experiences, please contact the individuals and organizations listed on page xviii (see addresses in Chapter 14).

# Acknowledgements

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- The writeshop participants and staff: see the *List of participants* (page xiv) and *Participants' profiles* (page 238).
- The staff of IIRR's Africa Regional Centre and Acacia Consultants, Cordaid regional and headquarters staff, and I/C Consult.
- The many other, unnamed local people, extension workers, researchers, government and NGO staff, whose knowledge and experiences are reflected in this book.
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- Promotion of Conservation Agriculture in Eritrea.
- Conservation Agriculture for Sustainable Agriculture and Rural Development in Southern and Eastern Africa (CA-SARD). This project operates in Kenya and Tanzania and is funded by the German government.

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# 14

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John is a British agricultural engineer with a PhD in agricultural engineering. He has worked overseas for nearly 40 years in South America, Africa and Asia, with much of his work focused on conservation agriculture. He initially worked with ODA (now the UK Department for International Development), and freelanced for 12 years. He is now working with the Food and Agriculture Organization of the United Nations.

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Philip holds a BSc and MPhil in agronomy and agricultural economics, and a postgraduate diploma in agricultural research for development from Wageningen, Netherlands. He worked with a GTZ project in Ghana for 6 years, then as a freelance consultant for GTZ and FAO until 2005. He specializes in participatory extension methods, agronomy and farming systems development, cover crops and conservation agriculture, agricultural economics, monitoring and evaluation, and project appraisal and planning.

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Gachene holds a BSc and MSc from the University of Nairobi, and a PhD in soil science from the Swedish University of Agricultural Science. He worked with the Kenya Soil Survey of the Kenya Agricultural Research Institute before joining the university. He has over 25 years of experience on soil and water management. His interests are soil erosion and productivity, green manure and legume crops for soil fertility improvement and erosion control. He also helps supervise the Legume Research Network Project.

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Eva has an MSc in weed science from Mississippi State University, and a BSc in agriculture from the University of Nairobi, Kenya. She has 10 years' experience working with farmers on soil fertility in agroforestry systems, participatory soil fertility improvement and weed control, with special focus on managing *Striga*, a parasitic weed.

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Violet holds a bachelor's degree in agriculture and human ecology extension from Egerton University. Her work experience spans over 26 years, including 6 years in extension. She has been in charge of home economics and rural youth programmes in several districts in Kenya. She is currently working with the Kenya Agricultural Research Institute as a socio-economist. She is a founder member of the Kenya Professional Association of Women in Agriculture and Environment (KEPAWAE).

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Bancy holds a PhD in rural land use and geographic information systems (GIS). She has long experience in research, consultancy and training, working on rainwater harvesting, water supply and management, irrigation, soil conservation, project planning and priority setting using GIS. She is active in networking and has published extensively.

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Barney holds a BSc in agriculture and an MSc in agricultural engineering. He worked with FAO for 12 years as a chief engineer and project manager. He has been a small-scale farmer in Kenya for 20 years. He has designed animal-drawn equipment for conservation agriculture for 12 years. He trains artisans how to make this equipment, and has also worked as a consultant for the Kenya Agricultural Research Institute, FAO and other organizations.

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Kimunya has worked in development since 1997 with GTZ, the Swedish International Development Agency (SIDA), and the International Centre for Research in Agroforestry (ICRAF). He has also consulted for various organizations. His background is in horticulture, and he is currently finalizing his MA in mass communication at the Centre for Mass Communication Research, University of Leicester. His work focuses on facilitating communication for development, producing and disseminating well-targeted communication products, and monitoring the efficiency and impact of communication for development.

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Rahab has 15 years of facilitation, training and management experience in business and development. She has been Principal of SATTC College in Mahe, Seychelles, and coordinator of the ActionAid-Kenya Inter-Development Centre in Kisumu. She holds a BSc in business management from Florida International University, a diploma in sales and marketing, and an advanced certificate in adult learning.

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Noordin has an MPhil in tropical forest soils. He has 12 years of experience in community-based extension services and participatory approaches. He is currently working with ICRAF as a development facilitator specializing in partnerships and scaling up.

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Nyakuni holds a bachelor's in agriculture and has extensive field experience in soil and water management, agroforestry, sustainable land management and participatory extension approaches. Since 2003 he has facilitated the integration of land management issues into NAADS. He has written books on extension approaches and land resources.

### **Paul Nyende**

**Consultant, Land Management, Food and Agriculture Organization of the United Nations, Technical Cooperation Programme on Conservation Agriculture (TCP-CA) Project, Uganda**

*Tel. +256 77 495950, email pnyende@yahoo.com, pnyende@africa2000network.org*

Paul holds an MSc in soil science and a BSc in agriculture. He has previously worked with the International Centre for Tropical Agriculture as a research associate in Uganda and as a programme coordinator with the Africa 2000 Network. He is now a consultant on land management for a project piloting conservation agriculture in Uganda.

### **Edwyn Odeny Odhiambo**

**Executive Director, National School Feeding Council of Kenya**

*Box 49772, Nairobi 00100, Kenya. Tel. +254 20 608960, email nsfck@yahoo.com, kyf73@hotmail.com*

Odhiambo holds a BSc in agricultural economics from Egerton University. He worked as a volunteer team leader for the Kenya Youth Foundation in charge of agriculture, food security and sustainable natural resource management, then joined the Kenya Freedom from Hunger Council as development officer for food security, water and sanitation. In February 2005 he became executive director of the National School Feeding Council of Kenya.

### **Okech John Odingo**

**Farmer, Kusa Community Development Society**

*PO Box 110, Pap Onditi, Kisumu, Kenya. Tel. +254 733 341496*

Okech is a retired education officer. He has worked with many development projects and is a member of various voluntary organizations. He takes a keen interest in farming initiatives.

### **Wilfred Richard Odogola**

**Director, Agricultural Engineering Research, Agricultural Engineering and Applied Technology Research Institute**

PO Box 7144, Kampala, Uganda. Tel. +256 77 220010, 041 566161, email [aetri@starcom.co.ug](mailto:aetri@starcom.co.ug)

Odogola holds an MSc in agricultural engineering from the Agricultural Mechanization and Electrification University, Rousse, Bulgaria. He has 30 years of experience as a lecturer and researcher on agricultural engineering with the National Agricultural Research Organisation (NARO) of Uganda. He has worked with projects funded by the Ugandan government, the World Bank, SIDA, DFID and other donors. Besides specializing in farm power and mechanization, he has 8 years of experience in post-harvest and rural energy systems, and in water for agricultural production. He has been involved in conservation agriculture since 2000.

