

# CONSERVATION AGRICULTURE BIENNIAL REPORT 2020/21 (1 April 2020 to 30 September 2020)

## DETAILS

PROJECT NUMBER	P05000011 (102160)
PROJECT TITLE	Promotion of conservation agriculture (CA) among selected farmer groups in the North West province
PROJECT MANAGER	APN du Toit
CO-WORKER(S)	Internal EA Nematodzi, MM Kola, TA Masiha External North-West Department of Agriculture, Land Care Unit, ARC-Institute for Agricultural Engineering (IAE), Grain SA, NWK Development Programme
PROJECT STATUS	Continue
DURATION	01/04/2017 to 31/03/2020

## ACTIONS TAKEN TO DATE

The first harvesting activities started on 13 May when cowpea was harvested at Lareystryd. At the two experimental plots at Brooksby and Lareystryd, all crops were harvested by 12 June 2020. Maize and sunflower had to be dried in the ovens at GC. On 15 July the threshing process started. All crops were threshed, weighed and the data were processed.

On the 23<sup>rd</sup> of September, co-worker farmers at the respective experimental plots were visited and preliminary arrangements for the coming season were made.

## PROGRESS MADE

The most significant progress made in the project is the increased level of interest and enthusiasm for the change required towards CA among the two study groups established in 2019 as reported. The invitation extended by the Ottosdal No-till club made a significant contribution to spark the enthusiasm among the study group members. On 12 March 2020, a special visit by the invited farmer groups (40 farmers), had a significant impact on the farmers in general. Although rain interfered with the planned visit to the experimental plots of the Ottosdal Club, a loaded and significant program organized by the Ottosdal Club contributed to stimulate the visitors and convinced the visitors greatly towards the first steps needed to change to CA. Most importantly, is the great stride made to build the long desired bridge between the commercial CA practitioners and the developing farmers participating in the project. For this, the Ottosdal No-till club should get all the credit.

## RESULTS ACHIEVED TO DATE

The following trial results at the respective experimental plots can be reported:

### Crop yields for 2019/20 at the Brooksby experimental plot:

Table 1: Estimated yield of replicated maize blocks at Brooksby

Maize yield - Estimated				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	4.62	5 088	4 633	0.52
Rep 2	4.23	4 660	6 410	0.42
Rep 3	0	(4 881)	5 494	-
Mean	4.42	4 874	5 512	0.47

Note: Due to theft, the maize yield at Brooksby had to be estimated, as more than 95% of the crop was removed. The estimation was based on the cob weights of the limited number of cobs left in small patches of replications one and two. In addition, the harvest index (H.I) and the homogeneous plant density of 22 500 plants per hectare could help to support the estimated figures.

**Table 2: Yield and Harvest Index of sunflower at Brooksby**

Sunflower yield				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	8.37	1 151	2 129	0.35
Rep 2	9.25	1 271	2 019	0.38
Rep 3	5.83	801	1 840	0.30
<b>Mean</b>	<b>7.81</b>	<b>1 074</b>	<b>1996</b>	<b>0.34</b>

**Table 3: Yield and Harvest Index of soybeans at Brooksby.**

Soybean yield				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	5.95	654	2 109	0.24
Rep 2	6.91	737	2 824	0.21
Rep 3	8.26	908	2 945	0.24
<b>Mean</b>	<b>7.04</b>	<b>766</b>	<b>2 626</b>	<b>0.23</b>

Notes:

- The poor performance of the soybeans at Brooksby is mainly the result of the poor response on the inoculation with Rhizobia bacteria, the resultant lack of atmospheric nitrogen fixation and the late application of LAN (28).
- No grain yield could be harvested from the cowpea blocks at Brooksby. The crop was well established and developed well throughout the early stages. However, during the flowering and pod formation stages, no proper reproduction took place. A plant disease is expected but no identification was made and unfortunately, no measures were taken to protect the crop.

