CONSERVATION AGRICULTURE (1 April 2012 to 30 September 2012)

DETAILS

PROJECT NUMBER		M106/11
PROJECT TITLE		Evaluation of conservation agriculture principles on two soil types on the Highveld
PROJECT MANAGER		AA Nel
CO-WORKER(S)	Internal	W Deale, SC Swanepoel, SB Mahlatsi, MA Mohutsiwa, PR Mogotlwane, M Mosiane, PS Hadebe
	External	North-West University
PROJECT STATUS		Continue
DURATION		01/04/2008 to 31/03/2017

ACTIONS TAKEN TO DATE

The aim of this project is to compare existing conventional cultivation practices for maize, with maize produced under the different principles of conservation agriculture (CA) viz. minimum soil disturbance, crop rotation and a permanent soil cover. The first season served to start creating conditions of conservation agriculture namely a soil cover, a rotational effect and to prepare the soil for no-till conditions from the second season onwards. The fourth growing season was completed and actions taken during the past six months were maintenance such as rodent and weed control, harvesting of all crops, measurement of yields, soil sampling and analyses of all samples. Talks were given to Namibian farmers during two field visits. Two radio talks (RSG Landbou) were broadcasted and a pamphlet on conservation agriculture was written and distributed during the NAMPO harvest days where numerous informal discussions with interested farmers were held. Two popular articles were published in GrainSA.

PROGRESS MADE

Successful collection of data and maintenance of the two field trials for four seasons was achieved as intended. Collaboration of all participating research and technical personnel as well as service providers was successful.

RESULTS ACHIEVED TO DATE

On the loamy sand soil at Buffelsvallei for the 2011/12 season, similar yields were found for conventionally cultivated maize and of maize grown under CA practices with a legume as part of the rotation system. However, with sunflower as rotational crop, the yield of the following maize was 15% lower than that of maize grown in monoculture with minimum soil disturbance. On the sandy soil at Erfdeel, a large response to crop rotation was found. The yield of maize grown was 45 % (2062 kg ha^{-1}) higher than that of maize grown in monoculture. Three out of four conventionally produced maize samples graded WM1 at Buffelsvallei while 19 out of 20 of the CA produced maize grade WM1. Milling indexes for the rotated maize were also higher than that of the monocultured maize. At Erfdeel however, grading and other quality parameters were unaffected by treatments in 2011/12. From the limited amount of results available from three seasons, it appears that the yield and quality of maize grown in conservation agriculture on these two soil types are equal or better than that of maize grown in conventional systems, with the exception where sunflower is the preceding crop for maize. Sunflower can suppress the yield of a following maize crop in some seasons.

PROBLEMS ENCOUNTERED

Severe drought occurred at Buffelsvallei, almost destroying crops. Despite three attempts at replanting the sunflower crop could not be established due to this drought.

DETAILS

PROJECT NUMBER		M106/12
PROJECT TITLE		Evaluation of soil microbial dynamics under conventional and conservation maize-production systems
PROJECT MANAGER		OHJ Rhode
CO-WORKER(S)	Internal	AA Nel, W Deale, C van Coller, CCM Abrams, KN Ntidi, L Bronkhorst, R Jantjies, SS Kwena
	External	North-West University, Rhodes University
PROJECT STATUS		Continue
DURATION		01/10/2008 to 31/03/2017

ACTIONS TAKEN TO DATE

All intended microbiological laboratory procedures were completed on soil samples from maize treatments that were taken during the 2011/12 season. Various chemical and microbiological analyses were completed successfully except for microbial metabolic profiling.

PROGRESS MADE

During the 2011/12 growing season soil samples from both conservation agriculture (CA) field trials, *viz.* Buffelsvallei and Ditsem (Erfdeel) were collected. Only soil samples collected from the maize crop treatments were subjected to various chemical and microbiological analyses. Microbiological data collected included enumeration of selected soil microbes *viz.*, actinomycete and bacterial as well as fungal plate counts. Microbial activities in the soil samples were also determined by means of microbial enzymes that included β-glucosidase and urease activities as well as levels of glomalin activity in the soil. Glomalin is a carbon-containing compound that can provide an indication of mychorrizal status and of carbon in the soil. Microbial abundance and shifts in microbial community composition due to various CA practices was also studied using a molecular technique namely denaturing gradient gel electrophoresis (DGGE). DGGE was applied to the various soil samples collected from the maize treatments.