### Alex Raymond Oduor

**Information Officer, Global Water Partnership Associated Programme, RELMA in ICRAF**

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Alex holds an MSc in water and environmental resources engineering from the UNESCO-IHE Institute of Water Education in Delft, Netherlands. As a research technologist with the Swedish Agency for Research Co-operation with Developing Countries (SAREC), he was in charge of the Steepland Research Station and the Soil and Water Laboratories of the Department of Agricultural Engineering, University of Nairobi between 1990 and 1998. He also served as a soil and water conservation officer with the Ministry of Agriculture, Machakos District, Kenya, from 1984 to 1990.

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**Communication and Administrator Officer, World Agroforestry Centre**

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Aileen holds an MA in communication. Before joining the World Agroforestry Centre, she worked as a public relations officer and as a communications specialist with IIRR.

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Benjamin has a BA in design from the University of Nairobi. He has worked as a designer for Longman Kenya, East Africa Educational Publishers, and University of Nairobi Press. He produces freehand and computer-generated scientific and technical art for publications.

### Alfred Ombati

**Artist**

PO Box 64427-00600, Nairobi, Kenya. Tel. +254 723 350628, 721 420806, email [aholiabsart@yahoo.com](mailto:aholiabsart@yahoo.com)

Alfred is a freelance artist. He has worked for EPZ (Ancheneyer), and has developed story books for Ribena and Panadol. He is currently working with Cover Concept Ltd. as an illustrator, as well as with IIRR. He does fine art, paintings, murals, portraits, book illustrations and comics.

### Kennedy Otieno

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Kennedy has been promoting conservation agriculture in western Kenya since 1995. He learned farmer field school and conservation agriculture methods with FAO and FITCA(K). He has promoted conservation agriculture as a volunteer and has worked with various community organizations on food security and the environment. He is currently studying indigenous practices and cover crops.

### Marietha Owenya

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Marietha works with SARI on on-farm socio-economics and agronomy research. She is also assistant national facilitator on conservation agriculture for sustainable development with an FAO-supported project covering 30 farmer field schools in Tanzania.

### **Motipi Ranthimo**

**Pastor and Trainer in Conservation Agriculture, Lesotho Evangelical Church**

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Motipi studied theology at the Morija Seminary of the Lesotho Evangelical Church. He has been pastoring at Tsoelike Lesotho Evangelical Church for the last 7 years. He has been practising conservation agriculture for 3 years with support from FAO.

### **Cecilia Ruben**

**Programme Development Manager, Stockholm Environment Institute (SEI)**

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Cecilia has an MSc in urban planning from Columbia University, New York, and a Fil kand in cultural geography and political science from Stockholm University. She has been involved in international environment research and development cooperation since 1971. Her work with the Stockholm Environmental Institute focuses on policy development for sustainability, and especially on ecological sanitation.

### **Brian Sims**

**Independent Consultant on Small Farm Mechanization, Engineering for Development**

*3 Bourneside, Bedford, MK41 7EG, UK. Tel. +44 1234 271699, 7966 155738, email briangsims@aol.com*

Brian has 30 years of experience of smallholder farm mechanization development, especially in Latin America. He has focused on needs assessment, participatory technology develop-

ment, on-farm testing and evaluation, and communal manufacture and distribution. He is now using his experience to enhance conservation agriculture technology in sub-Saharan Africa.

### **Kurt Steiner**

**Independent Consultant in Land Management**

*Goethestr. 7, 69250 Schonau, Germany. Tel. +49 6228 8457, email kurtsteiner@t-online.de*

Kurt has worked on agricultural research in Africa since 1970, first in plant pathology and then plant breeding. Since 1980, he has worked on smallholder farming systems, promoting intercropping in West and East Africa. He has introduced on-farm experimentation in research and development projects in various countries. He has promoted sustainable soil management and conservation tillage throughout the continent. He is co-founder of the African Conservation Tillage Network.

### **Gelson Tembo**

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Gelson holds a PhD in agricultural economics and statistics from Oklahoma State University and a bachelor of agricultural sciences from the University of Zambia. He has worked for the Dutch-funded Farming Systems Research Team-Western Province project, and as an agricultural economist for the Zambian government. He has conducted research on economics in Zambia and the USA, and has been involved in various regional and international missions, including for the United Nations, NEPAD, FAO and the African Conservation Tillage Network. He is currently part of a team of designing a collaborative masters programme in agricultural and applied economics, involving 16 African universities.

### **Melesse Temesgen**

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Melesse holds a BSc from Alemaya University and an MSc in agricultural engineering from Newcastle University in the UK. He has been researcher in Ethiopia for 16 years and is currently studying for his PhD on conservation tillage in the Netherlands.

## Bernard Triomphe

Researcher, Conservation Agriculture and Participatory Approaches, CIRAD

TA 60115, Av Agropolis 34398, Montpellier Cedex 5, France. Tel. +33 4 67615614, fax +33 4 67614415, email [bernard.triomphe@cirad.fr](mailto:bernard.triomphe@cirad.fr), internet [www.cirad.fr](http://www.cirad.fr)

Bernard is an agronomist with 20 years' experience in farming and cropping systems research. During the past 15 years he has been combining his interest in participatory approaches with sustainable agriculture, conservation agriculture and cover crops, with direct field experience in Latin America, and more recently in Africa.

## Bob Wagner

Editor

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Bob earned his MSc in dryland natural resource management with the Institute for Desert Research, University of Beersheba, Israel. As regional coordinator for the Arid Lands Information Network (1993 to 1999), he produced the well-known *Baobab* magazine. Since then, he has worked as a freelance writer and editor for several international organizations, with a focus on documenting sustainable natural resource management projects and practices.

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## Resource organizations and websites

### Africa-wide

#### Africa Conservation Tillage (ACT) Network

Zimbabwe office: No. 9 Balmoral Road, Borrowdale, Harare, Zimbabwe. Tel. +263 4 882107, fax +263 4 885596, email [actnetwork@africaonline.co.zw](mailto:actnetwork@africaonline.co.zw), internet [www.act.org.zw](http://www.act.org.zw). Contact: Martin Bwalya, Coordinator

Kenya office: PO Box 14733 00800, Westlands, Nairobi, Kenya. Email [actnairobi@wananchi.com](mailto:actnairobi@wananchi.com)

Promotes and facilitates sharing of information and experiences on conservation farming principles and practices in Africa.

#### Animal Traction Network for Eastern and Southern Africa (ATNESA)

[www.atnesa.org](http://www.atnesa.org)

Access to over 700 documents, many of relevance to conservation agriculture.

