

# **APPENDIX 2: BERGVILLE PROGRESS REPORT**

CA Farmer Innovation Programme for  
smallholders in Bergville  
Period: October 2017 - February 2018

---

**Farmer Centred Innovation in Conservation Agriculture  
in upper catchment areas of the Drakensberg in the  
Bergville region of KwaZulu-Natal**



*Compiled by:*

**Erna Kruger, Phumzile Ngcobo and Hendrik Smith**  
**March 2018**

***Project implemented by:***

**Mahlathini Development Foundation**

*Promoting collaborative, pro-poor agricultural innovation.*



**Contact:** Erna Kruger (Founder and Coordinator)

**Address:** 2 Forresters Lane, Pietermaritzburg, 3201, KZN

**Email:** [erna@mahlathiniorganics.co.za](mailto:erna@mahlathiniorganics.co.za), [info@mahlathini.org](mailto:info@mahlathini.org)

**Cell:** 0828732289

**Time of operation:** 2003-2016

**Legal status:** NPC

**BEE status:** 4. – Certificate available.

***In collaboration with:***



***Funded by:***



## Contents

<b>IDENTIFICATION OF THE PROJECT .....</b>	<b>4</b>
DESCRIPTION AND SELECTION OF STUDY AREAS.....	4
<b>APPROACH AND METHODOLOGY .....</b>	<b>4</b>
<b>KEY ACTIVITIES: OCTOBER 2017-FEBRUARY 2018 .....</b>	<b>5</b>
PROGRESS.....	6
<b>RESULTS ACHIEVED TO DATE .....</b>	<b>9</b>
CA PRACTICE.....	10
<i>Year 1 (1<sup>st</sup> level) trial outlines .....</i>	<i>10</i>
<i>Year 2 (2<sup>nd</sup> level) trial outlines.....</i>	<i>11</i>
<i>Year 3 (3<sup>rd</sup> level) trial outlines.....</i>	<i>11</i>
<b>SOIL HEALTH AND SOIL FERTILITY TESTS .....</b>	<b>12</b>
SOIL HEALTH INDICATORS .....	12
<b>FARMER CENTRES .....</b>	<b>16</b>
<b>PROGRESS PER AREA OF IMPLEMENTATION.....</b>	<b>17</b>
EQELENI .....	17
<i>Ntombakhe Zikode.....</i>	<i>18</i>
EMABUNZINI .....	20
MAGANGANGOZI.....	20
STULWANE.....	21
<i>Nelisiwe Msele .....</i>	<i>21</i>
<i>Phasazile Sthebe .....</i>	<i>22</i>
<i>Dlezakhe Hlongwane.....</i>	<i>23</i>
EZIBOMVINI.....	24
<i>Velephi Zimba.....</i>	<i>26</i>
EMANGWENI –EMAQELENI .....	26
<b>INNOVATION PLATFORMS AND FARMERS DAYS.....</b>	<b>27</b>
<b>PROBLEMS ENCOUNTERED, MILESTONES NOT ACHIEVED AND REASONS FOR THAT .....</b>	<b>29</b>

## Identification of the project

### Description and selection of study areas

Work in the Bergville (KwaZulu-Natal) site continued with the 17 village learning groups brought on board in the 2016-2017 season. Attention has been given to consolidating and expanding the learning groups within each village. In this way the numbers of farmer participants in farmer level trials have increased from 263 in the 2016-2017 season to 314 this season. The overall area for trials has increased from 13ha to 17 ha.

### 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 methodologies are used within the group to focus the learning on the actual growth and development of the crops throughout the season. New ideas 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 (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 (2017-2018) we have continued to focus on the following elements of the model, namely:

- a) Support farmers who are in their 1<sup>st</sup>, 2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> seasons,

- b) Conscious inclusion of crop rotation to compare with inter cropping trials
- c) Inclusion of summer cover crops in the crop rotation trials
- d) Continuation with experimentation with winter cover crops, but planted in separate plots rather than in-between maize
- e) Planting of late season beans
- f) More focussed introduction of lab-lab beans and
- g) Initiation of nodes for farmer centres that can offer tools, input packs and advice.

### **Key activities: October 2017-February 2018**

For this season a process of consolidation of existing learning groups has been the focus, along with implementation of the co-funded process from LandCare. Support here has been in the form primarily of implements, but also some seed and for hosting of farmers' days.