RESULTS ACHIEVED TO DATE

Contrary to results obtained during the third season (2010/11), bacterial counts in the soil at the Buffelsvallei trial differed significantly between treatments in the 0-5cm layer. In this layer bacterial activities were significantly higher in the two-year system of maize in rotation with cowpea and sunflower with minimum soil disturbance. Likewise, the bacterial activities showed no difference between treatments in the 5 - 15 and 15 - 30 cm soil depths. Compared to the third season, actinomycete levels did not differ significantly between maize treatments at lower soil depths (15 - 30 cm). Similarly, total fungal counts were not significantly different between treatments and depths.

In general, β-glucosidase and urease activities at Buffelsvallei were not significantly different between treatments. As compared to the third season a similar trend was observed between β-glucosidase levels and soil depths. β-glucosidase levels were highest in the top soil (0 - 5 cm) whilst lowest in the lower depths (5 - 15 and 15 - 30 cm). However, urease activity levels in the topsoil (0 - 5 cm) were significantly higher between the three-year system of maize in rotation with cowpea/sunflower and babala with minimal soil disturbance. In the case of glomalin levels no difference between treatments and depths were detected.

The trial at Erfdeel showed no significant differences between treatments in the 0 - 5 cm soil layer for actinomycetes, bacterial and fungal counts as well as for enzyme activities. A similar situation applied in the 5 - 15 cm and 15 - 30 cm soil layer between treatments. Although not significant, fungal counts were higher in the 15 - 30 cm layer between the CA and maize monoculture treatments.

Denaturing Gradient Gel Electrophoresis (DGGE) analysis showed similar DNA banding profiles between treatments and depths at Erfdeel. On the other hand DGGE profiles showed microbial community shifts between the cropping systems with a higher bacterial diversity in CA treatments at the Buffelsvallei trial. Initial indications are that changes occurred at microbial community level with different structural diversity when switching from conventional agricultural to CA practices.

This report does not include nematode investigations but will be discussed more comprehensively by the North-West University report that will follow.

PROBLEMS ENCOUNTERED

Late delivery for Biolog Eco plates for metabolic characterization was delayed. Hence analyses are still on-going.

DETAILS

PROJECT NUMBER		M106/13
PROJECT TITLE		Comparison of insect complexes in conservation and conventional tillage systems
PROJECT MANAGER		A Erasmus
CO-WORKER(S)	Internal	AA Nel, W Deale, JBJ van Rensburg, J Truter, UM du Plessis, SF Grobler, SH Nthangeni
	External	Farmers, North-West University
PROJECT STATUS		Continue
DURATION		01/10/2008 to 31/03/201**7**

ACTIONS TAKEN TO DATE

Field evaluations continued monthly at each site until April. The four well-established conservation agriculture farms with conventional tillage were monitored by pitfall traps and scouting. Monitoring also continued until April in the two agronomy trails (M106/11). Evaluations with pitfall traps stopped as soon as harvesting took place. During winter preparations were made for the new growing season including building of new pitfall traps. Several potential laboratory experiments will be identified from observations and assessments, which will be conducted if sufficient material and resources are available. Analysis of data of the previous growing season was done. A scientific article was published in African Entomology: Erasmus, A. 2012. First report of *Classeya tenuistriga* (Hampson) (Lepidoptera: Crambidae) as a pest of maize seedlings. African Entomology 20(1): 195 – 197. Pamphlets were compiled which were used at NAMPO addressing conservation farming from an entomological point of view. A presentation was prepared which was presented by a co-worker, 6 – 10 August, Kgigali, Rwanda, titled: Comparison of insect complexes in conservation and conventional tillage systems. One popular publication was published in SA Grain (titled: 'n Nuwe mielisaailing insek plaag gerapporteer) and a radio talk was presented 5 September on RSG to inform farmers about this new pest.

PROGRESS MADE

All actions proceeded as planned.