#### CropLife Africa Middle East

[www.croplifeafrica.org](http://www.croplifeafrica.org)

Represents manufacturers and distributors of crop protection products (pesticides), seeds and biotechnology products in Africa and the Middle East.

#### Ecoport

<http://ecoport.org>

An important database for conservation agriculture practitioners and others.

#### Green Water Harvesting Network

Contact: Maimbo Malesu, [m.malesu@cgiar.org](mailto:m.malesu@cgiar.org)

Eastern and Southern Africa and South Asia.

### Regional Land Management Unit (RELMA in ICRAF)

World Agroforestry Centre, ICRAF House, UN Avenue, PO Box 30677, Nairobi 00100, Kenya. Tel. +254 20 524400, 524418, fax +254 20 524401, 524001, email [relma@cgiar.org](mailto:relma@cgiar.org), internet [www.relma.org](http://www.relma.org)

Supports small-scale farm production management (including conservation agriculture), capacity building, information and documentation, gender, environmental concerns, poverty reduction and efforts to combat HIV/AIDS.

### Winrock International

ONFARM, BP E 457, Bamako, Mali. Tel. +223 293880, fax +223 292281, email [nhanssens@winrock-mali.org](mailto:nhanssens@winrock-mali.org), internet [www.winrock.org](http://www.winrock.org). Contact: Neils Hanssens, West Africa Coordinator

Conservation Tillage Project (Senegal, Mali and Cote d'Ivoire); On-Farm Agriculture Resources Management (ONFARM) Program

### Burkina Faso

#### Institut de l'environnement et de recherches agricoles (INERA)

Station de Koudougou, BP 10 Koudougou, Burkina Faso. Tel. +226 5044 65 10, 76 59 06 40, email [altbarro@yahoo.fr](mailto:altbarro@yahoo.fr). Contact: Albert Barro

Station de Farako-ba, 01 BP 910, Bobo-Dioulasso 01, Burkina Faso. Tel. +226 70264719, email [soul\\_oueder@hotmail.com](mailto:soul_oueder@hotmail.com), [osilamana@yahoo.fr](mailto:osilamana@yahoo.fr). Contact: Souleymane Ouédraogo

## Cameroon

### Bimbia Bonadikombo Natural Resource Management Council (BBNRMC)

Tel. +237 935 62 50, email [kjerry87@yahoo.com](mailto:kjerry87@yahoo.com).  
Contact: Jerome Bekoh Keji

### Cotton Development Company (SODECOTON)

PO Box 302, Garoua, Cameroon. Tel. +237 983 3881, email [projet.esa@sodecoton.cm](mailto:projet.esa@sodecoton.cm). Contact: Abdoulaye Abou Abba, Head officer, Soil Management Division

Soil conservation and water harvesting project monitored by Sodecoton and implementing field activities, training on soil conservation, water harvesting and implementation of conservation agriculture.

### Institute of Agricultural Research for Development (IRAD)

PO Box 33, Maroua, Cameroon. Tel. +237 292640, fax +237 292640. Contact: Oin Noé

National research institute which works on conservation agriculture.

## Chad

### Institut Tchadien de Recherche Agronomique pour le Développement (ITRAD)

Programme Gestion des Ressources Naturelles, ITRAD, BP5400, NDjaména, Chad. Tel. +235 520073, email [itrad@intnet.td](mailto:itrad@intnet.td) Contact: Michel Naitormbaide, tel. +235 29 87 66, email [naitormbaide\\_michel@yahoo.fr](mailto:naitormbaide_michel@yahoo.fr), [damiennh@yahoo.fr](mailto:damiennh@yahoo.fr).

## Ethiopia

### Mekelle University

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Adaptation of maresha ploughs.

## Ghana

### Ministry of Food and Agriculture, Crop Services Directorate

PO Box M 37, Accra, Ghana. Tel. +233 21 665066, email [cropserv@ghana.com](mailto:cropserv@ghana.com) Contact: J.K. Poku

Conservation agriculture included in work programme.

## Guinea

### Centre de Recherches Agronomique de Bordo (CRAB)

IRAG, BP 352, Kankan, Guinée. Tel. +224 11 58 42 76, email [kourouma\\_makan@yahoo.fr](mailto:kourouma_makan@yahoo.fr). Contact: Makan Kourouma

## Kenya

### Consortium for Scaling up Options for Increased Farm Productivity in Western Kenya (COSOFAP)

PO Box 25199, Kisumu, Kenya. Tel. +254 057 351163/64, fax +254 057 2021234, email [icraftsm@cgiar.org](mailto:icraftsm@cgiar.org), internet [www.ugunja.org/cosofap/](http://www.ugunja.org/cosofap/)

Training and provision of starter seeds for cover crops and fertilizer trees.

### **International Maize and Wheat Improvement Centre (CIMMYT)**

PO Box 1041-00621, Village Market, Nairobi Kenya. Tel. +254 20 7224600/05, fax +254 20 7224601, internet [www.cimmyt.org](http://www.cimmyt.org). Contact: Fred Kanampiu, [franampiu@cgiar.org](mailto:franampiu@cgiar.org)

The project "Conservation agriculture promotion in smallholder agriculture" is implemented in Zimbabwe, Zambia, Malawi and Tanzania. It promotes farmer-to-farmer adoption of proven conservation agriculture technologies and practices.

### **Kenya Agriculture Research Institute (KARI)**

PO Box 57811, Nairobi, Kenya. Tel. +254 2 583301-20, email [jwamuongo@kari.org](mailto:jwamuongo@kari.org). Contact: Jane Wamuongo or Joseph Mutua

Operating within the Kenya Conservation Tillage Initiative (KCTI) in Kenya's subtropical and semi-arid environments.

### **Kenya Network for Draught Animal Technology (KENDAT)**

PO Box 2859, 00200, City Square, Nairobi, Kenya. Tel./fax+254 20 6766939, email [kendat@africaonline.co.ke](mailto:kendat@africaonline.co.ke), internet [www.atnesa.org/kendat/](http://www.atnesa.org/kendat/) Contact: Pascal Kaumbutho

Partner (with the Ministry of Agriculture, RELMA, KARI, and the University of Nairobi) in the Kenya Conservation Tillage Initiative. Pilot trials of conservation agriculture, training of farmers and animals, training in handling equipment, field-days, key-stakeholder exposure and media campaigns, and manufacture and marketing of conservation tillage equipment.