**Crop yields for 2019/20 obtained after a cover crop season 2018/19 at Lareystryd**

**Table 4: Yield and Harvest Index of maize at Lareystryd.**

Maize yield				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	26.00	4 762	10 989	0.30
Rep 2	34.20	6 263	8 608	0.42
Rep 3	28.30	5 163	7 692	0.40
<b>Mean</b>	<b>29.50</b>	<b>5 402</b>	<b>9 096</b>	<b>0.37</b>

Note: In view of the late planting date, the relative good yield of the maize crop at Lareystryd can be attributed to the following: a), the good rainfall during the entire season, b), homogeneous plant density of 22 300 plants per hectare and the relative high levels of inorganic N e.g. 22.86 mg/kg NH<sub>4</sub> measured in the soil.

**Table 5: Yield and Harvest Index of sunflower at Lareystryd.**

Sunflower yield				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	4.33	794	9 157	0.08
Rep 2	4.24	776	6 716	0.10
Rep 3	4.15	760	8 791	0.09
<b>Mean</b>	<b>4.24</b>	<b>776</b>		<b>0,09</b>

Note: The main reason for the poor yield and Harvest index at this site is due to the poor and inadequate plant density (23 000 plants per hectare) obtained. It is also expected that the high level of vegetative growth was at the cost of the reproduction abilities of the plants.

**Table 6: Yield and Harvest Index of soybeans at Lareystryd.**

<b>Soybean yield</b>				
<b>Replication</b>	<b>Yield/plot (kg)</b>	<b>Yield kg ha<sup>-1</sup></b>	<b>Stover kg ha<sup>-1</sup></b>	<b>Harvest Index H.I</b>
<b>Rep 1</b>	4.80	879	3 479	0.20
<b>Rep 2</b>	6.17	1 130	3 113	0.26
<b>Rep 3</b>	5.64	1 032	4 212	0.20
<b>Mean</b>	<b>5.53</b>	<b>1 013</b>	<b>3 601</b>	<b>0.22</b>

Note: Despite the late planting date at the Lareystryd site, the soybean crop performed relatively well. Follow-up investigation into the potential of soybean production for inclusion in future rotation systems for the area, is required.

**Table 7: Cowpea yield at Lareystryd**

<b>Cowpea yield</b>		
<b>Replication</b>	<b>Yield/plot (kg)</b>	<b>Yield kg ha<sup>-1</sup></b>
<b>Rep 1</b>	10.37	1 899
<b>Rep 2</b>	10.79	1 976
<b>Rep 3</b>	12.08	2 212
<b>Mean</b>	<b>11.08</b>	<b>2 029</b>

Note: An average yield for cowpea (Betch White cultivar) of two tons per hectare at this site is encouraging. It is trusted that in future this crop will play a more important role in the cropping systems of farmers in this region.

### **PROBLEMS ENCOUNTERED**

The study group at Brooksby remains to be a difficult group to participating in a project of this nature and the experimental plot remains threatened by both livestock owners and thieves. The very dry season of 2018/19 was a great setback to the farmers of Brooksby and only a small number in this area was able to plant their crops in the past season of 2019/20. This contributed to a great loss of enthusiasm and interest by members to participate in the project. The termination of the farmer's day of 25 March also contributed the loss of enthusiasm. As soon as conditions normalized, follow-up actions will be taken together with Grain SA to reach out to the farmers of Brooksby. In addition, all the maize cobs at the experimental plot were stolen during the Lockdown period and we will only be able to report on a yield estimation regarding the maize plots at Brooksby.

