



Sustainable Agriculture and Natural Resource Management Collaborative Research Support Program

SANREM CRSP
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Trip Report: Lesotho and Mozambique

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Purpose of Trip: (1) to assess status of maize and bean trials at Maphutseng and Roma, Lesotho; (2) check on Bowen's Ratio (BR) unit at Maphutseng, Lesotho, and set up a second BR unit in soils managed under intensive tillage; (3) attend FAO Regional Workshop on Conservation Agriculture; (4) visit with CIMMYT partners in Chimoio, Mozambique; (5) visit on-farm demonstration sites in Chimoio, Mozambique; and (6) recruit graduate students from Mozambique and Lesotho.

Sites Visited: Lesotho: National University of Lesotho, Roma; Growing Nations, Maphutseng; Johannesburg, South Africa; CIMMYT Headquarters, Harare, Zimbabwe; Chimoio, Gorongosa, Sussundenga, Nhamatiquite, Buzi, Nhamatanda, Barwe and Gondola, Mozambique

Description of Activities

Meetings were held with our partners in Lesotho to review the results of a series of ongoing on-farm maize yield trials and on-farm conservation agriculture demonstrations in Lesotho.

Meetings were also held with colleagues at the National University of Lesotho and partners from the non-governmental organization Growing Nations. Planning meetings occurred to discuss the approaches and methodologies to be used during the five-year project.

One objective of the SANREM CRSP is to document changes in soil carbon (C) over this five-year project on conservation agriculture. Due to this short timeline and published results on the relatively slow changes in soil C following initiation of no-till management systems, we have chosen to work with Bowen's Ratio as a means to quantify C flux in the agricultural systems we are using in Lesotho. During this trip we set up a second BR unit on soils with a long history of plowing to contrast soils nearby that had not been tilled for nearly three decades.

The University of Tennessee team attended a three-day regional workshop on conservation agriculture sponsored by the FAO, in Johannesburg, South Africa. Conservation agriculture (CA) demonstration sites managed by CIMMYT, local Extension officers and other NGOs were visited in Zimbabwe and Mozambique. These sites are demonstrating a number of CA technologies (direct seeding, improved varieties, herbicides, fertilizer, residue cover and rotations).

Regional Conservation Agriculture Symposium, Johannesburg, South Africa. 8-10 February 2011

This symposium was hosted by the Food and Agriculture Organization of the United Nations (FAO), The Food, Agriculture and Natural Resources Policy Analysis Network (FANRPAN) Conservation Tillage Network (ACT) and the African Union Partnership for Africa's Development (NEPAD).

The symposium objectives were:

1. To share and document information on the social and economic impacts of Conservation Agriculture technologies in the region;
2. To share and document experiences on Conservation Agriculture scale up approaches and impacts
3. To identify key areas for research and development and explore institutional and policy innovations for Conservation Agriculture scale up.

The Symposium brought together over 130 participants as follows: government representatives from nine countries (Angola, Lesotho, Madagascar, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe), the Southern Africa Confederation of Agriculture Unions (SACAU), three national farmer organizations (CFU- Zambia, KZN- No Till Club, National Farmers Union of South Africa), eight NGOs (CARE, CRS, CHOPPA, GRM, RESCOPE, Peace Parks Foundation, KATC), 11 Research Organizations (ICRAF, CIMMYT, ICRISAT, CIAT, ARC-South Africa, Institute for Poverty, Land & Agrarian Studies-South Africa, Department of Research-Zimbabwe), 14 Universities and agricultural colleges from nine countries (Botswana, Namibia, Netherlands, Norway, Swaziland, South Africa, USA, Zambia, Zimbabwe), USAID/OFDA, Royal Norwegian Government, FAO, ACT, FANRPAN, COMESA and NEPAD.

Main outcomes

1. There was agreement that there is a critical need for action to scale up CA in the region as CA can contribute to food security, poverty alleviation and environmental sustainability.
2. The up-scaling of CA needs to be led and driven by farmers and farmer's needs. It was noted that no subsistence farmers attended the conference
3. It was agreed that CA should take a broader integrated systems approach to be more relevant to farmers.
4. Increased emphasis on capacity building and training with a focus on farmers, extension and other change agents necessary for effective up-scaling.
5. CA up-scaling requires on-farm, participatory action research for adaptation to farmer's needs.

6. Public-private partnerships and efficient value chains are necessary to achieve CA scaling up.
7. CA practitioners and stakeholders must engage in coordination and information sharing platforms and networks to ensure effective support to CA scaling up.
8. Governments should be encouraged to develop and implement policies that support the up-scaling of CA.

A poster presentation “Developing Sustainable Subsistence Smallholder Conservation Agriculture Systems in Lesotho” Neal Eash, Forbes Walker, Dayton Lambert, Michael Wilcox, Mokoala Marake and Patrick Wall was presented by the University of Tennessee / SANREM team at the symposium.

Monitoring Carbon Dynamics in CA Systems

As part of the SANREM CRSP we are mandated to monitor C sequestration potential of CA systems. Since changes to soil C happen slowly it would be rare to see any differences to soil total organic C within the five year project duration. For the Lesotho and Mozambique project we have opted to explore quantifying C sequestration by monitoring several parameters used to calculate Bowen's Ratio, a micrometeorological method effect that for finding minor meteorological changes on a daily basis. This process measures temperature, photosynthetically active radiation, soil T, soil heat flux, relative humidity, carbon dioxide concentrations, soil moisture, and wind speed.