### **Kenya Youth Foundation**

PO Box 1894, 00200 Nairobi, Kenya. Tel. +254 20 550278, email [kyl3@hotmail.com](mailto:kyl3@hotmail.com), [kenya@youthlink.org](mailto:kenya@youthlink.org). Contact: Bernard Luta

Rural Youth Livelihood Programme in Nyando District, Nyanza Province, involves training of youths on sustainable agriculture, income generation, and support services to the agricultural sector in Nyando.

### **National School Feeding Council of Kenya**

PO Box 49772 00100, Nairobi, Kenya. Tel. +254 20 608960, email [nsfck@yahoo.com](mailto:nsfck@yahoo.com)

Community-based school feeding programme involves training and facilitating schools and communities around them to produce food towards school feeding, implemented in Maragwa, Bondo and Thika districts. Conservation agriculture components introduced in Maragwa District.

### **Triple W Engineering Ltd.**

PO Box 176, Naro Moru 10105, Kenya. Tel. +254 62 62255, fax +254 62 62272. Contact: T.B. Muckle, [muckle@africaonline.co.ke](mailto:muckle@africaonline.co.ke)

Design and development of hand/animal-drawn conservation agriculture equipment for oxen, donkeys and camels. All equipment can be made by artisans with simple facilities using locally available raw materials. Training of artisans, production of manuals, and design of light equipment suitable for women and young people.

## **Madagascar**

### **Groupement Semis Direct Madagascar**

BP 6039, Ambanidia, Antananarivo, Madagascar. Tel. +261 20 22 27 627, email [gscdm@wanadoo.mg](mailto:gscdm@wanadoo.mg), internet [www.cirad.mg/fr/sco.php](http://www.cirad.mg/fr/sco.php), [www.agroecologie.cirad.fr](http://www.agroecologie.cirad.fr)

## **South Africa**

### **Agricultural Resource Consultants**

PO Box 3474, Parklands 2121, South Africa. Tel. +27 486 2254, +27 486 2274, email [agrecon@pixie.co.za](mailto:agrecon@pixie.co.za). Contact: Jim Findlay

Expertise in conservation agriculture throughout Africa, and in registration and legislation of crop protection products.

## Department of Agriculture, Western Cape

Tel. +27 21 808 5340, fax +27 21 808 5370, email [andrer@elsenburg.com](mailto:andrer@elsenburg.com). Contact: Andre Roux

Agricultural research, advisory services and planter modification, especially for farmers who grow wheat and vegetables using conservation agriculture in Western Cape.

## Grain Crops Institute

Agricultural Research Council of South Africa (ARC-GCI), Private Bag X 9029, Pietermaritzburg 3200, South Africa. Tel. +27 33 3559410, fax +27 33 3559518, email [rmfowler@iafrica.com](mailto:rmfowler@iafrica.com). Contact: Richard Fowler

Promotion and advice on adoption of conservation agriculture in southern Africa.

## Institute for Soil, Climate & Water

Agricultural Research Council of South Africa (ARC-ISCW), Pretoria, Gauteng Province, South Africa. Tel. +27 12 310 2500, fax +27 12 323 1157, email [DjBeukes@arc.agric.za](mailto:DjBeukes@arc.agric.za) or [Hjsmith@arc.agric.za](mailto:Hjsmith@arc.agric.za). Contact: Danie Beukes or Hendrik Smith

Research and advice on principles and practices of conservation agriculture and the establishment of action research-based conservation agriculture projects, especially among small-scale and emerging farmers.

## Small Grains Institute

Agricultural Research Council of South Africa (ARC-SGI), Bethlehem, Free State Province, South Africa. Tel. +27 58 307 3400, fax +27 58 307 3519, email [KilianW@arc.agric.za](mailto:KilianW@arc.agric.za) or [TolmayJ@arc.agric.za](mailto:TolmayJ@arc.agric.za). Contact: Willem Killian or John Tolmay

Research and advice on practice of conservation agriculture, especially by dryland wheat farmers.

## No-Till Club of KwaZulu-Natal

PO Box 1052, Howick 3290, South Africa. Tel. +27 33 239 1807, fax +27 33 330 6981, email [robin.d@absamail.co.za](mailto:robin.d@absamail.co.za). Contact: Robin Denny

Farmers in eastern South Africa who meet regularly with one another, universities, researchers, advisers and manufacturers to promote conservation agriculture.

## Tanzania

### Agricultural Research Institute Uyole

PO Box 400, Mbeya, Tanzania. Tel. +255 25 2510062, 2510363, fax +255 25 2510065, email [uyole@ud.co.tz](mailto:uyole@ud.co.tz), internet [www.drd.mafs.go.tz](http://www.drd.mafs.go.tz). Contact: Saidi Mkomwa, Team Leader

Seed supply and advisory services (pests, diseases and management) of cover crops. Training services on conservation agriculture equipment and practices.

### Ministry of Agriculture and Food Security

PO Box 4192, Dar-es-Salaam, Tanzania. Tel. +255 22 2862003, +255 744 373395, fax +255 22 2862077, 2862003. Contact: R.M. Shetto, Assistant Director, [mshetto@yahoo.co.uk](mailto:mshetto@yahoo.co.uk)

Technical training services for farmers, farmer-trainer and extension agents in mechanization, including conservation agriculture. Facilitation of mechanization input supply through policy adjustments, credit guarantees for farmers, stockists and manufacturers. Networking of stakeholders and dissemination of information on conservation agriculture and general agricultural mechanization.

### Selian Agricultural Research Institute (SARI)

PO Box 6024, Arusha, Tanzania. Tel. +255 27250 3883, fax +255 27 250 3971, mobile +255 748 403921, email [wlmiliki@sari.co.tz](mailto:wlmiliki@sari.co.tz), [wlmiliki@yahoo.com](mailto:wlmiliki@yahoo.com), internet [www.drd.mafs.go.tz/northern.htm](http://www.drd.mafs.go.tz/northern.htm). Contact: Ali Bwana or Wilfred Mariki (CA-SARD Facilitator)

Cover crop seed supply and advisory services (pests diseases and management) of cover crops. Training and advice on conservation agriculture equipment and practices; advice on extension methodologies such as farmer field schools and farmer-to-farmer exchange visits.

## Uganda

### Agricultural Engineering and Applied Technology Research Institute

PO Box 7144, Kampala, Uganda. Tel. +256 41 566161, +256 77 220010, email [aeatri@starcom.co.ug](mailto:aeatri@starcom.co.ug)

Research and adaptation of conservation agriculture, with focus on conservation agriculture equipment. Training on conservation agriculture for farmers, extensionists and rural artisans. Links with private sector manufacturers and academia.