## **DETAILS**

PROJECT NUMBER	P05000100
PROJECT TITLE	On-farm monitoring of selected soil fauna and beneficial microbes as bio-indicators in local soils under conservation agriculture regimes
PROJECT MANAGER	OHJ Rhode
CO-WORKER(S)	Internal MA Prinsloo, C Myburgh, CCM Abrams External North-West University, Stellenbosch University, ARC-Nietvoorbij/Infruitec
PROJECT STATUS	Continue
DURATION	01/04/2020 to 30/09/2020

## **ACTIONS TAKEN TO DATE**

Soil sampling was conducted during the first growing season, once before planting and during of grain filling stage of maize crops at the trial sites at Brooksby, and Lareystryd in the Lichtenburg and Mafikeng areas. Soil samples were subjected to numerous laboratory analyses. These analyses included the Haney soil analysis test, microbial soil enzyme assays viz. B-glucosidase, alkaline phosphatase and urease as well as mycorrhizal and soil fauna testing.

## **PROGRESS MADE**

During the first season of the project, various procedures were implemented such as the soil fauna and mycorrhiza analyses.

## **RESULTS ACHIEVED TO DATE**

After data was obtained for the second sampling at the two trial sites, results were obtained and are presented as follows: Selected soil enzyme assays (B-glucosidase, alkaline phosphatase and urease) revealed no significant differences between the various treatments at Lareystryd. However, the soil alteration index three (AI3) showed a more negative value in the maize plots compared to other treatments at Lareystryd. The AI3 index quantifies the balance between the three enzymes into a singular numerical value. A more negative value indicates an improvement in soil quality. This means the soil quality could be better in the maize plots compared to the rest of the treatments. Furthermore, this is also supported by the higher colonization (34%) percentage of maize treatments compared to cowpeas (12%) and soybean (13%). We also detected that in the maize and sunflower treatments the mites: springtails ratio is lower than in soybean treatments. At Brooksby the selected soil enzymes showed no significant differences among treatments. A more negative value for the AI3 index was also obtained in the maize plots. A similar finding for the mites: springtails ratio occurred in the soybean and cowpea treatments that was higher compared to the sunflower and maize treatments. Mycorrhiza colonization was also higher in the maize and sunflower treatments compared to the legume treatments.

## **PROBLEMS ENCOUNTERED**

Direct interaction between CA study group and researchers were limited due to local lockdown regulations. In addition, some analyses are still in progress. Results for the Haneytest for the second sampling is still being analysed and will be included in next report.

## DETAILS

PROJECT NUMBER P05000120  
PROJECT TITLE Herbicide resistance survey of *Conyza* species and efficacy evaluation of herbicide spraying programmes in herbicide resistant or tolerant populations.  
PROJECT MANAGER M Craven  
CO-WORKER(S) Internal Dr AEJ Saayman-du Toit (Weed Scientist); Vacant (Senior Technician); Vacant (Technician); GW Tshetlhe (Assistant), A Mofokeng (Research support), SI Phokompe (Research support)  
External Chemical companies (Villa Crop; BASF), Producers  
PROJECT STATUS None  
DURATION 01/04/2020 to 31/03/2024  
REPORT PERIOD April 2020 to 30 September 2020

## ACTIONS TAKEN TO DATE

The project commenced during April 2020. Seeds of *Conyza* species were collected from fields with suspected resistant populations during April and May 2020. *Conyza* populations were subsequently collected from farms in the Free State (Heilbron, Virginia/Theunissen, Clocolan (Photo 1); Bethlehem, Vredefort), Gauteng (Nigel) and North West (Ventersdorp and Potchefstroom). Seeds were harvested and stored at 4°C. Required herbicides were ordered. Preparations for the first set of glasshouse trials were made.



Photo 1: *Conyza* population at Clocolan in soybean field

## PROGRESS MADE

The first glasshouse trials will commence during October 2020.

## RESULTS ACHIEVED TO DATE

No results to report yet

## PROBLEMS ENCOUNTERED

Covid-19 lockdown during April and May 2020 resulted in some delays experienced regarding the delivering of purchased research consumables.

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Handtekening van Snr Navorsingsbestuurder  
Signature of Senior Manager Research

30 September 2020

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Datum/  
Date