RESULTS ACHIEVED TO DATE

Reports of localised outbreaks of an unknown pest were received in the Mooi River area, KwaZulu-Natal and the species was identified as *Classeya tenuistriga* (Hampson) (Lepidoptera: Crambidae). Fully grown larvae are between 10 and 15 mm long. Larvae curl up tightly when disturbed. Larvae develop into pupae inside pupal cells in the soil. Moths are typical of the Crambidae. The larvae emerge from soil during the night and sever seedlings at or just below soil surface level. Neat round holes (2-3 mm in diameter) are chewed into seedling stems. The damage can therefore not be mistaken for that of beetles or white grubs of which the feeding holes have frayed edges. Above ground symptoms are initial wilting of the central whorl leaf ("dead heart") which is followed by wilting of the entire plant. Stand loss can result in replanting. Affected fields in the outbreak area were non-Bt maize refuges for field planted with Bt maize. This afforded the opportunity to assess the impact of *C. tenuistriga* on genetically modified Bt maize, expressing Cry1Ab protein on Bt and non-Bt maize. Damage differed significantly between the Bt- and non-Bt maize seedlings with less damage recorded in the Bt field (0.7%) compared to the non-Bt refuge area (22.5%).

Agricultural soils under conservation systems will be cooler and wetter during spring and summer and will be warmer and wetter during autumn and winter compared to soils under conventional tillage. In terms of crop protection conservation systems thus provide a different habitat from conventional systems for attracting and supporting pests that can attack or interfere with the growth and yield of crops. Up to date *C. tenuistirga* was the only insect pest recorded. Insect pest management in CA systems will remain complex because of the lack of knowledge about the different environments CA will provide under various soils and conditions. Pest management will need careful planning and monitoring in order to ensure that farmers are not taken by surprise during any given season. The three basic principles of CA must always be kept in mind when pest management is being planned for a specific growing season. What is certain at this stage is that CA will definitely provide wider biodiversity and more stable ecosystems in agriculture, contributing to the conservation of our soils to produce food sustainably for future generations. Data from the past season are being analyzed.

PROBLEMS ENCOUNTERED

None.

DETAILS

PROJECT NUMBER	M106/14
PROJECT TITLE	Evaluation of integrated weed management practices in conservation agriculture on the Highveld
PROJECT MANAGER	E Hugo
CO-WORKER(S) Internal	MM van der Walt, W Deal, S Tsamai, KE Ramatseng, KA Nkasha, PR Mogotlwane, RT Nkasha
External	None
PROJECT STATUS	Continue
DURATION	01/10/2008 to 31/03/2012

ACTIONS TAKEN TO DATE

During the April to September 2012 time-frame, the following actions were taken:

Coordination and planning

- Annual meeting attended with ARC-CA Work Group to assist in project planning for forthcoming season (13 August 2012).
- Reported on data taken at two localities (Buffelsvallei and Ditsem).

Field trial activities

- Trials were harvested.

PROGRESS MADE

- No new species occurred at any of the trial sites.
- Successful collaboration of all participating research and technical personnel.

RESULTS ACHIEVED TO DATE

- Herbicide spray programs were discussed to enhance control of *Commelina benghalensis*
- No shift in weed species occurrence could be observed other than increased number of Wandering Jew (*Commelina benghalensis)*
- Winter weed species such as Starvation senecio (*Scenecia consanquineus*) and Mexican poppy (*Argemone ochroleuca*) were significantly less at both Buffelsvallei and Ditsem trial sites this year.

PROBLEMS ENCOUNTERED

No problems were encountered with weed surveys.

DETAILS

PROJECT NUMBER		M106/15
PROJECT TITLE		Impact of conservation agriculture practices on crown and root rot of maize
PROJECT MANAGER		M Craven
CO-WORKERS	Internal	AA Nel, Vacant (Research Technician)
	External	None
PROJECT STATUS		Continue
DURATION		01/10/2008 to 31/03/2012

ACTIONS TAKEN TO DATE

Two conservation agriculture (CA) trials were planted by the M106/11 project managers near Klerksdorp (Buffelsvallei farm) and Viljoenskroon (Erfdeel farm). These were monitored as part of the impact study of conservation agricultural practices on crown and root rot of maize. During October 2011 to March 2012, the trials were sampled 21, 70 and 100 days after planting and screened for root and crown rot development. Root and crown rot pieces were plated out to five different agar media after which fungal growth were re-isolated to split plates for identification purposes. Fungal identifications were finalised, data captured and statistical analysis conducted. As stalk rot was observed at the 3rd sampling date (100 days after planting) at the Buffelsvallei trial, stalk tissue was also plated out, and re-isolated to split-plates for identification purposes.

PROGRESS MADE

Approximately 18 000 data points were captured for the two trials combined and statistical analysis conducted. Statistical analysis involving split plot analysis as well as Canonical Variate Analysis (CVA) was used to interpret the generated data.