### National Agricultural Advisory Services (NAADS)

NAADS Secretariat, Plot 39A, Lumumba Avenue, PO Box 25235, Kampala, Uganda. Tel. +256 41 345065, +256 77874126, fax +256 41 347843

### National Agricultural Research Organization (NARO)

PO Box 295, Entebbe, Uganda. Tel. +256 041 320512

Coordination of research on conservation agriculture, including cover crops, tools and implements, soil and water management and fertility issues.

## Zambia

### Agriculture Support Programme (ASP)

PO Box 510091, Chipata, Zambia. Tel. +260 62 21284, 21379, email [scafe@zamnet.zm](mailto:scafe@zamnet.zm), [scafeast@zamnet.zm](mailto:scafeast@zamnet.zm). Contact: R.K. Shula

### Conservation Farming Unit, Zambia National Farmers Union

PO Box 30395, Lusaka, Zambia. Tel. +260 1 210112, 264781, 265455, fax +260 1 264781, Contact: Dutch Gibson, email [gibcoll@zamnet.zm](mailto:gibcoll@zamnet.zm)

The conservation farming unit has been developing and promoting the adoption of the conservation tillage and conservation agriculture technologies with small scale farmers through training; publication of materials to be used, trials and field days.

### Golden Valley Agriculture Research Trust

PO Box 50834, Lusaka, Zambia. Tel. +260 1 265455, fax +260 1 264781, email [paagaard@zamnet.zm](mailto:paagaard@zamnet.zm). Contact: Peter Aagaard,

Research trials on conservation farming and conservation agriculture.

## Zimbabwe

### Agricultural Research and Extension Services (AREX)

PO Box 8117, Causeway, Harare, Zimbabwe. Tel. +263 4 707311/794601, fax. +263 4 730525

Research and extension services on a national scale. Previously known as AGRITEX.

### University of Zimbabwe

Dept. of Soil Science, PO Box MP 167, Mount Pleasant, Harare, Zimbabwe. Tel. +263 4 339191, email [chuma@africaonline.co.zw](mailto:chuma@africaonline.co.zw), Contact: Edward Chuma

## Outside Africa

### Alternative Farming Systems Information Center

[www.nal.usda.gov/afsic/](http://www.nal.usda.gov/afsic/)

Provides access to information on alternative cropping systems, including conservation agriculture.

### **Confederation of American Associations for the Production of Sustainable Agriculture (CAAPAS)**

Email [sdrob@idi.com.ar](mailto:sdrob@idi.com.ar), internet [www.caapas.org](http://www.caapas.org). Contact: Roberto A. Peiretti, President

### **Center for Cover Crops Information and Seed Exchange in Africa (CIEPCA)**

[http://ppathw3.cals.cornell.edu/mba\\_project/CIEPCA/home.html](http://ppathw3.cals.cornell.edu/mba_project/CIEPCA/home.html)

### **Centre de coopération Internationale en Recherche Agronomique pour le Développement (CIRAD)**

TA 74/09, Avenue Agropolis, 34398 Montpellier Cedex 5, France. Email [agroeco@cirad.fr](mailto:agroeco@cirad.fr), internet <http://agroecologie.cirad.fr> (French), <http://agroecologie.cirad.fr/index.php?rubrique=accueil&langue=en> (English). Contact: Christine Casino

For Eastern and Southern Africa: c/o ICRAF, UN Avenue, Gigiri, PO Box 30677-00100, Nairobi, Kenya. Tel. +254 20 722 46 52. Contact: Denis Depommier, [denis.depommier@cgiar.org](mailto:denis.depommier@cgiar.org)

For West Africa: 5, Av. Kennedy, 01 BP 596, Ouagadougou, Burkina Faso. Tel. +226 50 30 70 70. Contact: Jacques Pages, [Jacques.pages@cirad.fr](mailto:Jacques.pages@cirad.fr)

Development of conservation agriculture-based cropping systems and rotations. Environmental and socioeconomic impact of conservation agriculture systems. Participatory innovation development. Case studies on conservation agriculture adaptation and adoption. Training of researchers and extension officers. Partnerships with donors, national institutions and private sector to develop and implement pilot conservation agriculture projects and programmes.

### **Cornell University-CIIFAD**

<http://mulch.mannlib.cornell.edu/CAwebsite/>

Useful information and resources related to conservation agriculture.

### **Cover Crops International Clearinghouse (CIDICCO)**

<http://cidicco.hn/newcidiccoenglish/>

### **CropLife International**

143 Avenue Louise, B-1050 Brussels, Belgium. Tel. +32 2 542 04 10, fax +32 2 542 04 19, email [croplife@croplife.org](mailto:croplife@croplife.org), internet [www.croplife.org](http://www.croplife.org)

Global federation representing the plant science industry. It represents a network of regional and national associations in over 90 countries and is led by companies such as BASF, Bayer CropScience, Dow AgroSciences, DuPont, FMC, Monsanto, Sumitomo and Syngenta.

### **European Conservation Agriculture Federation (ECAAF)**

CIFA Alameda del Obispo, Avda Menéndez Pidal, s/n, Apdo 3092, 14080 Córdoba, Spain. Tel./fax +34 957 760797, email [conservation.agriculture@ecaf.org](mailto:conservation.agriculture@ecaf.org), internet [www.ecaf.org](http://www.ecaf.org)

### **Federação Brasileira de Plantio Direto na Palha**

Rua 7 de Setembro, 800 - sala - 201, CEP 84.010-350, Ponta Grossa, Paraná, Brazil. Tel./fax +55 42 223 9107, email [febrapdp@uol.com.br](mailto:febrapdp@uol.com.br), internet [www.febrapdp.org.br](http://www.febrapdp.org.br)

### **Food and Agriculture Organization of the United Nations (FAO)**

Farm Power and Equipment Group, Conservation Agriculture, Viale Delle Terme di Caracalla, Rome 00100, Italy. Tel. +39 06 57053334, 57052612, email [agst-mail@fao.org](mailto:agst-mail@fao.org), internet [www.fao.org/ag/ags/subjects/en/farmpower](http://www.fao.org/ag/ags/subjects/en/farmpower), [www.fao.org/ag/ags/AGSE/Main.htm](http://www.fao.org/ag/ags/AGSE/Main.htm),

## Conservation Agriculture

*Intensifying crop production with conservation agriculture, [www.fao.org/ag/ags/AGSE/agse\\_e/general/CONT1.htm](http://www.fao.org/ag/ags/AGSE/agse_e/general/CONT1.htm)*

*Land and water development division,  
[www.fao.org/ag/agl/agll/prtcons.stm](http://www.fao.org/ag/agl/agll/prtcons.stm)*

Supports and promotes conservation agriculture worldwide. FAO's "Telefood programme" provides small grants to farmers groups that could be used for cover crop seeds or implements for conservation agriculture. For more information, contact your FAO country office.