Researcher-managed trial plots have now been set up in Ezibomvini, Eqeleni and Mhlwazini to work on quantitative benchmarking of some of the visual CA indicators being used in this process. This includes rain gauges, run-off plots, a weather station, gravimetric soil sampling and use of infiltrometers for measurement of water infiltration; with the intention of comparing water balances across control and CA trial plots. In addition visual soil assessments have been conducted for 20 selected participants and soil health samples have been taken for 9 participants across four villages, along with 42 soil fertility samples for new participants and 30 repeat samples for existing participants to build a body of information about the soil fertility and soil health status of the CA trial participants.

Two stakeholder innovation platform events/ farmers' days have been conducted in Emmaus and Ndunwana respectively. Three cross visits have been hosted; one for the Growing Nations team from Lesotho in collaboration with KZN DARD, one for the mentors and coordinators for the GrainSA FDP and one for a team of researchers from the ARC SGI in Potchefstroom. CA participants have been included on cover crop learning event hosted jointly between KZN DARD and the KZN No-till Club.

Fourteen (14) Village Savings and Loan Associations are being supported and 7 of these groups have held their share out sessions in the last few months. A total of roughly R385 000 has been saved between these groups.

Progress for the farmer centre in Ezibomvini has been monitored. The centre now operates independently of support.

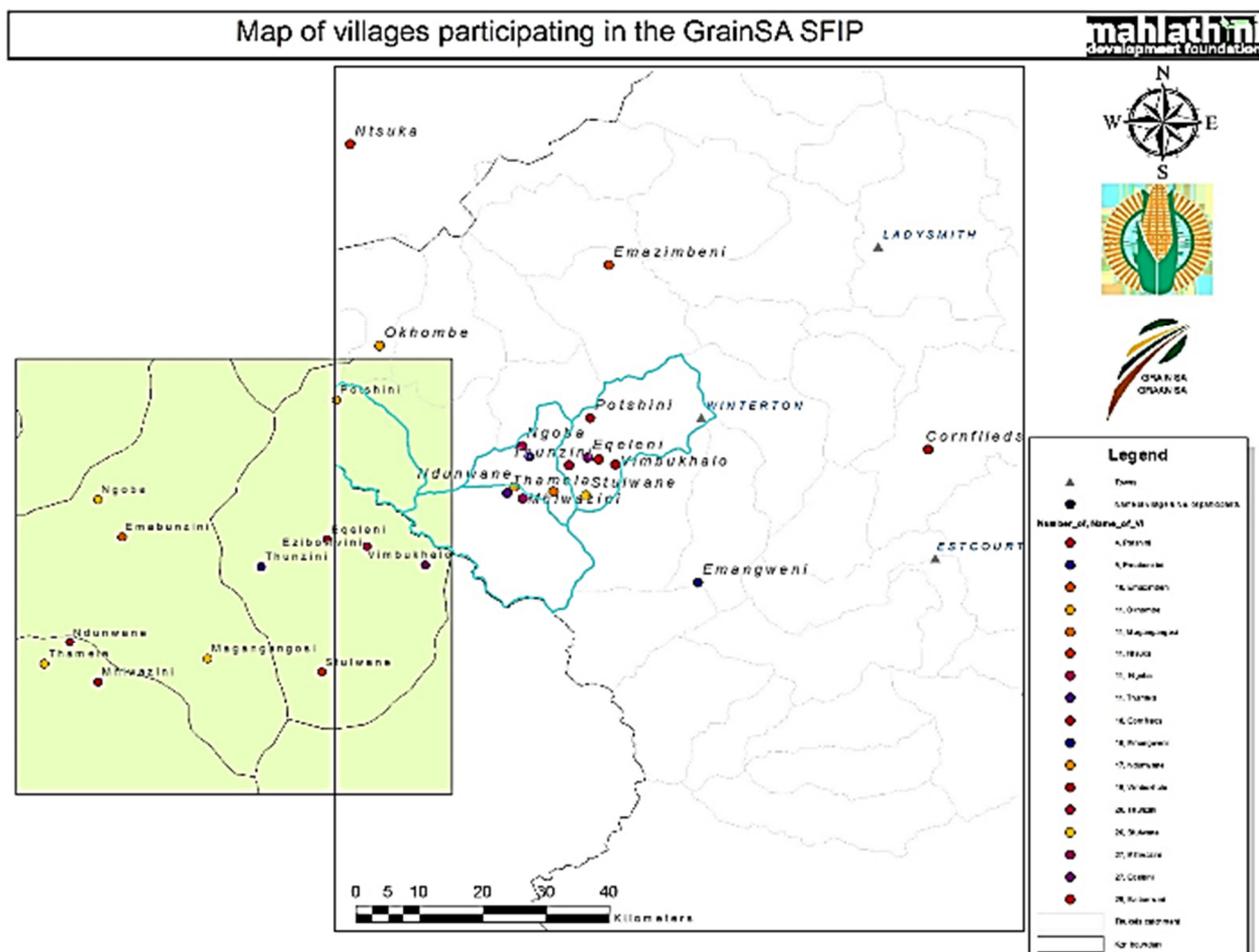
The table below outlines the key activities and deliverables planned for the period. The last column summarises actual expenses.

