APPENDIX 5: KWAZULU-NATAL MIDLANDS ANNUAL PROGRESS REPORT

CA Farmer Innovation Programme (CA-FIP) for smallholders in KZN Midlands.

Period: October 2018 - September 2019

Farmer Centred Innovation in Conservation Agriculture in upper catchment areas of the Drakensberg in Midlands of KwaZulu-Natal

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Identification of the project

Description and selection of study areas

The KZN Midlands programme has been expanding the CA Smallholder Farmer Innovation Programme (SFIP) activities piloted in Bergville to other maize growing areas in the Midlands, i.e. Estcourt, New Hanover and Wartburg for the last 2 seasons.

Communities targeted in this season expanded from Cornfields and Swayimanye (New Hanover) to include 3 new groups in Appelsbosch/ Ozawathini (Wartburg) and one group in Ntabamhlope (Estcourt).

Approach and Methodology

The farmer-centred innovation systems research process underpinning the programme, which is based on working intensively with farmer learning groups and local facilitators in each of the villages, has been continued and strengthened.

Within the learning groups farmer innovators volunteer to set up and manage farmer-managed adaptive trials as the 'learning venues' for the whole learning group. Farmer Field School (FFS) methodologies are used within the group to focus the learning on the actual growth and development of the crops throughout the season. New ideas (CA practices) are tested against the 'normal' practise in the area as the controls. Farmers observe, analyse and assess what is happening in the trials and discuss appropriate decisions and management practices. Small information provision and discovery-learning or training sessions are included in these workshops/ processes. These are based also on the seasonality of the crop and the specific requests and questions from farmer learning group participants.

Local facilitators are chosen from within and by members of the learning group to be a person who has the required experience, knowledge and a willingness to support the other farmer innovators in their implementation. Facilitators are only chosen and appointed where people with the appropriate skill and personality exists. Local facilitators receive a stipend for a maximum of 10 working days per month, for their support to the farmer innovators. They fill in detailed timesheets outlining their activities against which they claim a monthly stipend.

Learning group members agree to a season long learning process and put forward the farmer innovators to run the trials. Each prospective innovator is interviewed and visited and signs an agreement with the Grain SA team regarding their contribution to the process. They undertake to plant and manage the CA trials according to the processes and protocols introduced as well as a control plot of the same size. For the latter, farmers provide their own inputs.

The adaptive trials are also used as a focus point for the broader community to engage through local learning events and farmers' days. Stakeholders and the broader economic, agricultural and environmental communities are drawn into these processes and events. Through these events *Innovation Platforms (IPs)* are developed for cooperation, synergy between programmes and development of appropriate and farmer led processes for economic inclusion. These IPs also provide a good opportunity to focus scientific and academic research on the 'needs' of the process.

In this season (2018-2019) we have continued to focus on the following elements of the model, namely:

a) Support farmers who are in their 1st, 2nd and 3rd seasons of implementation
b) Intercropping and crop rotation
c) Late season planting of beans
d) Summer cover crops; sunflower, Sunnhemp, Babala, Dolichos beans
e) Continuation with experimentation with winter cover crops, including new species requested by farmers (Lucerne, clover, turnips)
f) Continued support for VLSAs (Village savings and Loan associations) and small business development training for these participants
g) Initiation of nodes for farmer centres that can offer tools, input packs and advice

Key activities: October 2018-September 2019

This season, farmers opted for different maize varieties; SC 701 in the Swayimane area – as farmers want to keep their focus of growing green mealies for marketing and PAN 53 and Sahara in Cornfields where farmers were looking for hardy, drought resistant varieties. For sugar beans, Gadra is well acclimatized and preferred by all farmers. Mixed brown cowpeas were planted only in two of the areas, as farmers in the other villages were reluctant to plant a crop that they no longer use.

The four learning groups in Swayimanye (New Hanover) have remained very active. Interest in commercial maize production (green mealies) here is high due the community's proximity to a large town - Pietermaritzburg. Smallholder farmer groups, mainly women, have been organised into cooperatives and are active in market gardening and field cropping.

The Cornfields (Estcourt area) focus has continued, despite the understanding both in the community and by the facilitators that this is likely a very marginal area for maize production-due to climatic conditions and extremely poor soils in the area. The learning group members requested another final attempt.

Learning groups have been initiated in two new areas – Appelbosch close to new Hanover and Tabamhlope close to Estcourt. These are expansion areas where participants have attended awareness raising days and requested initiation of the programme in their villages.

Innovation platform meetings and open days have not been held in the 2nd half of the season, given time constraints due to late planting. The annual review and planning sessions with the learning groups are presently underway and the learnings and issues from this season will be discussed and included into the experimentation process for the coming season.

Results achieved to date

Seven learning groups have been supported under this process. Training/learning workshops have been conducted for the following topics:

- **How to implement CA:** introduction to the principles, soil health, crop diversification and different planting options for CA

- **Working with herbicides and knapsack sprayers**: information on different herbicides, their uses and safety measures, as well as operation of knapsack sprayers, protective clothing, etc.
- **Trial plot layout and planting** using different CA planting equipment such as hoes, MBLI planters, and animal drawn not till planters.
- **Top dressing and pest control measures** for mid-season growth of crops and planting of cover crop mixtures where people have been interested in this option

The learning groups provide the innovation platforms also for discussion of the value chain issues, such as bulk buying, harvesting, storage and milling options and marketing.

The 2019 growing season has arguably been more challenging and somewhat confusing compared to previous seasons. Natal Midlands, which is still relatively new compared to Southern KZN and Bergville seems to have potential for expansion and different types of CA experimentation processes, especially in Swayimane as the community is still quite involved in farming. Cornfields, on the other hand has been somewhat bleak despite the participants' persistent efforts to grow maize. It is noteworthy that most people in Cornfields have shifted to goat and cattle farming due to the poor state of the soils in the area. The CA participants are among the few left who still practice crop farming. The area has not seen any rain since February this year. This then begs the question, how will the people survive in the next year, five years or even ten years from now with such merciless weather conditions and virtually lifeless soils?

The table below outlines activities related to objectives and key indicators for the period of October 2018-September2019.

Table 1: SUMMARY OF PROGRESS (OCTOBER 2018 - SEPTEMBER 2019) RELATED TO OBJECTIVES AND KEY ACTIVITIES

Objectives	Key activities	Summary of progress	% completion and comment
1. Document lessons learned	Documentation for learning and awareness raising	- Printing of hand books and learning support materials for groups and individuals - Sharing of information through innovation platforms processes -Articles and promotional material	- 1 000 copies of Individual savings books and 50 group savings books have been printed (100% complete) - Appelbosch Open Day, (50% complete) -None (0% complete)
	Reports	- 6 monthly interim report and final report	(100% complete)
2. Increase the sustainability and efficiency of CA systems	1st level experimentation: 38 (33)	- 33 participants in Tabamhlope and Appelbosch planted 100-400m² intercropping trials as advised.	- Basic CA design- intercropping with maize beans and cowpeas on a 100m²- 400m² plot, with a control plot managed entirely by the participant. Adaptation trials will include late season planting of beans with a mixture of winter and summer cover crops. (100% complete)

	2nd and 3rd level experimentation: 47 (29)	- 4 participants in Cornfields and 17 in Swayimane planted their 400m² intercropping trials.	- Participants opted to continue with intercropping practice from their 1st year. (45% complete) - Crop rotation, SCC and WCC are included in the experimentation in Swayimane and Cornfields (100% complete)
	Develop and manage PM&E framework; – weekly and monthly M&E visits	- M&E forms redesigned and used - Digital monitoring system piloted	- Monitoring of planting and crop growth completed, yearly reviews in progress (%75 complete)
	Facilitation of innovation platforms	- Co-facilitation of information sharing and action planning with stakeholders and role players	- A farmers day has been held in Appelbosch Further stakeholder meetings with DM, UKZN and NGOs to be held. Initiate discussions in potential expansion and new areas. (60% complete)
	CA working group, and reference group	- Planned for August 2019	

A performance dashboard is indicated below. This provides a snapshot of performance according to suggested numbers and outputs in the proposal.

Table 2: Performance Dashboard: September 2019

Outputs	Proposed (March 2018)	Actual (Sept 2019)
Number of areas of operation	4	4
Number of villages active	12	9
No of 1st level farmer experiments	24	33
No of 2nd level farmer experiments	51	29
No of local facilitators	4	8
No of direct beneficiaries	75	70
Participatory monitoring and evaluation process (farmer level)	Yes	Yes
Soil biological assessments	60	76
Innovation Platforms	5	3

Due to late onset of rain and high temperatures, fewer participants planted than expected. Crop growth and yields have been average, with higher than normal incidence of pests and diseases in the maize. Showcasing of participants' fields and crops have thus not been done this season, opting instead for group based seasonal reviews in each area.