### **German Agency for Technical Cooperation (GTZ)**

*PO Box 5180, 65726 Eschborn, Germany. Tel. +49 6196 790, internet, [www.gtz.de/conservation-tillage](http://www.gtz.de/conservation-tillage)*

Agriculture sector support and food security programmes.

### **Land Resources Management, World Bank**

*<http://lnweb18.worldbank.org/ESSD/ardext.nsf/11ByDocName/TopicsLandResourcesManagement>*

### **LEISA**

*PO Box 64, 3830 AB Leusden, Netherlands. Email [ileia@ileia.nl](mailto:ileia@ileia.nl), website [www.leisa.info](http://www.leisa.info)*

Magazine on low external input and sustainable agriculture

### **LEXSYS: Legume Expert SYStem**

*[www.iita.org/research/lexsys.htm](http://www.iita.org/research/lexsys.htm).*

Cover crop database has information on legumes, agroecological zones, plant characteristics, etc.

### **World Congress on Conservation Agriculture**

*First World Congress (Madrid, 2001):  
[www.ecaf.org/Congress/Latest\\_news.htm](http://www.ecaf.org/Congress/Latest_news.htm)*

*Second World Congress (Iguaçu, Brazil, 2003):  
[www.febrapdp.org.br/event.htm](http://www.febrapdp.org.br/event.htm)*

*Third World Congress (Nairobi, 2005):  
[www.act.org.zw/congress/index.htm](http://www.act.org.zw/congress/index.htm)*

Major international conference on conservation agriculture, held every 2 years. Papers available online.

### **World Overview of Conservation Approaches and Technologies (WOCAT)**

*[www.wocat.net](http://www.wocat.net), email [wocat@giub.unibe.ch](mailto:wocat@giub.unibe.ch)*

Database on soil and water conservation, including examples of conservation agriculture.



## Equipment manufacturers

Many of these manufacturers also provide training and advice on conservation agriculture equipment

### Brazil

See also [www.fao.org/ag/AGS/agse/planters.htm](http://www.fao.org/ag/AGS/agse/planters.htm)

#### Fitarelli Máquinas Agrícolas Ltda.

Rua Etelvino Pes. 30, Bairro Industrial, Aratiba, RS, CEP 9970-000, Brazil. Tel./fax +55 54 376 1198, email [fitarelli@fitarelli.com.br](mailto:fitarelli@fitarelli.com.br), internet [www.fitarelli.com.br](http://www.fitarelli.com.br)

#### IADEL Máquinas e Implementos Ltda

Rua Dona Ana 883, Centro Dona Emma, Santa Catarina, CEP 89155-000, Brazil. Fax +55 47 364 042

#### Indústria Knapik

Rua Prof. Alfredo Metzler, 480, Bairro Santa Rosa CEP 89400-000, Brazil. Tel. +55 42 522 1819, fax 42 522 2789, email [knapik@knapik.com.br](mailto:knapik@knapik.com.br), internet [www.knapik.com.br](http://www.knapik.com.br)

#### Jahnel Indústria e Comércio de Implementos Agrícolas Ltda.

Rua Benjamin Constant 636, Cuna Porã, Santa Catarina, CEP 89890-000, Brazil. Tel. +55 49 646 0587, email [jahnel@cpnet.com.br](mailto:jahnel@cpnet.com.br)

#### Máquinas Agrícolas Jacto SA

Rua Dr. Luiz Miranda 1650, PO Box 35, 17580-000 Pompéia, SP, Brazil. Tel. +55 14 3405 2100, fax + 55 14 3452 1306, email [jacto@jacto.com.br](mailto:jacto@jacto.com.br), internet [www.jacto.com.br](http://www.jacto.com.br)

Knapsack sprayers adapted to hand-pulled machines.

#### Triton Máquinas Agrícolas Ltda

Rua Dois Irmãos 263, Centro, Caixa Postal 31, CEP 89.609-000, Luzerna, Santa Catarina, Brazil. Tel./fax +55 49 523 1144, email [triton@tritonmaquinas.com.br](mailto:triton@tritonmaquinas.com.br), internet [www.tritonmaquinas.com.br](http://www.tritonmaquinas.com.br)

### Kenya

#### Lolli

PO Box 63514-00619, Outer Ring Road, next to Hardi, Nairobi, Kenya. Tel +254 20 860782, 802060, fax +254 20 860260

#### Sametract

Bambur Road, Industrial Area, Nairobi. Tel. +254 20 533081, 533446, 537019, fax +254 20 551475

#### Techno Plast

Nairobi. Tel. +254 20 551771

#### Triple W Engineering Ltd

PO Box 176, Naro Moru 10105, Kenya. Tel. +254 62 62255, fax +254 62 62272. Contact: T.B. Muckle, [muckle@africaonline.co.ke](mailto:muckle@africaonline.co.ke)

See description under Resource organizations and websites

### South Africa

#### Afritrac Ltd

South Africa. Tel. +27 11 918 5983 fax +27 11 918 0310, email [mike@afritrac.co.za](mailto:mike@afritrac.co.za), internet [www.afritrac.co.za](http://www.afritrac.co.za). Contact: Mike McMaster

Manufacturers and distributors of "Mealie Brand" animal and tractor-drawn planters and other equipment suited for use by small scale conservation agriculture farmers.

## Northmec/CSE

PO Box 851, Isando 1600, South Africa. Tel. +27 11 974 2501, 82 896 5236, fax +27 11 392 2889, email [stefs@northmec.co.za](mailto:stefs@northmec.co.za), internet [www.cse.co.za](http://www.cse.co.za). Contact: Steph Strydom

South African representatives of Case, Baldan, Fitarelli, Jacto and other locally manufactured and imported agricultural machinery for conservation agriculture farmers, large and small.

## Tanzania

### Nandra Engineering Works

Nguvu Kazi Area, Sukari Road, PO Box 304, Moshi, Tanzania. Tel. +255 27 51542, fax +255 27 50575, email [nandra@eoltz.com](mailto:nandra@eoltz.com). Contact: Frank Alfred Lesiriam (Managing Director)

Animal-drawn rippers and subsoilers, spare parts for rippers and tractors, piloting the manufacture of hand jab-planters and no-tillage equipment. Also maize mills, hullers, grain storage tanks, cookers, water tanks.