The budget set aside for the 1st six months (Oct 2017 to Feb 2018), according to the overall work plan is R307,109.50. Actual expenditure for the last five months has been R337,688.79. There has been over expenditure on budget in the last five months due to the large number of trial participants and purchase of the required inputs. This will be rectified in the coming months as further purchasing of inputs will not be required.

The materials and inputs budget for this proposal is R75,000. Actual expenditure on this budget has been R124,510. Through the farmer subsidies R23,865 was recouped into the materials budget, bringing the total inputs expenditure to R81,200. Expenditure can thus be considered to be within reasonable limits and to be on track.

## Progress

The project is now operational across 17 villages in the Bergville area, with a total of 314 learning group participants and 258 farmer-level trials. The map below indicates the clusters of villages around the Bergville and Winterton areas



The basic experimental design was followed for all 1<sup>st</sup> year participants and most of the 2<sup>nd</sup> year participants as well. Variations have included crop rotation, intercropping, summer and winter cover crop mixes, planting of lab-lab beans and late season planting of beans.

The table below outlines activities related to objectives and key indicators for the period of October 2017 -February 2018.

**TABLE 1: SUMMARY OF PROGRESS (OCTOBER 2016 - FEBRUARY 2017) RELATED TO OBJECTIVES AND KEY ACTIVITIES**

Objectives	Key activities	Summary of progress	% completion and comment
<b>1. Document lessons learned</b>	Documentation for learning and awareness raising	<ul style="list-style-type: none"> <li>- Manuals, promotional and learning materials</li> <li>- Sharing of information through innovation platforms processes</li> <li>- Articles and promotional material</li> </ul>	<ul style="list-style-type: none"> <li>- GrainSA promotional DVD used in learning sessions and events.</li> <li>- Shooting of CA implementation DVDs with Bergville CA participants</li> <li>- 2 farmers days, 3 cross visit learning events awa further meetings and workshops</li> <li>- 3 small articles in the grains newsletter; incl a case study for Phumelele Hlongwane (Dec2017, Jan 2018, Feb 2018), one article in the Adaptation Network newsletter (Jan 2018) (80% completion)</li> </ul>
	Final report	- 6 monthly interim reports	- Interim report finalised. Final report at end of project (50% completion)
<b>2. Increase the sustainability and efficiency of CA systems</b>	1 <sup>st</sup> level experimentation: farmers sue their own practice as a control – size 400m <sup>2</sup> ha exp, 400m <sup>2</sup> control, Control. farmers	- 12 villages, 56 farmers	<ul style="list-style-type: none"> <li>- Basic CA design- intercropping with maize beans and cowpeas on a 100m<sup>2</sup>- 400m<sup>2</sup> plot, with a control plot managed entirely by the participant.</li> <li>Adaptation trials included late season planting of beans with a mixture of winter and summer cover crops. (50% completion)</li> </ul>
	2 <sup>nd</sup> level experimentation: existing farmers use their own practice as a control – size: size 400m <sup>2</sup> ha exp, 400m <sup>2</sup>	- 14 villages, 118 farmers	- Adaptation trials included late season planting of beans with a mixture of winter and summer cover crops. Most participants opted to continue with intercropping practice from their 1 <sup>st</sup> year. (50% completion)
	3 <sup>rd</sup> level experimentation; own contribution, larger plots, own ideas	- 9 villages, 59 farmers	- Larger level plantings using oxen drawn planters and including cover crops. Intercropping still practised. Awa crop rotation and summer and winter cover crops. (50% completion)
	4 <sup>th</sup> level experimentation (inc also participants from 5 <sup>th</sup> year); own contribution, larger plots, own ideas	- 8 villages, 26 farmers	-Participants undertake their own combination of experimental plots that include intercropping, crop rotation and cover crops (summer awa winter). (50% completion)