The table below summarises the planned and actual farmer trial implementation for the 2018-2019 planting season. A total of 85 trial participants volunteered through the planning processes across 9 villages in four areas. Eighty-two (82) of these farmers planted trials.

Table 3 : Summary of farmer innovation numbers and areas planted per village; KZN Midlands 2018-2019

Area	Village	2016	2017	2018 Inputs for trials	2018 Planted	Experi- mentation	Comments; incl planters used.
Estcourt	Cornfields	8	9	10	8 (4)	Intercropping; PAN 53, Sahara (yellow maize) Gadra, Mixed brown cowpeas	Demonstration plot at Mr Miya's homestead. Last attempt – given lack of growth for 3 years running. Planted 2018/12/10
Nkandla			10				
Greytown	Mpolweni	8					
New Hanover; Swayimane	Mayizekanye 1		6	8	7 (5)	Intercropping: SC701, Gadra beans	Hand hoes and MBLI planters used. Planted 2019/01/08
	Mayizekanye 2		9	8	7	Intercropping: SC701, Gadra beans	Planted 2019/01/09
	Mayizekanye 3		8	9	5	Intercropping: SC701, Gadra beans	Hand hoes and MBLI planters used. Planted 2019/01/10
	Gobizembe		9	12	10 (7)	Intercropping: SC701, Gadra beans, mixed brown cowpeas	Very active group members: Planted 2018/12/10
Appelbosch	Ozwathini			15	13 (7)	Intercropping: SC701, Gadra beans, mixed brown cowpeas	Hand hoes and MBLI planters used. Planted 2019/01/15
Tabamhlophe	De Klerk, Emdwabu			23	20 (12)	Intercropping: PAN53 PAN148 beans, mixed brown cowpeas	Hand hoes and MBLI planters used. Planted 2018/12/10
TOTAL	9	26	41	85	70(47)		

Of the 85 participants who started out this season around 82% of them planted their CA trials and their other field cropping plots and of those who planted around 67% managed to harvest. The above figures apply mainly to direct beneficiaries and exclude spontaneous adopters and other indirect beneficiaries who attend meetings out of curiosity.

Climate Variability

The global buzz around climate change may seem like a myth to some as they may perhaps argue that harsh climatic conditions have been an issue since time immemorial. However, climate change is a lot more complex than that, and although it takes a considerable amount of time and data to attribute persistent weather patterns to this phenomenon, experiences in these

communities over the last couple of years have shown extreme climatic events which seem to hit hardest among those with marginal access to resources. Conservation Agriculture (CA), in this context the SFIP, aims to promote farmer led research and increase food security aiming to increase farmer capacity, adaptation and resilience to ever changing climatic conditions. Swayimane seems to be quite flexible when it comes to planting as the climatic conditions allow for planting to commence from September until January the following year for maize. Beans are planted until March where after the rains stop. Despite having generally good weather, ever rising temperatures pose a real threat to their cropping systems as they seem to go hand in hand with high intensity, low duration rainfall. Choosing the best time to plant is becoming a delicate balancing act where proper planning is increasingly becoming a necessity.

In 2017, Cornfields planted on the 20th of December which was said to be very late as their normal planting time used to be November. In 2018 planting took place on the 20th of January due to absence of rain and all the crops which germinated were scorched by the heat and withered. The farmers planted again during the second week of February as that is when, according to them, the first summer rains came. The crops got off to a promising start and seemed to flourish but the yields, or rather absence thereof show otherwise.

More attention will need to be given to experimenting with different planting times and designing planting calendars that can accommodate for weather variability as much as possible; in addition to trying out short season maize varieties.

Overall process

As this is an existing 'technology' the farmer level experimentation is in essence an adaptation trial process.

Year 1:

Experimental design is pre-defined by the research team (based on previous implementation in the area in an action research process with smallholders). It includes a number of different aspects:

- Intercropping of maize, beans and cowpeas
- Introduction of OPV and hybrid varieties for comparison (1 variety of maize and beans respectively)
- Close spacing (based on Argentinean system)
- Mixture of basin and row planting models
- Use of no-till planters (hand held, animal drawn and tractor drawn)
- Use of micro-dosing of fertilizers based on a generic recommendation from local soil samples
- Herbicides sprayed before or at planting only
- Decis Forte used at planting and top dressing stage for cutworm and stalk borer
- Planting of cover crops; summer and winter mixes

Experimental design includes 2 treatments; planter type (2) and intercrop (2). See the diagram below.

	PLOT 1: Hand Hoe			PLOT 2: Planter	
10m or 5m	Maize 1, bean 1	Maize 2, Bean 1		Maize 1, bean 1	Maize 2, Bean 1
	Maize 1, Bean 2	Maize 2, Bean 2		Maize 1, Bean 2	Maize 2, Bean 2
	10m or 5m				
	PLOT 3:	OR repeat plot 1 and 2		PLOT 4:	
	Hand hoe	Planter		Hand hoe	Planter
	Maize 1, cowpea	Maize 1, cowpea		Maize 1, Dolicho	Maize 1, dolichos
	Maize 2, Cowpea	Maize 2, Cowpea		Maize 2, Dolicho	Maize 2, Dolichos

Figure 1: Example of plot layouts for the 1st level farmer trials

The basic process for planting thus includes: Close spacing of tramlines (2 rows) of maize (50cmx50cm) and legumes (20cmx10cm) intercropped, use of a variety of OPV and hybrid seed, weed control through a combination of pre planting spraying with herbicide and manual weeding during the planting season and pest control using Decis Forte, sprayed once at planting and once at top dressing stage.

For the tractor drawn two row planter the layout has been adapted to incorporate both close spacing and inter cropping. Rows are planted with the following order and spacing; Maize-50cm -Beans-25cm-Beans-50cm Maize

Year 2:

Based on evaluation of experiment progress for year 1, includes the addition of options that farmers choose from. Farmers also take on spraying and plot layout themselves:
- A number of different OPV and hybrid varieties for maize
- A number of different options for legumes (including summer cover crops)
- Planting method of choice
- Comparison of single crop and intercropping planting methods
- Use of specific soil sample results for fertilizer recommendations
- Early planting
- Own choices

Year 3:

Trials are based on evaluation of experimentation process to date; to include issues of cost benefit analysis, bulk buying for input supply, joint actions around storage, processing and marketing. Farmers design their experiments for themselves to include some of the following potential focus areas:
- Early planting; with options to deal with more weeds and increased stalk borer pressure.
- Herbicide mix to be used pre and at planting (Round up, Dual Gold, Gramoxone)
- A pest control programme to include dealing with CMR beetles
- Intercropping vs crop rotation options
- Spacing in single block plantings
- Use of composted manure for mulching and soil improvement in combination with fertilizer,.

- Soil sample results and specific fertilizer recommendations
- Planting of dolichos and other climbing beans
- Summer and winter cover crops; crop mixes, planting dates, management systems, planting methods (furrows vs scatter)
- Seed varieties; conscious decisions around POVs, hybrids and GM seeds
- Cost benefit analysis of chosen options

Possible agrochemical spraying regime options

1. Roundup 2 weeks before planting - if there has been some rain. DualGold at planting (just after with Decis Forte/Kemprin).
2. Gramoxone at planting (just before or after planting) with or without Dual Gold and Decis Forte/Kemprin – Dual Gold does not work on dry soil (followed by heavy rain)

Runoff Plots

Runoff pans were installed in Swayimane Gobizembe on the 29th of January with the aim to measure runoff on the trial (undisturbed plot) and control (tilled plot). The runoff pans were installed in Mrs Ngobese's trial on the maize and bean plot as well as in the plot with amadumbe as a control.

The small table below summarises the available data for rainfall and run-off.

Table 4: Rainfall and runoff data for the period of Feb -April 2019 for Swayimane

Date	Rainfall	Runoff ml	
	mm	CA trial (M+B)	Conv control (Amadumbe)
Feb-19	61	1777	3786
Mar-19	26	150	30
Apr-19	226,5	12	23,5
Ave seasonal runoff		1939	3839,5

Overall the runoff from the untilled CA plot was 50% lower than an adjacent tilled plot. The dramatic reduction of run-off in march and April are a combination of reduced rainfall intensity afforded by canopy cover in the plots.

Progress per area of implementation

Information from the interim report is not repeated here. Given that most of the learning groups in the midlands plant maize very late, and potentially even later this season due to late onset of rain (January-February), the mid- season monitoring of the growing season is included here.

Ozwathini

The team monitored the three groups in Appelsboch/ Ozwathini, namely Swidi, Gobinsimbi and Hlathikhulu. The Mbalenhle and Mathulini groups did not form part of the final participants who planted. The total number of participants in Ozwathini came to fifteen, of which 80 percent are women. All the group members are above the age of 50 years old and more than half of the total participants are pensioners.

