

# ANNUAL PROGRESS REPORT

## 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 Mr MA Prinsloo, EA Nemasodzi, MM Kola, and 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 31/03/2022
REPORT PERIOD	01 Oct 2019 to 30 Sep 2020

## ACTIONS TAKEN TO DATE

### Establishment of experiment at Brooksby:

Due to removal of most of the crop residue maintained as soil cover for the following season (a constant problem caused by local livestock owners despite a proper fence), it was decided, to continue with the project and the plan to support the grain farmers at Brooksby. In view of the threat posed by the presence of livestock in the farming community, the best alternative was to focus on crop rotation as one of the principles of conservation agriculture (CA). On 18 December 2019, a crop rotation trial was planted at Brooksby. Four crops were included, i.e. sunflower, maize, soybean and cowpea in three replicated strip blocks. The establishment of all the crops was successful and the monitoring and maintenance program could continue. An important property of the soil at Brooksby is the low clay content of 11%. As a result, the soybean crop unfortunately did not respond well on the inoculation with nitrogen fixing bacteria. In order to provide the necessary amount of N required by the crop at that stage, LAN(28) was applied at a rate of 25 kg/ha four weeks later. The crop responded well on this treatment and was able to recover to some degree. The combination of a low soil clay content and the relative high rainfall of the season, contributed to poor herbicide efficiency at the experimental plot. Weed control in the cowpea and sunflower strip plots was unsatisfactory. This shortcoming was addressed, and a team of temporary laborers was used to do hand hoeing, particularly in the cowpea and sunflower plots.

### The experiment at Lareystryd:

The new experimental plot of Mr. Vuyani Lolwane at Lareystryd, between LICHTENBURG AND MAFIKENG was planted on the cover crop residue established in the 2018/19 season. Four crops namely Sunflower, Maize, Soybean and Cowpea were planted in three replicates on the 15<sup>th</sup> of January 2020. Although a very late planting date, the good climatic conditions throughout the season and a high inorganic N content of the soil, contributed to the crops performing better than expected. Note: It is highly probable that the relative high NO<sub>3</sub> (Nitrate) and NH<sub>4</sub> (Ammonium) levels at the Lareystryd experimental plot made a significant contribution to the performance of the maize at the site (see Tables 1 and 5).

**Table 1: Inorganic nitrogen content of soils: A comparison of the two experimental plots at Lareystryd and Brooksby.**

N Compound	Location	
	Lareystryd	Brooksby
	Content of N compound in milligram/kilogram	
NO <sub>3</sub>	6.06	1.46
NH <sub>4</sub>	22.86	1.18

### Interaction with participating farmer groups:

Active participation on the side of farmers in the project remains unsatisfactory and difficult to achieve. However, in the newly established Ganalaagte study group near Delareyville, regular interaction took place. Between September and November of 2019, three study group meetings was scheduled. In addition, a field day with the focus on soils and soil potential was conducted on 23 October 2019. At this event, farmers participated actively and were motivated to become more engaged in the project and its goals. On 12th March,

farmers of the study groups, Mafikeng CA and Ganalaagte participating in the project, were invited to the Ottosdal No-till Club. The purpose was to expose the visitors to the six years of CA research that was done at the experimental plots of the Club. At Brooksby, a farmer's day, in collaboration with Grain SA, was planned for 25 March with the focus on soil fertility and fertilization, effective weed control and feed-back on crop rotation research results of previous work in adjacent areas. Although a lot of preparation to conduct the farmer's day was made, the farmer's day was eventually put off due to the National Covid 19 Lockdown which was to start on the 26<sup>th</sup> of March.

## PROGRESS MADE

### The Ganalaagte study group:

The involvement and interaction with the Ganalaagte study group is a valuable addition to bring more enthusiasm and impetus to the project. The group consists of a small membership of 10 farmers who are all actively involved in working towards developing their grain production enterprises into more profitable and sustainable units. The group is supported by the FARMSOL group, which provides financial support to the study group's grain enterprises in particular. Much of the active participation of the Ganalaagte group should be greatly attributed to the strong leadership of the study group leader, Mr. Job Metswamere.

### An important link created:

However, at this point, 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 progress in support to developing farmers in the North West province, the Ottosdal No-till club should get all the credit.

## RESULTS ACHIEVED TO DATE

Two on-farm experiments (randomized strip blocks) were planted, respectively at Brooksby and Lareystryd

### Brooksby:

The purpose of the experiment was to plant four crops i.e. maize, sunflower, soybeans and cowpeas to serve as a first season rotation. Due to the significant chances to experience theft of maize in particular, sunflower, currently the main crop in the area, will be planted as follow up crop.

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

**Table 2: Estimated yield of replicated maize blocs 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	-
<b>Mean</b>	<b>4.42</b>	<b>4 874</b>	<b>5 512</b>	<b>0.47</b>

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 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 3: 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 4: 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.

Lareystryd:

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

**Table 5: 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 as seen in Table 1.

**Table 6: 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 00 plants per hectare) obtained. It is also expected that the high level of vegetative growth was at the cost of the reproductively of the plants.

**Table 7: Yield and Harvest Index of soybeans at Lareystryd.**

Soybean yield				
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>	Stover kg ha <sup>-1</sup>	Harvest Index H.I
Rep 1	4.80	879	3 479	0.20
Rep 2	6.17	1 130	3 113	0.26
Rep 3	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.

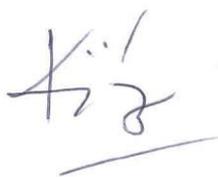
**Table 8: Cowpea yield at Lareystryd**

Cowpea yield		
Replication	Yield/plot (kg)	Yield kg ha <sup>-1</sup>
Rep 1	10.37	1 899
Rep 2	10.79	1 976
Rep 3	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 participate 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 to the loss of enthusiasm. As soon as conditions normalized, follow actions will be taken together with Grain SA to anew reach out to the farmers of Brooksby. Almost all the maize cobs at the experimental plot were stolen during the Lockdown period and thus only a yield estimation of the maize performance could be reported.



Handtekening van Snr Navorsingsbestuurder  
Signature of Senior Manager Research

1 September 2020  
Datum/  
Date



**Four crops in the rotation experiment at Brooksby (February 2020).**



**Sunflower in the rotation at Brooksby (February 2020).**



**Cowpea planted in the residue of the previous season's cover crop at Lareystryd (February 2020)..**



**Mr. Mosa Kola in the soybean stand at Lareystryd (February 2020).**



**Ganalaagte study group at one of their well-prepared profile pits. The soil expert in the pit is Mr Martiens du Plessis of NWK (October 2019).**



**Farmers representing the two study groups at the Ottosdal No-till Club's event on 12 March 2020. Despite rainy conditions, nothing could prevent a visit to the trials of the club.**



**Farmers were exposed to various mechanical advances used by the No-till club in practicing CA.**