	Develop and manage PM&E framework; – weekly and monthly M&E visits	- M&E forms redesigned and used - Digital monitoring system piloted	- Monitoring still to be done for winter cover crops and harvesting. Planting and growth monitoring moving towards completion (65% completion)
	Facilitation of innovation platforms	- Co- facilitation of information sharing and action planning with stakeholders and role players	- 2 Farmers days, 3 cross visits, numerous meetings and workshops (80% completion)
	CA working group, and reference group	- To attend in August 2018	-
	Sharing of information using a range of innovation platforms	-Attendance of a range of meetings, workshops, networking events and planning processes	- CCA processes linked to UKZN and the WRC - Meetings with DEA re CA adaptation and mitigation potential - Networking meetings; ProInnova, Green fund, -Student thesis inputs- Khetiwe Mthethwa – UKZN RRM Honours, Mazwi Dlamini – UWC PLAAS Masters (80% completion)

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; FEBRUARY 2018**

<b>Outputs</b>	<b>Proposed (March 2017)</b>	<b>Actual (Feb 2018)</b>
Number of areas of operation	2	2
Number of villages active	17	17
No of 1 <sup>st</sup> level farmer experiments	27	56
No of 2 <sup>nd</sup> level farmer experiments	80	118
No of 3 <sup>rd</sup> level experiments	125	59
No of 4 <sup>th</sup> level experiments	17	26
No of local facilitators	12	6
No of direct beneficiaries	270	258
VSLAs	11	14
Participatory monitoring and evaluation process (farmer level)	Yes	Yes

The process of focusing on the existing villages have bolstered the learning group numbers and most of the participants from last season (2016-2017) continued with their CA process. There has been some attrition for the 3<sup>rd</sup> level experiments; some reasons given by participants include inability to pay the subsidies and a wish to continue with CA without the intercropping experimentation.

## Results achieved to date

The framework for scaling out implementation included: Continuation with existing farmer experimentation options for 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> level participants. This includes intercropping, crop rotation, late season planting of beans and combinations of summer and winter cover crop mixes.

The table below outlines the villages, numbers of participants and experimentation processes for the present learning groups in the Bergville area.

**TABLE 3: ACTIVITIES AND NUMBERS OF FARMERS INVOLVED, PER VILLAGE FOR OCTOBER 2017-SEPTEMBER 2018.**

<b>BERGVILLE</b>	<b>Year started with CA</b>						<b>COMMENTS</b>
<b>Villages</b>	<b>2013</b>	<b>2014</b>	<b>2015</b>	<b>2016</b>	<b>2017</b>	<b>Total</b>	
Emabunzini				9	3	12	Intercropping with hand hoes and MBLI planters; Maize, beans, cowpeas
Emangweni-Engodini			14	3	2	16	1 <sup>st</sup> and 2 <sup>nd</sup> level experimentation; intercropping
Emangweni-Emaqeleni				8	6	14	1 <sup>st</sup> level experimentation; intercropping
Eqeleni	7	3	4	4	6	24	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> level experimentation; MBLI's hand hoes and animal drawn planters; intercropping crop rotation summer and winter cover crops, late season beans
Ezimbovini		6	4	10	6	25	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> level experimentation; MBLI's hand hoes and animal drawn planters; intercropping crop rotation summer and winter cover crops, late season beans
Magangangozi		9	1	8	4	21	1 <sup>st</sup> and 2 <sup>nd</sup> level experimentation; intercropping
Mhlwazini		6	10	7		23	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> level experimentation; MBLI's hand hoes, intercropping crop rotation summer and winter cover crops, late season beans
Ngoba			6	5	2	13	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> level experimentation; MBLI's hand hoes and animal drawn planters; intercropping crop rotation summer and winter cover crops, late season beans