Participants planted the first year 400 m2 CA trials. The overall growth of the trials was good although most participants had a challenge with stalk borer on their maize, which appears to be more aggressive in the current season. As a result, during monitoring the team discovered most of the participants had already sprayed pesticide twice and in two cases three times as the stalk borer has become resistant to some of the chemicals they were using. Kemprin was the most widely applied and has become ineffective. The team supplied Decis Forte which had better results. Other chemicals applied include Steward, Kombat granules, Ampligo and Coragen. Other pests identified were black aphids, beetles and grasshoppers. Ravens were also identified as an issue in maize causing some participants to replant.

In all three groups, overall germination was good for all three crops (maize, beans and cowpeas), although beans and cowpeas did not do well subsequently. Cowpeas in particular had significant insect damage on leaves and in some cases the leaves were curled up and starting to dry out. Black aphids were also quite common on cowpeas in most of the trials. The overall appearance of beans was good although in a few of the trials the leaves were yellow with speckles, which the farmers attributed to too much sunlight.

 The majority of participants made a noteworthy effort to keep their trials free of weeds. In cases where no weeding was done competition was visible as the maize was yellow and had uneven growth. Common weeds were mainly yellow nutsedge, crab grass, Bermuda grass, fleabane, gallant soldier and pigweed amongst others. Generally, the weeds were a combination of broadleaf and grass species. Table 5 on the following page gives a summary of the participants and their CA trials.

Table 5: Growth monitoring information for Ozwathini; 2018-2019 (e-surveys)

	PERSONAL INFORMATION						TRIAL LAYOUT								ISSUES			GERMINATION %		
Appelsboch (Swede)																				
No	Name	Surname	M/F	Age	Employment Status	Yrs	size of trial	Planter	Plot 1	Plot 2	Plot 3	Plot 4	Weeds		Pests	presence of pest at the day of		Maize	Beans	Cowpeas
1	Martina	Xulu	F	64	Pensioner	1	400m2	hand hoe	m+b	m+c	m+b	m+c	0-5 %		stalk borer	yes		98%	80%	80%
2	Khithi	Zondi	F	74	Pensioner	1	400m2	hand hoe	m+b	m+c	m+b	m+c	0-5%		stalk borer, aphids, CMR beetles, locusts	yes		95%	90%	85%
3	Dolly Lydia	Mwelase	F	55	Unemployed	1	400m2	hand hoe	m+b	m+b	m+c	m+c	nutsegde, crab grass, dandelion, gallant soldier		Stalkborer, grass hoppers	yes		95%	95%	95%
4	Aaron Khethezakhe	Nkomo	M	60	Unemployed	1	400m2	hand hoe	m+b	m+c	m+b	m+c	0-5%		stalkboer	yes		98%	95%	90%
5	Ndabenkulu	Myeza	M	66	Self Employed	1	400m2	hand hoe	m+b	m+b	m+c	m+c	0-5%		none present	no		95%	90%	90%
Hlathikhulu																				
1	Thembeni	Mkhize	F	67	Pensioner	1	100m2	hand hoe	m+b				0-5%		none present	no		100%	100%	
2	Philisiwe	Zondo	F	57	Unemployed	1	400m2	hand hoe	m+b	m+c	m+b	m+c	(crab grass, nutsedge, gallant soldier)		stalk borer	yes		95%	95%	95%
3	Nathaniel	Zondi	M	71	Unemployed	1	400m2	hand hoe	m+b	m+c			no		stalk borer	yes		85%	80%	85%
4	Bobo	Mchunu	M		Unemployed	1	DID NOT PLANT													
5	Amos	Zondi	M	65	Pensioner	1	DID NOT PLANT													
Gobinsimbi																				
1	Ntomi Joice	Makhoba	F	72	Self employed	1	400m2	hand hoe	m+b	m+b	m+b	m+c	0-5%		none present	no		95%	90%	90%
2	Thobile Solly	Hlophe	F	56	Self Employed	1	400m2	hand hoe	m+b	m+b	m+b	m+c	0-5%		none present	no		90%	90%	90%
3	Delta Jabulile	Bhengu	F	66	Self Employed	1	400m2	hand hoe	m+b	m+c	m+b	m+c	creeping sorrel, crab grass, pig weed, couch grass, bermuda grass,		stalk borer, grasshoppers, beetles, black aphids, cutworm	yes		95%	85%	60%
4	Sibongile M	Mkhlongo	F	77	self employed	1	1000m2	hand hoe	m+b	m+c	m+b	m+c	0-5%		stalkborer	yes		90%	85%	85%
5	Ncengeni Doris	Chamane	F	55	self employed	1	400m2	hand hoe	m+b	m+c	m+b	m+c	0-5%		stalkborer	yes		95%	80%	80%

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Aaron Khethezakhe Nkomo is a 60 year old unemployed male who lives with his wife and grandchildren. He does not receive a pension grant as there were complications with his identity document, his wife is the sole breadwinner. He derives some income from farming as he normally supplies vendors who come to the area to purchase maize. He planted his CA experiment in the last week of January and the trial appeared to be growing well and he planted the control a week after *(see figure 2 below).* His main challenge in terms of pests was stalkborer; he sprayed Kemprin and Decis Forte to control it. A more pressing issue was his soil condition as the field used to produce very good crops but this year he was not confident this would be the case. Erosion of the top soil was suspected to be the primary cause of the reduction in soil fertility. The control maize seemed to be worse off as there were patches where there was no germination and he had to replant. Most of the maize in the control had purple leaves indicating a phosphorous deficiency. A similar scenario was seen in some parts of the trial plot although to a lesser degree. Mr Nokomo noted that intercropping provided much more biomass and could be a solution to the soil issue as a lot of soil gets washed away when it rains due to the steep slopes of the area.

Figure 2: Left: Aaron's CA trial with a good stand of maize, beans and cowpeas. Right: Aaron's control plot. Here the run-off is more obvious and the germination and growth of the maize were not as good as the CA plot.

Ndabenkulu Myeza's trial showed the effects of run-off as well. The trial was planted in a field below his sole maize crop. The control maize was planted in November and had already reached tasselling stage (in March, when the photos below were taken). The M+B intercropped plot showed marked yellowing when compared to the M+CP plot

Figure 3: Run-off and yellowing in the maize and bean plots, compared to the maize and cowpea plot

Dolly Mvelase is a 55 year old female who farms mainly for food production. She had similar problems as the participant above, where she did not manage to do her weeding on time and laos had a high infestation of stalk borer, for which she was provided Decis Forte, given that the Kemprin used most often in the area, was ineffective.

Figure 4: Mrs Mvelase spraying Deci Forte for a stalk borer outbreak on her maize.

Khithi Zondi's trial got off to a promising start but at four weeks the maize started to turn yellow and showed significant damage from stalk borer. The legumes also showed signs of stress and infested with aphids and beetles. Mrs Zondi did not follow the recommended close spacing and thus had a lot of bare soil in between her crops which led to run-off and erosion issues in her fields. One of the outcomes of this was that LAN applied as top dressing was washed away. The control maize plot had poor ground cover due to patchy germination of maize. It appeared that years of mechanical tilling had caused a considerable amount of soil degradation.

Ozwathini - Gobinsimbi

Ncengeni Chamane is a 55 year- old female who supports her family through farming. She supplies the informal market with a range of crops including maize, Ukulinga beans, amadumbe and cabbage among others. The trial demonstration was carried out at her household. The overall appearance of the trial was good and the maize and legumes had formed a canopy cover, but the beans had slight yellowing of leaves. The control plot was also planted using CA.

Figure 5: Above Left to right: Mrs Zondi's trial plot with yellowing maize, her conventional control plot showing run-off damage and cowpeas with leaf damage from beetles and aphids.

Sbongile Mhongo planted a 1000 m^2 trial of maize and beans/maize and cowpeas. The trial was looking good, however two out of the ten plots had patchy germination for both maize and beans. According to Sibongile the maize was eaten by crows but it was not clear why the beans

Figure 6: Left and center; Mrs Chamane's CA Trial maize and bean/cowpea intercrop and Right, the control plot

did not germinate. Her maize did not appear to be affected by stalk borer as much as the other participants as she sprayed early Kemprin to control the outbreak. The control plot did not look good and had many patches, the soil was mostly bare as there was insufficient ground cover.

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Delisile Bhengu is a 66 year -old farmer and grows maize for household consumption and selling surplus. There was a significant difference in appearance between the maize /bean and maize/cowpea plots, where maize and cowpeas was yellow compared to maize and beans which was green. The cowpeas also had curled leaves that seemed to be drying out and thus had not formed a ground cover in between the maize. The maize on the control plot was yellow due to a high number of weeds.

Figure 7: Delisile Bhengu's CA Trial maize and bean (left), maize and cowpea (center), control plot (right

Ntombi Makhoba planted her trial in the last week of January. She planted three plots of beans and one plot of cowpeas as she was not convinced the cowpea would germinate. Her trial appeared to be growing very well and although there was stalk borer, the damage was not extensive. The beans and cowpeas had formed a good canopy cover and there were minimal weeds.