RESULTS ACHIEVED TO DATE

Erfdeel trial (sandy soils)

The Erfdeel trial consisted of four treatments:

1) TMT 1 - Mono-cropped maize under conventional tillage.
2) TMT 2 - Mono-cropped maize under minimum soil disturbance.
3) TMT 3.1 CP - A two-year system of maize in rotation with cowpea under minimum soil disturbance.
4) TMT 4.1 CP - A three-year Cowpea/maize/pearl millet rotation system under minimum soil disturbance.

Statistical analysis indicated that a significant higher biomass was observed for both TMT 3.1CP and TMT 4.1 CP compared to the remaining two treatments (TMT 1 and TMT 2), whilst no significant difference could be observed for root and crown rot severity. *F. verticillioides* frequencies were significantly reduced by both TMT 3.1 CP and 4.1 CP, but no correlation could be made between the frequency level of this particular fungus within the roots and the eventual biomass obtained. A negative correlation could, however, be made between the frequencies of *F. verticillioides* as well as *F. graminearum* within the crowns and the biomass obtained. Early on in the season, *F. semitectum* was higher in both the CP treatments, whilst lower frequencies of *Trichoderma* spp. were observed in these two treatments.

Fungal frequencies measured in the roots with the 3rd sampling date that correlated negatively with the yield obtained at Erfdeel were *F. oxysporum, F. subglutinans, Neocosmospora vasinfecta* as well as *Phoma* spp. Similar analysis for the crowns indicated that *Aspergillus* spp., *F. graminearum* as well as *F. verticillioides* correlated negatively with yield.

Buffelsvallei trial (loamy sand)

Six treatments were investigated:

1) TMT 1 - Mono-cropped maize under conventional tillage.
2) TMT 2 - Mono-cropped maize under minimum soil disturbance.
3) TMT 3.1 CP - A two-year system of maize in rotation with cowpea under minimum soil disturbance
4) TMT 3.1 SF - A two-year system of maize in rotation with sunflower under minimum soil disturbance
5) TMT 4.1 CP - A three-year cowpea/maize/pearl millet rotation system under minimum soil disturbance.
6) TMT 4.1 SF - A three-year sunflower/maize/pearl millet rotation system under minimum soil disturbance

Drier conditions during the second half of the season resulted in significantly lower biomass being measured compared to the previous two seasons (2009/10 and 2010/11). Under these conditions TMT 4.1 CP resulted in significantly higher biomass 100 days after planting. The only fungus that correlated negatively with biomass at the 3rd sampling date was *Macrophomina phaseolina* (Charcoal rot pathogen) as observed in the crowns. Both root and crown rot severities were, however, low. TMT 2 yielded significantly higher root rot at the 3rd sampling date, with both TMT 3.1SF and TMT 4.1.SF resulting in the lowest root rot severities. *F. oxysporum* correlated negatively with root rot severity at this sampling date.

Stalk rot was observed for the first time during the commencement of the project. Significantly higher stalk rot was observed with the monoculture maize treatments. *Diplodia* spp. as well as *F. graminearum* was most frequently isolated from the stalk material. When the frequency of fungi as isolated from the roots were correlated with the % plants that demonstrated signs of wilting within the plots, positive correlations were obtained with *Rhizoctonia* spp, *M. phaseolina* as well as *Diplodia* spp (3rd sampling date). When the same analysis was conducted for fungi that were isolated from the crowns, *F. verticillioides* and *M. phaseolina* correlated positively.

CVA graphs were generated separately for roots and crowns at the various sampling dates. From the graphs the conclusion was made that there was no consistent reaction in fungal frequencies due to the treatment effect. This finding is consistent with that of international literature (Smit and Van Rensburg,1997) indicating that the effect of crop rotation on isolates of maize root fungi appear to be complex and that the isolated fungi were affected differently by various rotation systems under conventional agricultural practices, implying that no single cropping system favours all fungi. It can be concluded that crop rotation might have a long-term effect on soil fungus populations that may only become evident after a longer period.

PROBLEMS ENCOUNTERED

None.

DETAILS

PROJECT NUMBER		M106/16
PROJECT TITLE		Response of maize to variance in plant population under different tillage practices
PROJECT MANAGER		TC Baloyi
CO-WORKER(S)	Internal	MD Thobakgale, RR Ditse, RJ Nthoba, CS Seutlwadi, AA Nel, TJ Nkutha, PM Nhlapo
	External	Farmers
PROJECT STATUS		Continue
DURATION		01/04/2011 to 31/03/2014

ACTION TAKEN TO DATE

Trials were harvested successfully at all localities namely, Boskop, Poortjie and Ventersdorp. The trial at Koppies could not be harvested as it was terminated before the harvesting period due to animal damage.