### SEAZ Agricultural Equipment Ltd

PO Box 2607, Mbeya, Tanzania. Tel. +255 744 399599, fax +255 25 2502121, email [seaz@yahoo.co.uk](mailto:seaz@yahoo.co.uk). Contact: Vasimbile Sinda

## Uganda

### Soroti Agricultural Implements and Machinery Manufacturing Company (SAIMMCO)

Cementry Road, Soroti, Uganda. Tel. +256 45 61361, fax +256 45 61361, email [saimmco.soroti@alam-group.com](mailto:saimmco.soroti@alam-group.com), internet [www.alam-group.com/saimmco.html](http://www.alam-group.com/saimmco.html)

Manufactures tools and implements for agricultural production and processing. Particularly strong in the manufacture of draft animal power implements. Participated in the field introduction of conservation agriculture in Uganda, and makes implements such as including rippers, subsoilers, no-till planter and manually operated sprayers.

## Zambia

### Zamwipe

c/o Fedex, Nangwenya Road, Rhodes Park, Lusaka, Zambia, or PO Box 44, Fringilla, Lusaka, Zambia. Tel. +260 1 264281, +260 1 230112, email [zamwipe@zamnet.zm](mailto:zamwipe@zamnet.zm), [gibcoll@zamnet.zm](mailto:gibcoll@zamnet.zm). Contact: Dutch Gibson

## Zimbabwe

### Mealie Brand

39 Steelworks Road, Steeldale, PO Box 1059, Bulawayo, Zimbabwe. Tel. +263 9 887989, 880667 or 71363/4/5, fax 71365. General information: [mdsec@zimplow.co.zw](mailto:mdsec@zimplow.co.zw), sales: [sales@zimplow.co.zw](mailto:sales@zimplow.co.zw), internet [www.zimplow.co.zw](http://www.zimplow.co.zw)

### Hastt

PO Box 2356, Harare, Zimbabwe. Tel. +263 4 620321-7, fax +263 4 620371. Enquiries: [enquiries@hastt.co.zw](mailto:enquiries@hastt.co.zw), sales: [sales@hastt.co.zw](mailto:sales@hastt.co.zw), internet [www.hastt.co.zw](http://www.hastt.co.zw)

Equipment development, manufacture and supply for conservation agriculture. Manufactures and supplies rippers and planters for minimum and zero tillage. Product range covers tractor-mounted, animal-drawn and hand-operated equipment.

## Resource materials

The following websites have a wide range of information and downloadable documents on conservation agriculture. See the *Organizations and websites* section above for more information:

**ACT**, [www.act.org.zw](http://www.act.org.zw)

**ATNESA**, [www.atnesa.org](http://www.atnesa.org)

**CIRAD**, <http://agroecologie.cirad.fr>

**FAO**, [www.fao.org/ag/ags/AGSE/Main.htm](http://www.fao.org/ag/ags/AGSE/Main.htm)

**GTZ**, [www.gtz.de/conservation-tillage](http://www.gtz.de/conservation-tillage)

**Relma in ICRAF**, [www.relma.org](http://www.relma.org)

### CD-ROMs

**CropLife International**. 2004. *Conservation technologies for sustainable agriculture*. CD-ROM. CropLife International, Brussels. Obtainable from Keith Jones, [keith@croplife.org](mailto:keith@croplife.org)

Presentations from a workshop at the 2004 International Weed Science Congress in South Africa. Presentations from FAO, the World Bank, the Kenya Agricultural Research Institute, the International Crops Research Institute for the Semi-Arid Tropics; Sasakawa Global 2000, as well as Bayer CropScience, Monsanto, Dow AgroSciences, and several others.

**FAO**. 2004. *Conservation of natural resources for sustainable agriculture: training modules*. Land and Water Digital Media Series no. 27, FAO, Rome.

CD-ROM with training materials. Introduction to conservation agriculture; modules on soil, agronomy, mechanization, pest control, economics, etc.). Useful for training.

### Publications

**African Conservation Tillage Network**.

*Information series*. [www.act.org.zw/infoseries.html](http://www.act.org.zw/infoseries.html)

Series covers various aspects of conservation agriculture.

**Ashburner, J., T. Friedrich and J. Benites**.

2002. Opportunities and constraints for conservation agriculture in Africa. *LEISA* 18(3):13-14.

**Bishop-Sambrook, C., J. Kienzle, W. Mariki, M. Owenya and F. Ribeiro**. 2004. *Conservation agriculture as a labour saving practice for vulnerable households*. Study report. IFAD and FAO, Rome, Italy. 80 pp. [www.fao.org/ag/ags/programmes/en/enhance/FAO\\_IFAD\\_CA\\_Tanzania.pdf](http://www.fao.org/ag/ags/programmes/en/enhance/FAO_IFAD_CA_Tanzania.pdf)

Study of reduced tillage practices and cover crops for households under labour stress in Babati and Karatu Districts in Northern Tanzania.

**Buckles, D., A. Etèka, O. Osiname, M.**

**Galiba and N. Galiano** (eds). 1998. *Cover crops in West Africa: Contributing to sustainable agriculture/Plantes de couverture en Afrique de l'Ouest: Une contribution à l'agriculture durable*. International Development Research Centre, International Institute of Tropical Agriculture and Sasakawa Global 2000. [http://web.idrc.ca/en/ev-9393-201-1-DO\\_TOPIC.html](http://web.idrc.ca/en/ev-9393-201-1-DO_TOPIC.html)

**Calegari, A., J. Ashburner, and R. Fowler**.

2005. *Conservation agriculture in Africa*. ISBN 9988-627-04-1. FAO, Rome, Italy. 98p. (in press)

**CIDICCO, IITA, and Judson College**. 2002.

*Food and feed from mucuna: Current uses and the way forward. Proceedings of an international workshop*. CIDICCO (International Cover Crops Clearinghouse), CIEPCA (Center for Information and Seed Exchange in Africa)-IITA (International Institute of Tropical Agriculture), and World Hunger Research