Figure 8: Mrs Makhoba's CA trial plot

Cover crops were distributed in the first and second weeks of March; the 'winter master mix' which includes Saia Oats, fodder radish and fodder peas to two out of the three groups (Gobinsimbi and Swidi), to plant in between the maize where beans have been harvested and where there is a lot of bare soil. Participants however did not plant these

Swayimane

In this area, the CA experimentation process generally went well and the CA trial plots produced good results. Overall germination was good as it was above 85 percent for both maize and legumes. Most trials did not have a high percentage of weeds as the farmers are generally meticulous when it comes to weeding. With regards to plant spacing, many participants had used a wider spacing than the recommended 50 cm and 25 cm inter row spacing for maize and beans. The farmers are used to using large plant spacing of up to a metre in between rows for maize as they believe that if the plants are too close together it will negatively affect the size and quality of the cob. Their soils are starting to show signs of degradation due to years of erosion as a result of ploughing and leaving large portions of soil bare. CA is a concept that the farmers are still grappling with, although they are familiar with the concept of intercropping maize with leguminous crops, many still believe ploughing is a necessity

Mayizekanye Group 1

Nomusa Shandu who is in her 2nd seasons of Ca experimentation, lives with her daughter and four grandchildren. The family survives on child support grants and farming maize, potatoes and taros (amadumbe). Mrs Shandu planted her trial in February 2019. Although the trial (bottom left picture) appears to be growing well, the spacing between rows is twice the recommended spacing. The MDF team gave her winter cover crops to plant between the spaces in order to ensure maximum cover.

The picture on the right is her control plot which is not doing well. There were many large gaps in between the maize due to patchy germination, and generally the stalks appeared thin with purple and yellow leaves. Mrs Shandu's field is on a steep slope hence ploughing has removed most of the top soil leaving a less fertile subsoil and subsequent reduced productivity.

Figure 9: Nomusa Shandu Trial (left), Control (right)

Lungile Phungula, a 48 year- old participants who lives with her husband and child and mainly grows maize, beans and amadumbe for household consumption, is also in her 2nd season of CA experimentation. Last season, her CA plot performed very poorly, when compared to growth

and production this season. She attributes the change to incorporating lime this season and also in using her more preferred maize variety (SC701), which she believes is better adapted to the area. This season she also altered her planting method slightly by first planting beans and then

Figure 10: Layout of trial (left), WCC in between maize (center), Gadra bean (right)

planting maize just over a week later in order to give the beans a kick start, which turned out to be a winning formula. She was very pleased with the results and said she plans on continuing this way in the future. The MDF team gave her the Wintermaster mix which she planted in between the maize as shown in the pictures below.

Eunice Maphumulo's trial did well and both maize and beans were growing vigorously. She planted three plots of maize and beans and one plot of maize and cowpeas. Germination for beans however, was very patchy in some plots and she planted winter cover crops in the spaces where the beans did not germinate to help create soil cover.

Figure 11: Left, Mrs Maphumulo;s CA intercropped maize and bean plot and right, winter cover crops relay cropped in between the maize

Fikelephi Maphumulo is a 52- year old lady who is unemployed and lives with her five children. She planted two 200 m^2 plots of maize only and beans only and did not plant cowpeas. This season she separated the maize and beans as she felt intercropping had an adverse effect on beans after obtaining a poor yield for beans in the previous growing season. This season

however was not much better, with beans rotting towards the end of the season due to high rainfall in early March.

Her field is also on quite a steep slope and like Nomusa Shandu she has started experiencing problems with her maize crop on her control plot. Again, due to years of ploughing and leaving large patches of bare soil, erosion has washed away a lot of the top soil. Furthermore, she plants the same crop in the same field using the same method season after season. She relay cropped winter cover crops into her CA maize plots to reduce the erosion, as she noticed other participants in the area doing this, which provided for better soil cover in her plots towards the end of the season.

Figure 12: Fikielephi Maphumulo (left), maize plot (center), bean plot, (right)

Maylzekanye 2

Thembi Nene Mkhize was probably the biggest critic of CA in the previous growing season who was not shy to say she planted simply out of curiosity but she knows her traditional planting methods are far better. This growing season she planted again and her trial was growing very well, except the one plot of maize and beans which had a yellowish appearance compared to the other plots. She also planted cowpeas using seed she had saved from last year's trial as a sole crop as she wanted to see how it would turn out if not intercropped with maize. In a separate field she planted 100 m^2 of left-over maize and bean seed, but instead of separating the maize and bean rows, she planted the maize and beans in the same rows.

Figure 13: MaNene Mkhize's trial (left), own experiment, m+b in same row (center), cowpeas sole plot from saved seed (right)

Qondeni Bhengu is also a 2nd year participant who decided to intercrop single rows, rather than the tramlines suggested. Her trial grew well for both maize and beans but she did have a slight issue with stalk borer. There were no weeds in the trial at the time of monitoring.

Fikile Maphumulo is an enthusiastic farmer who grows maize, beans, amadumbe and vegetables to support herself and her family. She is also in the program for a second season and planted both maize and beans and maize and cowpeas. Her trial looked beautiful, especially the maize and cowpea plots which had formed a full canopy. The beans were lagging slightly behind but were also growing well. No pests were identified on the day of monitoring and there was no presence of stalk borer and very few weeds.

Figure 14: Left, Mrs Maphumulos m+b intercrop, center m+cp growing very well

Mayizekanye 3

Dumazile Nxusa and her sisters, Khonzephi and Ntombi planted a trial of 1200 m2 of maize and beans and maize and cowpeas together. This season, their trial did not look good as they had problems with crows and rats eating the seed and also with browsing by buck. Cowpeas however grew well, as these were not preferred by the buck. As a result, they did not tend their plots well and weeding was done late. They have decided to move their field closer to their homestead in future.

Figure 157: Left, the Nxusa's m + cp CA trail plot and Right , one of her m + b plots.

Babhekile Nene is a hard working farmer who lives with her husband, daughter and three grandchildren. She also farms mainly to support herself and her family and grows primarily maize, beans and potatoes. Her trial He CA trial plot have done well in both seasons. However, the maize intercropped with beans was yellow and shorter than the maize intercropped with cowpea. The maize and bean plot, was situated on the upper part of the field

which more likely has leached soils.

Figure 16: Left, Mrs Nene's m + cp CA trial plot and Right , one of the m + b plots.

Ntombikhona Mchunu is another participant that had a disastrous first season. She did not obtain any yields, which left her feeling hopeless. This season, she moved her cropping to a different fields and results are more promising. She reverted to the wider spacing more common in the area, as well as monocropping of cowpeas, as she thought they would compete with her maize.

Figure 17: Left, Mrs Mchunu's cp CA trial plot and Right , one of the m + b plots. Runoff in this plot is visible – wide spacing and clearing of the ground during weeding did not help

Cornfields

Cornfields has been a very challenging area to work in. The area is characterized by very poor-quality soils that are shallow, rocky and light greyish in colour. The area also has many dongas due to erosion which seems to be getting worse each year. Nevertheless, a handful of farmers have persevered and are determined to improve their situation.

The season started off on a seemingly hopeless note as rains took even longer to come this season. In 2017/18, planting was done in December and the rains came on 20 January 2018, however this season planting took place in late January and the rains only came at the end of February when everyone had lost hope. In a courageous effort to take advantage of the late rains, most of the farmers replanted where the maize had initially dried out and their leap of faith has seemingly paid off as their trials appear to be performing better than in the first and second seasons.

Progress

During the review meetings in 2018 the following resolutions were made:

RESOLUTIONS (2018)	PROGRESS (2019)
Trials: Mr Mya, Mr Xaba and Mr Khumalo want to increase their trials to 1000 m² in the upcoming season. It was agreed that on the bigger trials, the two row planter would be used during planting and those going on to their third year of CA will be required to pay input subsidies.	Mr Miya increased the size of his trial to 1000 m² but Mr Xaba continued to plant the 400 m² trial. During the planting demo, the haracca planter was used to plant cover crops and lab lab and the rest of the trial was planted by hand. None of the participants have paid inputs subsidies

Intercropping: The team has agreed to introduce summer cover crops to be intercropped with maize at planting and also carry on with the maize and bean intercrop in order to see if there won't be an improvement in the soil.	Summer cover crops including sunflower, sunnhemp and millet were planted during the planting demo at Mr Miya's house and the rest of the participants will plant them this upcoming season
Seed Varieties: There was a request from the farmers for yellow maize as it has a wider range of uses (also used as poultry feed) and is more marketable than white maize.	Both white and yellow maize seed was brought to farmers and they took their preferred variety. Mr Xaba took yellow maize and the rest of the participants planted white maize.
Soil samples: Collection of soil samples is one of the first things to be done in the upcoming season. Soil samples were collected in previous season but could not be utilized as the sampling method was not correct.	Soil samples were collected for all participants in 2018 and according to the results none of them have issues with acidity, which was previously suspected to be the cause of poor yield. Issues related to yield seem to be more related to drought and poor soil fertility.