Wendy Bruns, a graduate student from the University of Tennessee was in Lesotho from late November and until late February to collect data from the unit as well as monitor crop growth development. Crops at Maphutseng are quite stunning compared to other fields across Lesotho. We anticipate that due to the excessive rainfall during the growing season (rainfall in excess of the annual rainfall occurred in just December and January) that the national yields will be greatly reduced resulting in an extended period of short food supply in the rural areas. We noted continued weed suppression in cover crop research plots even after the mineralization of leguminous biomass.

CIMMYT Conservation Agriculture (CA) Demonstrations, Zimbabwe- Feb 11th 2011

En route to Mozambique, the University of Tennessee team visited the CIMMYT regional offices and the CA on-farm demonstration sites in and around Shawva and Madziwa.

CIMMYT Conservation Agriculture (CA) Demonstrations, Mozambique- Feb 13th to 18th, 2011

CIMMYT has a number of on-farm CA demonstrations at sites across central Mozambique. These demonstration sites have been going on for up to four years depending on the source of funding donor. In most cases the demonstrations are comparing farmer practice (tillage, local maize varieties, hand weeding, and no fertilizer) with a combination of improved conservation agriculture technologies:

1. Direct seeding by using potholes, jab-planter (*‘matracca’*), dibble stick, or animal traction no-till drills
2. Improved CIMMYT selected maize varieties
3. Crop rotations or intercropping with cowpeas or pigeonpea as legumes

4. Use of fertilizer (200kg per hectare of 12: 24: 12 as a starter fertilizer, followed by 100 kg of urea)
5. Use of herbicides
6. Residue covers

Spacing is typically on a 90 cm x 50 cm rate with two seeds per planting station.

Funding sources for these demonstrations include:

- IFAD. This project has been going on for four years and will be renewed in 2011.
- SIMLESA (Sustainable intensification of maize-legume cropping systems) project.
- SANREM. The objective of these demonstrations is to demonstrate CAS systems, their gender impact, local and regional supply and market networks drought tolerant varieties in a region that is prone to drought and less reliable rainfall.

Over the course of the week in Mozambique we visited sites in the coastal plain (Buzi) as well as sites north, south, east and west around Chimoio. Sites were visited in Gorongoza (SIMLESA and IFAD funded demos), Sussundenga, Nhamatiquite, Buzi, Nhamatanda, Barwe and Gondola. At each location there were 5 to 6 demonstrations per community under different levels of management and supervision!

Due to the contrasting soil types in the areas we visited, we observed the obvious in that there is no recipe for CA due to the variability in soils. In some areas direct seeding was preferred; in others the dibble stick worked best whereas in other areas the jab planter was the implement of choice. Farmers—both men and women—stated that in heavy clay soils many planters would gum up due to the stickiness of the soil. Where the soil texture was lighter there was more diversity of opinion as to which implement worked best. Farmers also found chemical weed control useful and labor saving compared to labor intensive hand weeding.

At some sites maintaining a residue cover was difficult due to termite activity. Response to fertilizer depended very much on the inherent soil fertility as well as the time since the land was cleared from the native *miombo* woodland. At some sites the CIMMYT varieties with a high yield potential did not appear to be performing as well as the open pollinated variety Matuba. This is possibly due to the relatively low rates of nitrogen being applied to the crop (equivalent to only 100kg urea per hectare).

Striga, a parasitic weed was observed at several sites and it too was affecting the results of some of the technologies being demonstrated. At other sites there were shading and other effects (such as leaf litter) were observed from trees that were either adjacent, or in some cases inside the plots.

Recruitment of Graduate Students, Mozambique

Discussions were held with Dr. Rafael Massinga, Director General of the Instituto Superior Politencnico de Manica (ISPM) regarding identifying potential candidates for graduate studies at the University of Tennessee. Several names were suggested:

- Nascimento Nhantumbo for a PhD in Soil Fertility / Crop Management
- Jose Chambo for a MS in Agricultural Economics
- Ivan Cuvaca for a MS in crop management

Both Mr. Nhantumbo and Mr. Cuvaca had accompanied the group on the field tours so we were able to discuss the opportunities further. Both are planning to submit applications to the University of Tennessee graduate school in the near future. We also carried transcripts and an application packet for Mr. Mpheshea Molefi, a Lesotho national who has passed the TOEFL exam and will likely start at UT in August 2011 once his completed application has been approved.

Collaboration

Jaap Knot: Mr. Knot recently enrolled as a PhD candidate at UFS. His research work will focus on the adoption of conservation agriculture in Lesotho. He currently works part-time for Growing Nations overseeing some of their efforts in Tebellow. Mr. Knot's research is focused on the water balance of cover crops in historic fallow systems.

Suggestions and Recommendations

1. The work of monitoring carbon data was continued at Maphutseng by Wendy Bruns who was in Lesotho from late November to February. Another Bowen ratio unit was brought out to Maphutseng on this trip to enable side by side comparisons of carbon emissions from tilled and untilled fields.
2. Dr. Marake will be overseeing the establishment of this seasons' research and on-farm trials.
3. Further consultations are need with NGOs, Extension, CIMMYT and other partners in Mozambique on how to best complement their on-going research and outreach activities

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