

Understanding the adoption and application of conservation agriculture in southern Africa

GRANT RESULTS SHEET



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The programme focused on developing productive and profitable smallholder farming systems based on the principles of conservation agriculture

Goals and objectives

The programme's goals were to increase the food security of smallholder farm households in southern Africa and enhance their livelihoods while conserving and improving the natural resources used for agriculture.

The focus of the programme was on developing productive farming systems for smallholder farmers who managed maize-based systems, based on the principles of conservation agriculture (CA): increasing the profitability, sustainability and labour efficiency of agricultural production.

Specific objectives of the programme included the following:

- Identify impediments to the adaptation and adoption of systems based on the principles of CA and help resolve these impediments through public and private stakeholders involved in local innovation systems.
- Develop locally-adapted CA systems through adaptive research to resolve challenges and capture opportunities observed in farmer-managed field plots; and conduct participatory evaluations of CA options.
- Understand the long-term effects of CA on farming system productivity, sustainability and resilience in relation to future scenarios of climate change in southern Africa.
- Assess, evaluate and document the impact of CA on labour requirements, farm productivity and risk for different household members, especially women and children.
- Facilitate the scaling up of sustainable systems by increasing knowledge and awareness of the benefits and management of CA technologies among farmers, researchers, extension agents and policymakers.



Facts at a glance

Grant implementing agency

International Maize and Wheat Improvement Center (CIMMYT)

Theme

Soil and water conservation, farm technology, conservation agriculture

Benefiting countries

Malawi, Zambia, Zimbabwe

Total programme cost

US\$977,000

IFAD contribution: US\$750,000

Cofinancing (other donors): US\$227,000

Partners

National Agricultural Research and Extension Systems in Malawi, Zambia and Zimbabwe; Total LandCare (TLC), Malawi, and Development Aid from People to People (DAPP), Zimbabwe

Effectiveness and duration

September 2011-December 2013, with a no-cost-extension up to June 2014

Linkages to IFAD investment projects

- Malawi: Sustainable Agricultural Production Programme (SAPP) – large sub-grant to TLC to deliver extension support for CA and good agricultural practices in this project to 150,000 households over five years
- Zambia: Smallholder Productivity Promotion Programme (S3P)

Beneficiaries

The main target group of this research programme consisted of smallholder farmers in Malawi, Zambia and Zimbabwe, farming in areas receiving more than 500 mm of annual rainfall. The intermediate beneficiaries of the project were the National Agricultural Research and Extension Systems (NARES), which will benefit through improved capacity to manage farmer-participatory technology adaptation, catalyze local innovation systems, and foster farmer-learning and farmer-to-farmer knowledge-sharing.

Main results

IFAD grants have funded long-term research on CA systems in southern Africa. Based on research evidence, it is now known where and when CA is a more profitable, viable and environmentally-friendly cropping system than traditional plough- or tillage-based agriculture.

The major results of the research are as follows:

- CA has significant yield benefits in the medium to longer term and can overcome crop failure risks even in marginal environments.
- Regional results show that, in 80 per cent of cases, a yield increase was achieved using CA treatments rather than conventional control treatments. However, this was often achieved only after two to five cropping seasons, depending on both the site and farmer circumstances, the systems applied and the extension officers who assisted in implementing the work.
- CA systems had distinct labour benefits, ranging from 23 to 42 labour days saved when direct seeding was practised and weeds were controlled by herbicides.
- Adoption of at least two CA principles (minimum tillage and/or mulching/crop associations/rotation) increased food production and efficiency of labour use. For example, CA systems in Central Malawi had gross margins that were US\$193-546 higher planted with maize than with conventional ridge tillage, and US\$415-600 higher for groundnuts planted under CA during the period 2011-2014.
- CA can lead to higher water infiltration and increased moisture retention, and can therefore support adaptation to climate variability and change.

In CA systems, weed control is one of the biggest challenges, accounting for up to 70 per cent of farm labour. Weeds can be managed through various strategies, including the use of herbicides and/or green manure cover crops.

- However, results show that no matter what strategies are applied (manual or chemical weed control), weed seed numbers and associated weed emergence can be significantly reduced if weed control is at an optimum level.
- Much progress has been made in understanding the dynamics and effects of residue retention. However, adequate residue retention levels and strategies still need to be developed.



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Successful maize-groundnut rotation under CA in Malawi

Lessons learned

Many lessons about CA and smallholder farming were learned during the implementation of the project:

- There are few biophysical limitations to successfully applying CA systems, especially in areas above 800 mm of rainfall, where CIMMYT experimented with CA.
- The use of direct seeding systems (manual and animal traction) is the most economical way of planting and also reduces labour.
- Crop rotations with maize and legumes (e.g. soybean, cowpeas, groundnuts, pigeon peas) provide a broad range of options for farmers to improve cereal yields, nutrition and income.
- Combinations with other climate-smart technologies such as drought-tolerant germplasm and trees provide additional benefits and can increase the niche where CA can be applied.
- Sustained adoption of CA systems is dependent on a number of factors such as education level of household head, type of extension support, access to critical inputs, farm size, lack of precipitation (risk) and labour shortage.
- The reduction in planting and weeding time achieved by shifting to less labour-intensive cropping systems (e.g. mechanized CA systems, direct seeding systems, use of herbicides for weed control) can benefit women, who can then devote themselves to other agricultural activities such as home gardening, thus increasing the household food basket and generating additional income.

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Way forward

The publication and broad dissemination of on-station and on-farm research results from this grant and the previous one will lead to an increased understanding among researchers, donors and governments of the benefits and potential of CA systems, as well as the challenges involved in applying CA principles and practices across diverse farmer groups and environments. In turn, this will help to identify specific interventions for development partners. Equally important, this critical evidence is enabling more initiatives to scale up CA systems, for example with SAPP in Malawi and S3P in Zambia. Other donor-funded projects, such as the Sustainable Intensification of Maize and Legume Systems for Food Security in Eastern and Southern Africa (SIMLESA), have invested more than USD\$58 million to scale out CA extensively. The African Union's New Partnership for Africa's Development (NEPAD), along with some large international NGOs (Concern, Care, Catholic Relief Services, Oxfam and World Vision), have formed an alliance to scale up climate-smart agriculture technologies; CA being one of the most widely accepted. The grant has led to the development of simple decision guides and recommendations that will be tested in the coming years to enable better targeting and CA systems that are adapted to the needs and circumstances of farmers in southern Africa.

Knowledge generated

The project has generated new knowledge on how resource-poor smallholder farmers can effectively and efficiently utilize and integrate CA into their farming context for increased nutrient and water use efficiency and productivity, and reduced production risk. More specifically:

- NARES scientists and their partner NGO research and development specialists broadened their experience in agronomic research on CA and adaptation strategies.
- National extension agents have benefited from training on CA systems and increased knowledge on available maize varieties and climate change related adaptation strategies.
- Local seed companies have profited from increased knowledge and understanding of the synergies between improved stress-tolerant seed and sustainable intensification options.

Overall, the project has generated a large amount of public goods through more than 30 research papers, book chapters, conference articles, presentations and technical bulletins. These knowledge products are widely used by an increasing number of researchers in Africa and around the world. The project further supported three BSc, four MSc and four PhD projects in Malawi and Zimbabwe. Regional development projects have started to make use of the knowledge on improved climate-smart technologies – for example, the IFAD-funded Smallholder Agriculture Production Project (SAPP) in Malawi and Smallholder Productivity Promotion Project (S3P) in Zambia will scale up these improved CA systems to 200,000 households over the next five years.



Investing in rural people

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