Fisokuhle Ngcobo has been planting using CA since 2017 and is now in her 3rd season. She, like the rest of the farmers planted in January and the maize dried out due to the heat. She replanted in February and March when the rains came and got a much better result. For the first time in the three years her trial is looking good, the maize was dark green and the beans were growing well. She did not plant cowpeas. Her only concern was how big the cobs will turn out as it as it is already late in the season and the maize is still short.

Shintshile Mbatha also joined the program in 2017. She has a small 200 m² tCA trial. She did not plant beans this year, due to the excessive heat

Florence Cebekhulu is in the program for a second season. She is a hard working farmer who lives with her children and supports herself through social grants and farming. Her trial was not looking good, as there were many weeds, the maize was light green and did not have uniform height and the beans had very low germination. Cowpeas germinated well but due to overgrowth of weeds were not doing very well and had not formed canopy cover. She said she did not bother to weed as she did not think anything would grow but can now see that there is some progress.

Figure 19: Mrs Cebekhulu's CA trial plots; better growth is for crops replanted at the end of February.

Mbuso Mkhize is a farmer who has been persistent from the beginning. Like Fisokuhle Ngcobo, he has been resilient and has bounced back despite many setbacks. He believes CA has helped him a lot in terms of improving his productivity and there has been some improvement every year. This year he almost gave up at the beginning, but also replanted, with better results.

Figure 80: Mr Mkhize's CA trial plots. Patchy germination is evident as are weeds, but growth has been reasonable. Right: Infestaiton of maize with a hairy caterpillar that feeds on the green cobs, was common in the rea this season.

Mdungeni Miya is a third year participant who extended his trial to 1000 m². Planting took place in January and he planted maize, beans, cowpeas, and lablab and summer cover crops. His trial failed miserably due to the heat and lack of weeding. Even the cover crops were not doing well, except for sunhemp which seemed completely immune to the adverse conditions. Millet also has very good germination but was uneven in growth. Sunflower seemed to be the worst hit by the

drought and was hardly visible except for two or three plants. The rains did not seem to help Mr Miya's trial much, as his maize was thin and frail, and tasselled prematurely. The rest of the plots were hardly identifiable as there was nothing but weeds.

etros Khumalo is a third year participant who enjoys farming and works in partnership with his wife. This season she assisted him in planting the trial and decided to plant the maize together with beans and butternuts in between as a way to create soil cover and hold moisture. The trial grew exceptionally well and it was interesting to see that there was no competition between the beans and butternuts as both were thriving. The maize was also growing very well.. Next to the trial Mrs Khumalo also planted sweet potatoes and beans. It was great to see someone who really understands the concept of diversification and intercropping. She is an example of someone who implemented all three principles of CA, minimum soil disturbance, permanent soil cover and crop diversification.

Figure 22: Left, Mrs Khumalo's CA trial bean, butternut and maize intercrop and Right, a butternut fruiting.

Figure 21: Left, Mr Miya's CA trial plot with stressed maize. Right, millet and sunnhemp survived the adverse weather conditions quite well

Ntabamhlope

This area was primarily managed by Lima staff members, as they are a partner in the implementation process. CA has been introduced here as one option in a suite of climate resilient agriculture practices.

Ntabamhlophe participants have completed their first year of CA experimentation. The group of 20 participants intercropped maize and beans on 100m² plots as their first trial. All the participants planted late, between the 15th and 18th of December 2018. This season was very dry until early January and was characterised by heavy rainfall towards the end of season (March and April) with late and heavy rains. This affected the maize yield with some of the participants' maize rotting.

However, most of the participants shared that the maize cobs were generally of good quality with a few exceptions were the maize was affected by stalk borer and rot. Low maize yields were mostly due to livestock invasion in the fields. This is an issue in the community, where cattle are released back into the village prior to people being able to harvest their maize and is a trend in the whole region. As grazing for cattle is diminished through a combination of climate variability and lack of grazing management, the traditional authorities allow the cattle back into the villages earlier; jeopardising harvests for those villagers who have produced crops.

Below are a few small cases for yield measurements for individual participants.

Cinelele Sibiya has naturally assumed the role of local facilitator by visiting the trial plots of other farmers in the learning group to monitor crop growth. As this was their first year, they were not sure whether the maize would grow and produce any yield. She shared this because she has shallow sandy soil with hard rock that does not favour good crop growth.

She was happy with the 'good lines formed' and was satisfied with maize cobs sizes. She thinks the MAP (33) fertilizer and lime used had a great impact on the 41.607 kg yield (~4,7t/ha) she harvested this season and wants to continue on with the programme next season.

Figure 9: Mrs Sibiya showing the quality of maize cobs she harvested

Robert Gabuza frms with his wife and they recorded the follwoign

yields for their trial, which they were more than satisfied with:

Maize = 53.258 kg (~6,08t/ha)

Beans = 5 litres (~0,7t/ha)

Figure 24: Robert Gabuza's wife with the samples from his harvest.

Sibongile Zuma is a young farmer in the area. Sibongile's plot was invaded by cattle and her yields of both maize and beans were greatly reduced:

Beans = 1.850 kg (~0,054t/ha)
Maize = 18.520 kg (~2,1t/ha)

Figure 105: Sibongile showing a portion of her bean yield

Two other participants whose yields were monitored; Vusi Nkabinde (~0,7t/ha of beans), Thembi Xaba (~1,4t/ha beans and 2,3t/ha maize) shared that their yields were low due to cattle invasions. They also felt that their cobs were a bit small and under-developed and believed that this was due to the late planting. They all felt that it would be important for them to continue their experimentation with CA, as their harvests were nevertheless better than before and they appreciate the idea that benefits from improving soil health and organic matter would take a few seasons to be seen.

Way forward

Being introduced to an existing group was beneficial because the participants were already working together and identify themselves as part of a collective. There is potential to reach other farmers in the communities who are grain crop farmers including those producing soya beans. The partnership with LIMA RDF has been effective in introducing CA into the thinking of the learning groups there, but more effort needs to be put in engaging our partners throughout the experimentation phase.

The season - in summary
- Participants in the Midlands planted from the 15th of January to mid-February; which is when the rains finally started. A number of participants had to re-plant due to initial lack of germination.
- This season has been characterized by very high temperatures and late summer rainfalls which the farmers believe contributed to the outbreaks of stalk borer, both in Gobizembe and Appelbosch areas. Mayizekanye (3 villages in Swayimane) experienced much lower levels of stalk borer infestation. Reasons for this will need to be discussed with the learning group members, as build-up of stalk borer populations is related to cropping practices and management.
- This season a different Mazie variety, SC701 was used in Swayimane upon request from the participants.
- Due to the low performance of beans last season, some participants opted to plant mono-cropped plots of beans and cowpeas. The performance of these plots wasn't markedly different from the intercropped plots (as expected by the facilitation team).

- Run-off is somewhat of an issue in these Midlands sites; exacerbated in 'difficult' seasons, as the early canopy cover afforded by the close planting regimes does not happen; leading to high weed pressure and or bare soils susceptible to erosion.
- Relay cropping of the winter cover crops worked reasonably well this season
- A number of participants included their own variations in the experimentation process; one planting beans two weeks prior to maize- which worked very well; a few reverted to the wider spacing and mono-cropping more familiar in the area, with negative results in growth and much higher run-off and others used one row intercrops and included other crops such as butternuts. Although, it is more difficult to monitor these high varied plot layouts, it is considered a very positive sign that participants are undertaking their own experimentation and learning from these exercises.

Maize Yields

Maize yields for this season turned out slightly better than expected although two out of the five areas (that planted for a second season) experienced a dramatic drop in total yield. Gobizembe and two out of the three groups in Mayizekanye saw an improvement in total yield with some participants having managed to sell green mealies to local van traders. Mayizekanye 3 (Mrs Nxusa's group) saw the sharpest drop in yield out of the three Mayizekanye groups as most people's trials did not do well. The overall averaged yield for the group was 4,1 t/ha. Cornfields is another group which also saw a dramatic drop in yield. Around 50% of the participants obtained zero yield and only Mr Miya seemed to have promising results, with a yield of 1,955 t/ha. Mr Miya managed to get a yield as he replanted towards the end of February. The figure below shows the difference in total yields amongst second year participants for the 2017/18 and 2018/19 growing seasons.