- Center, Judson College. [www.cidicco.hn/newcidiccoenglish/food\\_and\\_feed\\_from\\_mucuna.htm](http://www.cidicco.hn/newcidiccoenglish/food_and_feed_from_mucuna.htm)
- Conservation Farming Unit.** 1997. *Conservation farming handbook for small holders in Regions I & II*. Conservation Farming Unit, FAO, Lusaka. [www.fao.org/ag/AGS/AGSE/agse\\_e/3ero/cases1c.htm](http://www.fao.org/ag/AGS/AGSE/agse_e/3ero/cases1c.htm)
- Critchley, W., K. Siegert and C. Chapman.** 1991. *Water harvesting techniques: A manual for the design and construction of water harvesting schemes for plant production*. FAO, Rome. [www.fao.org/docrep/U3160E/u3160e07.htm](http://www.fao.org/docrep/U3160E/u3160e07.htm)
- CropLife International.** 2005 (forthcoming). *Conservation technologies and the plant science industry: Managing natural resources sustainably*. CropLife International, Brussels.
- Case studies from around the world showing how the plant science industry is increasing its emphasis on conservation technologies. Draft at [www.croplife.org/conservationtech](http://www.croplife.org/conservationtech)
- Dobson, H., G. Matthews, T. Wiles, and P. Baleguel Nkot.** 2004. *Pesticide safety and application equipment, sprayer operator pocket book*. FAO, Rome.
- Training and reference pocket book, available in English, French and Spanish.
- Dobson, H., G. Matthews, T. Wiles, and P. Baleguel Nkot.** 2004. *Hints on pesticide use, Hints on spraying, calibration of LK sprayers*. Set of three posters. Yaounde Initiative, FAO, Rome.
- Posters with pictograms and simple text to assist in sprayer training. Useful for sprayer training and as a reminder for participants.
- Ekboir, J., K. Boa, and A.A. Dankyi.** 2002. Impact of no-till technologies in Ghana. *Economic Program Paper 02-01*, CIMMYT, Mexico DF.
- Case study of conservation agriculture in Ghana.
- Erenstein, O.** 2003. Smallholder conservation farming in the tropics and sub-tropics: A guide to the development and dissemination of mulching with crop residues and cover crops. *Agriculture, Ecosystems and Environment* 100:17-37.
- Good academic synthesis of conservation agriculture.
- FAO.** 2000. Manual on integrated soil management and conservation practices. *FAO Land and Water Bulletin* 8, FAO, Rome.
- FAO.** 2001. Conservation agriculture: Case studies in Latin America and Africa. *FAO Soils Bulletin* 78. ISBN 92-5-104625-5. FAO, Rome. 69p.
- FAO.** 2004. *Pesticide safety and application equipment: Sprayer operator pocket book*. Agricultural and Food Engineering Technology Service, FAO, Rome.
- Groupement Semis Direct Madagascar.** Undated. *Le semis direct sur couverture végétale permanente: Enjeux et potential pour une agriculture durable à Madagascar*. Groupement Semis Direct Madagascar, Antananarivo.
- Haggblade, S. and G.. Tembo.** 2003. Conservation farming in Zambia. IFPRI and MSU, *EPTD discussion paper* 108, Washington DC.
- Case study of conservation agriculture in Zambia.
- Hercilio de Freitas, V.** 2000. Soil management and conservation for small farms: Strategies and methods of introduction, technologies and equipment. Experiences from the State of Santa Catarina, Brazil. *FAO Soils Bulletin* 77, FAO, Rome.
- Jonsson, L.-O., E. Mawenya and J. Rockström.** Conservation tillage I: Management practices for animal-drawn systems in Tanzania, *Working Paper* 16. RELMA, 2003.
- Jonsson, L.-O.** Conservation tillage II: Handling and care of drought animals under Tanzanian conditions, *Working Paper* 17. RELMA, 2003.
- Landers, J.** 2001. Zero tillage development in tropical Brazil: The story of a successful NGO activity. *FAO Agricultural Services Bulletin* 147. ISBN 92-5-104672-7. FAO, Rome. 144p.
- Liniger, H.P., and W. Critchley** (forthcoming 2005). Local responses to global land degradation: Exchange of knowledge for Sustainable Land Management Centre for

- Development and Environment (CDE), United Nations Environment Programme (UNEP).
- Global overview book with over 30 case studies.
- Ministry of Agriculture and Cooperatives.** 2000. *Tanzania soil fertility initiative*. Ministry of Agriculture and Cooperatives, Tanzania.
- Discussion on soil fertility and related policy issues.
- Mutunga, K., and W. Critchley.** 2001. *Farmers' initiatives in land husbandry*. Regional Land Management Unit (RELMA), Nairobi.
- Farmers' innovations in sustainable agriculture.
- Naudin, K., and B. Oumarou.** 2002–04. *Rapports de synthese campagne*. ESA/SODECOTON, Garoua Cameroun. Annual report of activities.
- Pieri, C., G. Evers, J. Landers, P. O'Connell, and E. Terry.** 2002. No-till farming for sustainable rural development. *Agriculture & Rural Development Paper*, IBRD, Washington, DC. 65p.
- Pieri, C., G. Evers, J. Landers, P. O'Connell, and E. Terry.** 2002. A road map from conventional to no-till farming. *Agriculture & Rural Development Paper*, IBRD, Washington, DC. 20p.
- Seguy, L., S. Bouzinac, and A.C. Maronezzi.** 2001. *Systèmes de culture et dynamique de la matière organique*. CIRAD-CA, Agronorte Pesquisas, Groupe Maeda, ONG TAF/A/FOFIFA/ANAE. <http://agroecologie.cirad.fr/pdf/dosscv.pdf>
- Shaxson, F.** 1999. New concepts and approaches to land management in the tropics with emphasis on steep lands. *FAO Soils Bulletin 75*. ISBN 92-5-104318-1. FAO, Rome. 125p.
- Shaxson, F. and R. Barber.** 2003. Optimizing soil moisture for plant production: The significance of soil porosity. *FAO Soils Bulletin 79*, FAO, Rome.
- Thomas, D.** 1997. *Soil and water conservation manual for Kenya*. Ministry of Agriculture, Nairobi.
- Technical manual on soil and water conservation.
- Van der Merwe, G.M.E., R.O. Barnard, and D.J. Pretorius.** 2004. *Overview of conservation approaches and technologies in South Africa*. Department of Agriculture and Agricultural Research Council, Pretoria.
- ZNFU.** 2003. *Conservation farming in Zambia*. ISBN 9982-52-005-9. ZNFU, Lusaka, Zambia. 46p.
- ZNFU CFU.** 2002. *Defeating weeds with the Zamwiper*. Zambia National Farmers' Union, Conservation Farming Unit, Lusaka.
- How to use the Zamwiper weed wiper to control weeds.

## Videos

- Critchley, W.** 1991. *Looking after our land*. International Institute for Environment and Development, Oxford and London. Book and video comparing soil and water conservation in West and East Africa.
- Monsanto Central Africa Inc.** *Growing together: Conservation tillage in Africa*. Video on how partnerships are providing solutions needed to empower small-scale farmer.