PROGRESS MADE

Two successful farmer days were held at Poortjie and Venterdorp and was attended by most farmers and extension officers in the respective regions. Majority of the farmers acknowledged technological disciplines of the project transferred during these farmer days. Relevant data of plant emergence as well as grain yield and yield components at harvest was recorded.

RESULTS ACHIEVED TO DATE

The main effect of tillage and row width as well as their interactions did not have a significant influence on the percentage of emerged plants. Significantly higher percentage of emerged plants was obtained with the lowest plant density (10 000 plant ha^{-1}) than at the highest plant density (40 000 plant ha^{-1}). The relationship of row width and plant density had a significant influence on mean emergence dates (MED). The MED of the lowest plant density (10 000 plants ha^{-1}) in either narrower rows (0.9m) or wider rows (1.5m) were significantly shorter compared to all the other plant densities. For both row widths, MED was significantly longer at the highest plant density (40 000 plants ha^{-1}), except with the plant density of 30 000 plants ha^{-1} when planted in wider rows. The interaction effect of locality x row width x density was significant on MED. The MED obtained with the highest plant density (40 000 plant ha^{-1}) in narrower rows at Boskop and Poortjie was significantly longer than all the other plant densities. However, the lowest plant density in wider rows showed significantly lower MED at Poortjie and Ventersdorp compared to all other plant densities.

The main effect of tillage resulted in no significant effect on grain yield and yield components measured. However, the effect of row width and plant density was significant on grain and stover yield. The interaction effect of density x locality as well as tillage x row width x locality was significant on maize grain yield. Plots planted at 20 000 plant ha^{-1} gave mean grain yield of 3173 kg ha^{-1} which was significantly higher than at 10 000 plants ha^{-1} (2057 kg ha^{-1}). However, grain yield at this lowest plant density was statistically comparable to that at 30 and 40 000 plants ha^{-1}. Maize stover yield at the lowest plant density (10 000 plants ha^{-1}) was significantly reduced compared to all the other plant densities. Mean stover yield ranged from 1156 to 1797 kg ha^{-1} across the plant densities. The response of grain and stover yield parameters followed the similar trend, being generally higher in all cases at Poortjie and lower at Boskop. The consistent reduced grain and yield components at Boskop could probably be attributed to the early frost during milk dough stage which could have hampered efficient cob and grain filling process.

PROBLEMS ENCOUNTERED

No major constraint encountered across the localities, except that the trial at Koppies was not harvested due to animal damage.

DETAILS

PROJECT NUMBER		M106/17
PROJECT TITLE		Evaluating the effects of chemical fertiliser types on soil microbial community structure in maize production
PROJECT MANAGER		OHJ Rhode
CO-WORKER(S)	Internal	AA Nel, W Deale, C van Coller, CCM Abrams, MA Mohutsiwa
	External	North-West University, Rhodes University
PROJECT STATUS		Continue
DURATION		01/4/2012 to 31/03/2015

ACTIONS TAKEN TO DATE

This project is a new project evaluating the effects of chemical fertiliser on soil microbial structure in maize production. Potting soil has been identified for the coming growing season's trial. All laboratory protocols have been prepared for the new trial.

PROGRESS MADE

Very little experimental work has been done. Most efforts went into planning and preparations for the trial.

RESULTS ACHIEVED TO DATE

So far data collection has been done to a limited extent and results for first season's results will only be presented in the next report.

PROBLEMS ENCOUNTERED

Except for the procurement of specialised chemicals, no serious problems have been encountered.

DETAILS

PROJECT NUMBER		M106/81
PROJECT TITLE		Evaluation of conservation agriculture as an alternative to conventional production methods as applied by a selected group of land reform beneficiaries in Mpumalanga
PROJECT MANAGER		APN du Toit
CO-WORKER(S)	Internal	AA Nel, EA Nemadodzi, VL Thaphathi and E Motitimi
	External	L Nchabeleng (DAFF - Dipaleseng Municipality, Mpumalanga) J van Biljon (ARC-IAE) and G Paterson (ARC-ISCW)
PROJECT STATUS		Continue
DURATION		01/04/2012 to 31/03/2017