Midlands Total Maize Yields 2018 vs 2019

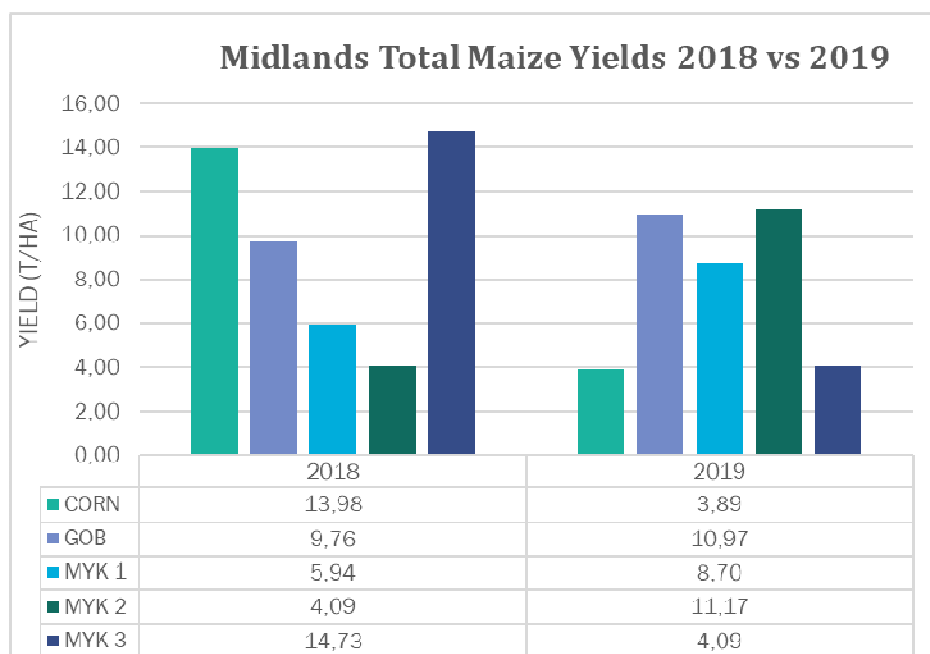|	2018	2019
CORN	13,98	3,89
GOB	9,76	10,97
MYK 1	5,94	8,70
MYK 2	4,09	11,17
MYK 3	14,73	4,09

Figure 26: Total maize yields for Midlands participants for 2017/18 and 2018/19

Changes in Yield Distribution in the 2018 and 2019 Growing Seasons

This season has not gone very well in most areas with most farmers lamenting over either a reduction in yield or poor performance at the market, however it was good to see some increases in yields among the groups that were planting for a second season. The benchmark normally used to measure how well farmers are doing in terms of yield is calculating the yield required for them to break even which comes to 4 t/ha. Most smallholder farmers obtain much lower yields of 1 to 2 t/ha. Below is a small table summarising the average maize yields across the two seasons. The average yield across the villages has remained constant at around 1,8t/ha. Yields for Cornfields and Mayizekanye 1 and 2 increased slightly between the seasons.

Table 6: Yield averages for Midlands in the 2017/18 and 2018/19 cropping seasons

Area	2017/18	2018/19
	Trial (t/ha)	Trial (t/ha)
Cornfields	2,0	2,2
Mayizekanye 1	1,2	1,5
Mayizekanye 2	1,0	2,8
Mayizekanye 3	3,2	1,2
Gobizembe	1,6	
Ozwathini		1,3
Average yield (t/ha)	1,8	1,8

Note 1: Yields were not measured in Gobizembe this season, as yields were too low.
Note 2: Control yields are very difficult to assess. Farmers do not keep records and often eat this maize green.

Percentage increase/reduction was calculated for the three groups in Mayizekanye as well as Gobizembe as all these were returning groups. In 2017-18, 47 % of the participants achieved a yield between 0-1.5 t/ha and in 2018/19 the percentage of farmers in the same range increased to 56%. The percentage of farmers between the range of 1.5-2.5 t/ha decreased from 32% in 2018 to 18% in 2019. The third range of 2.5. t/ha to 4 t/ha saw a further decrease from 22% in 2018 to 10% in 2019 and the highest range of 5-7.5 t/ha also saw a reduction in percentage of 11% in 2018 to 4% in 2019. This data clearly depicts the reduction in yield for the 2018/19 season for the majority of participants, losses due to variable weather conditions and associated stresses such as livestock invasion, increased pest attacks and increased presence of cob rots.

However, from the pie chart below, it can however be seen that around 26% of participants did in fact produce enough maize to break even (the ~4t/ha threshold), despite the harsh conditions
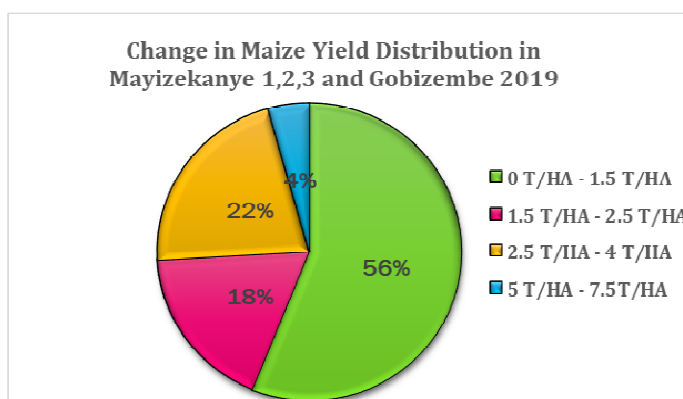

Figure 27: Pie chart depicting the range of yields for Swayimane participants; 2018/19

Gobizembe

Gobizembe participants saw an improvement in overall yield although only 70 percent of the participants managed to harvest. Most of the farmers said that the maize quality was also much better than in the previous season. However overall yields were still generally low, with the highest yield reaching only 3 t/ha and the lowest being 0.3 t/ha. For 2019, the group changed from PAN 53 to SC701, a more locally adapted variety.

Gobizembe Maize Yields						
Name	Surname	Experiment	No of bags	% Grain weight	Grain weight (kg)	weight (t/ha)
Ntombiyomuntu	Ngobese	Trial	3	0,846	36,341	1,211
CONTROL		Control	6	0,799	46,381	2,319
Janet Ntombencane	Gasa	Trial	5	0,169	6,483	0,324
CONTROL		Control	1	0,169	0,745	0,037
Lindiwe	Zondi	Trial	1,5	0,859	23,187	0,773
Busisiwe	Khoza	Trial	0	0,000	0,000	0,000
Khwezi	Majola	Trial	4	0,799	43,506	1,450
Khanyisile	Xasibe	Trial	0	0,000	0,000	0,000
Wandile	Shabalala	Trial	0	0,000	0,000	0,000
Thanda	Sithole	Trial	4	0,764	46,800	1,560
Khombisile	Mncanyana	Trial	8	0,850	90,353	3,012
Simephi	Choncho	Trial	1	0,803	9,693	0,323
Total						10,973
Average Yield						1,829

Figure 28: Right, Ntombencane Gasa who got a very low yield of 0.324 t/ha. Maize had very small cobs and half of it went rotten

Figure 29: Above, Khombisile Mncanyana's Maize. Her yield was 3.02 t/ha

Figure 30: Right, Rita Ngobese trial maize (left), control maize (right). Her yield as around 1,2t/ha for her CA trial and 2,4t/ha for her control

Mayizekanye 1 (Nomusa Shandu's group)

Mrs Nomusa Shandu's group also had an improved overall yield and some participants also managed to sell to local vendors. Lungile Phungula obtained the highest yield of 3 t/ha and Fikelephi Maphumulo had the lowest yield. In terms of sales, the farmers made between R150-R360 from their trial maize and between R240-R1 500 from their control plots. The farmers sell green mealies to local vendors/van traders every year in dozens at a cost of R25- R35 per dozen. Some participants had an issue with maize going rotten either in the field or in storage due to excessive rainfall.

MAYIZEKANYE 1 MAIZE YIELDS				Total Income from Maize		
Name	Surname	Grain weight kg)	weight (t/ha)	Qty(dozen)	Price	Total
Nomusa	Shandu	52,232	2,176	5	R30,00	R150,00
		130,579	2,176	8	R30,00	R240,00
Eunice	Maphumulo	27,457	1,144	5	R30,00	R150,00
Fikelephi	Maphumulo	7,387	0,369	0	R30,00	R0,00
Ntombi	Shandu	60,115	2,004	15	R30,00	R450,00
Lungile	Phungula	60,207	3,010	12	R30,00	R360,00
				50	R30,00	R1 500,00
TOTAL			**8,704**	**Total sales**		**R2 850,00**
Average Yield			1,45			

Mayizekanye 2 (Thembi Mkhize's group)

Thembi Mkhize's group also experienced an improvement in overall yield The highest yield for the group was 4, 645 t/ha from Fikile Maphumulo's trial and the lowest was 0,989t/ha from Nakeni Ngubane's trial. Farmers pointed out that overall yields were much better despite initial fears that the maize would not perform well due to the excessive heat in January.

MAYIZEKANYE 2							
Name	Surname	Experiment	Number of bags	weight (t/ha)	Qty (dozen)	Price	Total
Qondeni	Bhengu	Trial	0	0,000	0	R0,00	R0,00
Thembi	Mkhize	Trial	5	2,725	5	R35,00	R175,00
Mambedu	Ndlela	Trial	6	2,808	0	R0,00	R0,00
Fikelephi	Maphumulo	Trial	7	4,645	0	R0,00	R0,00
Nakeni	Ngubane	Trial	3	0,989	0	R0,00	R0,00
TOTAL				**11,167**	**Total sales**		**R175,00**
Average Yield				**2,792**			

Mayizekanye 3 (Dumazile Nxusa's Group)

Dumazile Nxusa's group had the lowest yields compared to the other three groups, as some participants reverted back to their old way of planting and the trials that were planted did not perform as well as expected save for Babhekile Nene's trial. The group however did still manage to make some income with Babhekile Nene having made some profit from her own fields but did not disclose how much and Mrs Nxusa made R 1380 from the trial and R 2820 from the control.

The maize and cowpea plot from the trial was the only one which produced a good yield with the other plots having only a few maize plants reaching maturity.

MAYIZEKANYE 3 MAIZE YIELDS							Total sales		
Name	Surname	Experiment	No of bags	% Grain weight	Grain weight (kg)	weight (t/ha)	Qty (dozen)	Price	Total
Babhekile	Nene	Trial	5	0,789	77,398	3,225	0	R0,00	R0,00
Agnes	Gabela	Trial	0	0,000	0,000	0,000	0	R0,00	R0,00
Mzenkosi	Maphumulo	Trial	0	0,000	0,000	0,000	0	R0,00	R0,00
Dumazile	Nxusa	Trial	0	0,000	0,000	0,000	46	R30,00	R1 380,00
Dumazile	Nxusa	Control	7	0,819	112,494	0,865	**94**	R30,00	R2 820,00
TOTAL						4,090	Total sales		R4 200,00
Average Yield						1,226			

Figure 31: Right, Babhekile Nene's maize harvest. Some of her maize was still slightly wet, she obtained an estimated yield of 3.225 t/ha

Figure 32: Right, Eunice Maphumulo's maize trial. She got a yield of 1.44 t/ha

Ozwathini

Ozwathini fared quite badly when it comes total maize yields for both the trials and their own plots. They also experienced the same fate as the Swayimane groups with regard to market and some have found themselves doubting if they will plant in the upcoming season. Their biggest challenge this year has been the overall size of the maize cobs which were smaller than usual.

This, they attributed to excessive heat and planting late. More than 80% of the farmers said that if they had planted earlier they would have experienced better results but had opted for the 15th

of January as they were busy with their own fields in December but still wanted to experiment with CA. For the trials, the highest yield obtained was 2. 396 t/ha and the lowest was 0.747 t/ha.

A total of 8 out of the 13 participants who planted managed to get a yield, although some had already sold or used all their trial maize when team visited them for weighing. Income accrued from trial plots ranged between R 210 and R 990 and for their control plots that amount was triple and even quadruple that as their own fields are much larger in size.

Ozwathini Maize Yields				Total sales		
Appelsboch (Swidi	Name	Surname	weight (t/ha)	No of dozens	Price (R)	Total
	Khithi	Zondi	0,008	4	30	R120,00
	Ndabenkulu	Myeza	1,728	7	30	R210,00
Hlathikhulu						
	Thembeni	Mkhize	0,000	2	120	R240,00
Gobinsimbi						
	Ntombi Joice	Makhoba	0,000	33	30	R990,00
	Thobile Solly	Hlophe	0,000	24	25	R600,00
	Delta Jabulile	Bhengu	0,747	0		R0,00
	Sibongile M	Mhlongo	2,396	0		R0,00
	Ncengeni Doris	Chamane	0,000	25	30	R750,00
TOTAL						R2 910,00

Figure 33: (Clockwise from top, 1. Mrs Mhlongo's maize, 2. Mrs Zondi's s maize, 3. Mrs Chamane's maize

Challenges with Maize Market

Most of the farmers were quite disappointed as they had to drop their price/dozen from R 35 to R 30 and even R 25 per dozen for some as a new competitor has now risen in the form of a commercial farmer from Richmond. The smallholder farming sector in Swayimane has survived by taking advantage of the gap in planting times after they previously had challenges with commercial farmers dominating the market. They planted in January as most commercial farmers plant around October and November, however this year, a commercial farmer from Richmond area decided to plant in January and sold his maize at R 20/dozen which proved quite detrimental to smallholder farmers.

Mrs Nxusa's group even commented that they used to make up to R 22 000 from their maize fields but this year they only managed around 40 percent of that amount. Other farmers expressed fears of not having enough money to purchase inputs in the upcoming season as they use the income from green mealies to purchase inputs. Also, although the maize yields somewhat increased, the quality left the van traders wanting ,as many complained that the cob sizes were smaller than usual or smaller than those of the commercial farmer. Some farmers ended up giving the maize to neighbours and leaving it in the field for people who normally come to pick what's left over after the farmers have sold the best maize.

The income for maize ranged from R 150 to R 1380 from the maize trials. A total of 12 farmers were willing to share how much they sold with a few being slightly more conservative and others having made no sales due to the size and quality of maize not meeting the required standard. Out of the 12 farmers, 42% accrued between R150 and R300 and 33% made between R 301and R 600. The highest range was between R 901 and R 1400 with 17% of the farmers reaching this level.
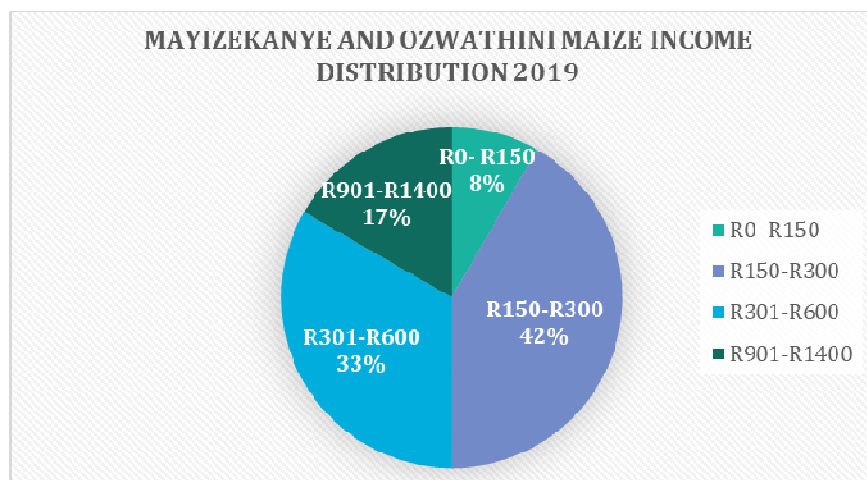

Figure 34: Income from maize yields for Midlands learning groups; 2018/19

Cornfields

Cornfields has been quite challenging to work in although there have been some few instances where things seemed like they were looking up. Maize yields for this season were very similar to those in the 2017/18 season at 2,0 and 2,2t/ha respectively. Mbuso Mkhize, our most consistent farmer who had steady increases in yield over the years got zero yield this year both in his trial and his own field. For the first time the family has to purchase maize meal and beans this year as they had previously acquired these from their CA trial which sustained them for up to three months.

Cornfields MAIZE YIELDS							
Name	Surname	Experiment	Number of bags	Grain weight (kg)	area (m2)	Weight (t)	weight (t/ha)
Zakhe	Xaba	Trial	5,5	106,857	300	0,107	3,562
Fisani	Ngcobo	Trial	2	11,216	200	0,011	0,561
Gwaja	Khumalo	Trial	2	38,589	300	0,039	1,286
Florence	Luthuli	Trial	4	62,804	300	0,063	2,093
Shintshile	Mbatha	Trial	1	26,689	200	0,027	1,334
Moses	Sthomo	Trial	3	53,743	300	0,054	1,791
		Control	35	518,977	1600	0,519	3,244
Mbuso	Mkhize	Trial	10	100,649	300	0,101	3,355
		Control	14	151,902	400	0,152	3,798
TOTAL							**21,024**
Average Yield							**1,998**

Mdungeni Miya

Mr Miya was quite surprised by the performance of his maize as like many, he had lost hope anything would grow after the scorching heat damaged most people's crops. Although he managed to harvest 12 crates (100 cobs each) from his trial, the cob sizes were generally small and some of the maize had been eaten by birds and chickens. Nonetheless he was happy to get any yield at all. In terms of his control plot, Mr Miya had not yet harvested but was expecting to get around 25 crates as the yellow maize seemed to have fared much better and had considerably larger cob sizes.