ACTIONS TAKEN TO DATE

- **Meeting to establish a partnership with the Department of Agriculture: Mpumalanga**
  A meeting between ARC-GCI and the local staff of the PDA was held on the 1st of August at the Office of Extension Services in Balfour. This took place after correspondence with the District manager Mr. George Xaba which started on 26 June 2012.
- **Meeting with farmers**
  The first meeting with the farmer group took place on 14 August 2012. The purpose was to present the project to the farmers and to introduce them to the concept of conservation agriculture (CA as an alternative to the conventional method). The event was attended by 23 farmers. A baseline study was also introduced to the farmers by means of a questionnaire.
- **Planning meeting and identification of on-farm experimental plots**
  The purpose was to discuss the details of the project with the farmers and to negotiate the terms for the planting of on-farm experiments. The meeting was held on 29 August 2012. The six farmers who volunteered to provide land for on-farm experiments were accompanied to their respective field sites. Three sites were then selected and soil samples were taken on 12 September 2012.
- **Information day**
  On Wednesday, 19 September 2012 an information day aimed at the target group was presented. The event was attended by 19 farmers. Based on previously determined information needs of the target group, the following crop production related topics were addressed at the event:
  a) Foundations of the fertilization programme
  b) Cultivar selection
  c) Effective weed control

PROGRESS MADE

- The partnership established was an important step to start the project at the right footing. Specific support and commitment to the project was given by the Manager at the office i.e. Me. Lethabo Mashamaiti.
- Interaction with farmers and sharing of information. It became clear from the start that farmers are in dire need of information and support. The interaction with farmers also helped to determine their knowledge levels.

RESULTS ACHIEVED TO DATE

New project - no results available.

PROBLEMS ENCOUNTERED

- Complex nature of land reform projects and bureaucratic restraints.
- Farmers were not eager (skeptical) to provide information requested for the baseline study. This will be followed up to make sure that farmers are cooperating.

BIANNUAL REPORT (ARC-ISCW)

DETAILS

PROJECT NUMBER		59/010/02
PROJECT TITLE		Quantifying the effects of conservation agriculture (CA) practices on soil and plant properties
PROJECT MANAGER		CM Swanepoel
CO-WORKER(S)	Internal	DJ Beukes, TP Fyfield, MV Kidson, R Mampana
	External	J Habig, S Koch, M Marais, WM Sekgota, A Swart, G Trytsman
PROJECT STATUS		Continue
DURATION		01/04/2007 to 31/03/2012 (requested for project to be extended until 2014)

ACTIONS TAKEN TO DATE

During the above mentioned time-frame, the following actions were taken:

- Harvest maize (April 2012);
- Soil water measurements, both from capacitance probes and neutron water meter (continuous);
- Soil samples taken to determine gravimetric soil water content (April 2012);
- Calibrate capacitance probes and neutron water meter for soil water content;
- Soil samples taken for aggregate stability (August 2012);
- Determine biomass from delayed intercrops (August 2012);
- Compiling results, and submit data to biometry division for statistical analyses (April - August 2012);
- Planning and preparation for forthcoming planting season.

PROGRESS MADE

- Successful completion of 2011/2012 growing season;
- Successfully collected, analysed and interpreted data from the research trial;
- Successful collaboration of all participating research and technical personnel;
- Purchase of seed and fertilizer for season 2012/2013;
- Calibration of capacitance probes and neutron water meter completed;

RESULTS ACHIEVED TO DATE

- Average yield results for maize grain were as follows: conventional tillage = 2.931 ton/ha and reduced tillage = 1.826 ton/ha;
- Grain yields from the maize monoculture treatment and maize/oats intercrop were lowest at 1.968 and 1.915 ton/ha respectively compared to the maize yield from maize/cowpea intercropping and maize/grazing vetch treatment that was the highest at 2.827 and 2.805 ton/ha respectively. Statistical analyses indicate significant difference between the lowest yields (maize mono and maize/oats) and highest yields (maize/cowpea and maize/vetch intercropping).
- Soil water content results showed that the average soil water content was higher under reduced tillage, than under conventional tillage.
- Complete results are discussed in the progress report (Report No: GW/A/2012/33), available at the ARC-ISCW.

PROBLEMS ENCOUNTERED

- Maize yields were negatively affected by low seasonal rainfall;
- Poor intercrop performance, especially soybean, but also oats and grazing vetch, mainly as a result of poor rainfall distribution,
- Failure of some capacitance probes during logging of soil water content;