He attributes the performance of his crops to replanting later than everyone else. It was quite surprising that he managed to obtain a yield whereas Mbuso Mkhize and Shintshile Mbatha who are not very far from him experienced the opposite. Even the cover crops seemed to have fared quite well under the dry and hot conditions although sunflower flowered and went to seed early due to the lack of water.

BEAN AND COWPEAS YIELDS

Bean yields across 2017/18 and 2018/19 were similar, albeit low for both seasons. Farmers all seem to experience similar challenges with beans, which is field rotting due to dampness and they often experience the same fate with cowpeas. Pests were not a major problem this season

with only a handful of famers reporting issues with CMR beetles and cutworm. Farmers also had an issue with beans getting spoiled while in storage due to them harvesting the beans before they dried out properly due to wet weather conditions.

With regards to cowpeas, most participants did not obtain any yield, some due to leaving the cowpeas in the field and others lost their yield to both excessively dry and wet weather conditions during the season. Cowpeas did surprisingly well in Ozwathini with over 80% of participants obtaining a yield whereas only about 30% of participants normally obtain a yield for cowpeas.

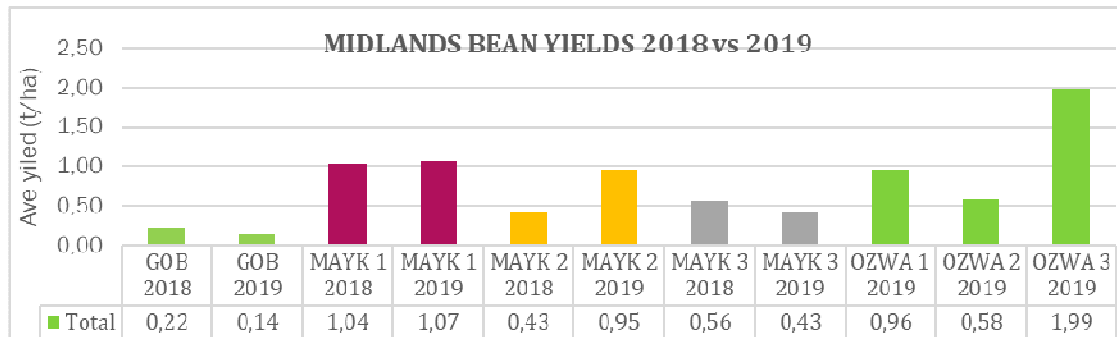|	GOB 2018	GOB 2019	MAYK 1 2018	MAYK 1 2019	MAYK 2 2018	MAYK 2 2019	MAYK 3 2018	MAYK 3 2019	OZWA 1 2019	OZWA 2 2019	OZWA 3 2019
Total	0,22	0,14	1,04	1,07	0,43	0,95	0,56	0,43	0,96	0,58	1,99

Figure 35: Comparison of bean yields for Midlands groups 2017/18 and 2018/19

Figure 36: Right, Mrs Ngobese's cowpeas (left) and Mncanyana's and Rita Ngobese;s bean yields

Figure 37: Below, images of bean and cowpea yields for Ozwathini

Cover Crops

Winter Cover crops were distributed in Ozwathini, Gobizembe and Mayizekanye , comprising of a mix of Saia oats, fodder radish and forage peas. Only one farmer in Ozwathini managed to plant them as the others said it was too late to plant since they would only harvest beans in May. In Mayizekanye and Gobizembe the cover crops performed very well with more than 80% of the farmers who received them having planted. Fodder radish grew most vigorously, followed by Saia oats. The forage peas were much less visible except in one or two households. The team visited each farmer for a close inspection of how they planted the cover crops and to monitor how they were growing. Results are summarised in the table below.

Table 7: Winter cover crop planting monitoring for Midlands; 2810/19

Name of Participant	Cover Crop Mix	Quantity	Method of PLANTING	% Germination
GOBIZEMBE				
Rita Ngobese	WCC (black Sia oats, fodder rye, forage peas)	3 cups	In maize row	90%
Lindiwe Zondi	WCC (black Sia oats, fodder rye, forage peas)	3 cups	In maize row	95%
Khombisile Mncanyane	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Did not plant	n/a
Smephi Chonco	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Relay cropped cc with beans	98%
Thanda Sithole	WCC (black Sia oats, fodder rye, forage peas)	3 cups	In maize row	Already grazed by cattle
Mayizekanye				
Ntombi Shandu	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Intercropped with maize	70% (too many weeds)
Nomusa Shandu	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Did not plant	n/a
Eunice Maphumulo	WCC (black Sia oats, fodder rye, forage peas)	3 cups	In between maize and in spaces were beans did not germinate	85%
Fikelephi Maphumulo	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Intercropped with maize	30% (degraded soil)
Lungile Phungula	WCC (black Sia oats, fodder rye, forage peas)	3 cups	Planted cc between maize and beans	90%
Mrs Ngubane	WCC (black Sia oats, fodder rye, forage peas)	1 cup	Broadcast cc on separate plot	Already eaten
Thembi Mkhize	WCC (black Sia oats, fodder rye, forage peas)	7 cups	Planted cc alone in separate plot	98%
Gogo Ndlela	WCC (black Sia oats, fodder rye, forage peas)		Was not available	n/a
Dumazile Nxusa	WCC (black Sia oats, fodder rye, forage peas)	9 cups	Did not plant	n/a
Mrs Mchunu	WCC (black Sia oats, fodder rye, forage peas)		Did not plant	n/a
Babhekile Nene	WCC (black Sia oats, fodder rye, forage peas)		Planted in between maize rows after harvesting maize and beans	Already grazed by livestock but farmer said germination was very good.

Below are a few indicative pictures

Figure 38: Right, Mrs Eunice Maphumulo's cover crops which she also planted in patches where beans did not germinate

Figure 39: Right, Simephi Chonco's cover crop. Quite an improvement from last season where she only planted a handful. This year she relay cropped them with beans

Figure 40: Rita Ngobe's cover crops; she had started to allow her livestock in for grazing

Figure 41: Thembi Mkhize's, she was so keen to try them out she demarcated part of her field just for cover crops

Figure 42: Nomusa Shandu's cover crops grew quite well but most had already been grazed except for radish

Key risk factors, adaptation strategies

The key risk factors for CA in the Midlands is weather variability and eroded soils. In the upcoming season the following suggestions will be given some attention.

➢ More attention will need to be given to experimenting with different planting times and designing planting calendars that can accommodate for weather variability as much as possible; in addition to trying out short season maize varieties.
➢ More attention needs to be given to high pest loads and pest outbreaks; such as stalk borer, beetles and caterpillars using an integrated pest management approach.
➢ A much ore concerted effort is to be made to diversify cropping options for the majority of participants including summer cover crops, Dolichos beans and fodder options.
➢ Specific interventions to control run-off will be required for the majority of participants. Ideas here include planting across the slope where participants are still not doing this,

contouring, mulching with weeds (which participants are reluctant to do, but is important), strip cropping, grass strips and agroforestry option.

➢ Participants from the newer villages in Appelbosch and Ntabamhlope, need to be introduced to their co-experimenters in the Swayimane area, as rich interchange and shearing of ideas is possible.

➢ Running farmer level symposiums on soil fertility and soil health issues, including soil and water conservation strategies is seen as important, as farmers still do not fully appreciate the significance of their management practices on the condition of their soils. They tend to focus more on weather conditions and crop varieties.

➢ There may be a need to separate the expansion and awareness raising aspects of this programme to an extent from the research aspects-

  o Further funding is required for the expansion, both in terms of resources for the inputs required for the farmer experimentation and the required logistical capacity to service many different areas

  o Research requires greater focus, time and technical expertise than some of the fieldworkers have and specific staff may need to be employed for this. Instrumentation and analysis is generally too expensive to fall within the present budgets

➢ Bringing other potential donors on board is important both for the research and the expansion as is the initiation of smaller, dedicated research projects within this process.

➢ Opportunities exist to work within the realm of climate change adaptation and payment for ecosystem services schemes, but this aspect is complex and will require focussed attention.

➢ Partnerships with government departments such as Agriculture, Rural Development will continue to be sought.

Budget summary by August 2019

Date of transaction	Type of transaction	Amount (R)
2018/10/08	Monthly expenses	64 191,04
2018/10/18	Monthly expenses	50 514,33
2018/10/26	Monthly expenses	75 856,43
2018/12/11	Monthly expenses	50 470,63
2018/12/11	Monthly expenses	90 960,00
2019/01/30	Monthly expenses	46 029,16
2019/02/28	Monthly expenses	38 631,50
2019/03/29	Monthly expenses	33 963,06
2019/04/30	Monthly expenses	42 412,30
2019/05/31	Monthly expenses	31 817,79
2019/06/30	Monthly expenses	29 874,16
2019/07/31	Monthly expenses	30 472,72
TOTAL AUG 2019		**585193,12**