Nsuka-Zwelisha				11		11	Intercropping with hand hoes and MBLI planters; Maize, beans, cowpeas
Okhombe		5				5	1 <sup>st</sup> and 2 <sup>nd</sup> level experimentation; <b>intercropping</b>
Potshini	1					1	3 <sup>rd</sup> level experimentation
Stulwane	7	4	2	1	4	18	1 <sup>st</sup> , 2 <sup>nd</sup> and 3 <sup>rd</sup> level experimentation; MBLI's hand hoes and animal drawn planters; intercropping crop rotation summer and winter cover crops, late season beans
Thamela				11	5	16	Intercropping with hand hoes and MBLI planters; Maize, beans, cowpeas
Thunzini				21		21	Intercropping with hand hoes and MBLI planters; Maize, beans, cowpeas
Vimbukhalo		8	4	10	6	28	1 <sup>st</sup> and 2 <sup>nd</sup> level experimentation; <b>intercropping</b>
Ndunwana			14		6	20	1 <sup>st</sup> and 2 <sup>nd</sup> level experimentation; <b>intercropping</b>
Emazimbeni				10	6	16	Intercropping with hand hoes and MBLI planters; Maize, beans, cowpeas
<b>Grand Total</b>	<b>15</b>	<b>11</b>	<b>59</b>	<b>118</b>	<b>56</b>	<b>258</b>	<b>17,4 ha trials; 13,4ha controls</b>

314 Participants across 16 villages are still registered and have been implementing the CA trials for between 1-5 seasons. This year 258 trials have been planted of whom 56 participants started this season for the first time.

### CA practice

Going into the 3<sup>rd</sup> year, the farmer experimentation protocols for each level of farmer participants has been more clearly defined, given that those farmers with more experience can now incorporate some of their own learnings and preferences in the trials, but the 1<sup>st</sup> level trial participants still need to get used to the overall CA planting process and thus the close spacing intercropping trial plots are 'prescribed' for them.

The protocols are outlined below:

#### Year 1(1<sup>st</sup> level) trial outlines

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 model)
- Mixture of basin and row planting models
- Use of no till planters (hand held and animal drawn)
- Use of micro-dosing of fertilizers based on a generic recommendation from local soil samples
- Herbicides sprayed before and/or at planting
- Decis Forte or Kemprin used at planting and top dressing stage for cutworm and stalk borer
- Planting of cover crops; winter mix in Autumn

Experimental design includes 2 treatments; planter type (2) and intercrop (2)

### Year 2 (2<sup>nd</sup> level) trial outlines

Based on evaluation of experiment progress for year 1, this 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 inter cropping planting methods
- Use of specific soil sample results for fertilizer recommendations
- Early planting and
- Own choices.

### Year 3 (3<sup>rd</sup> level) trial outlines

Based on evaluation of the experimentation process to date this protocol includes 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, or singly.
- 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 and
- Farmer level monitoring of trials for selected individuals.

## Soil Health and Soil Fertility Tests

Soil health tests were conducted again this season for a selection of participants. Now two participants from 4 different villages have been included. Mhlwazini has been brought on board alongside Eqeleni, Stulwane and Ezibomvini. See the table below

**TABLE: SOIL HEALTH SAMPLES TAKEN FOR BERGVILLE PARTICIPANTS; 2016/17**

Soil Health Samples					
<b>Mhlwazini</b>			<b>Trial</b>	<b>Control</b>	<b>Cover Crops</b>
Ntozana Zimba	Mhlwazini		(Maize, Beans)	(Maize)	
Phumzile Zimba	Mhlwazini		(Maize, Beans)	(Maize)	
<b>Stulwane</b>					
Mthuleni Dlamini	Stulwane		(Beans) (Cowpeas)	(Beans)	(Millet, Sunflower, Sunhemp)
Dlezakhe Hlongwane	Stulwane		(Beans)	(Beans)	
<b>Eqeleni</b>					
Smephi Hlatshwayo	Eqeleni		(Maize, Beans), (sorghum)	(Maize)	
Ntombakhe Zikode	Eqeleni		(Maize, Beans)	(Maize)	
<b>Ezibomvini</b>					
Phumelele Hlongwane	Ezibomvini		(Maize, Beans), (maize, lab lab), (maize, cowpeas), (lab lab)	(Maize)	(Millet, sunflower, sunhemp)
Zodwa Zikode	Ezibomvini			(Maize)	(Millet, sunflower, sunhemp)
Mtholeni Nkabinde	Ezibomvini		(maize, cowpeas), (lab lab), (maize, beans), (maize)	(Maize)	(Millet, sunflower, sunhemp)
<b>Total</b>					

## Soil health indicators

Soil health test results for 2-3 seasons have been collected for 4 participants in Bergville. These participants have all focused on both crop diversity (intercropping and cover crops) as well as crop rotation to a lesser extent in their CA trial plots. The figure below compares average soil health indicators for the various trial plots for the four participants

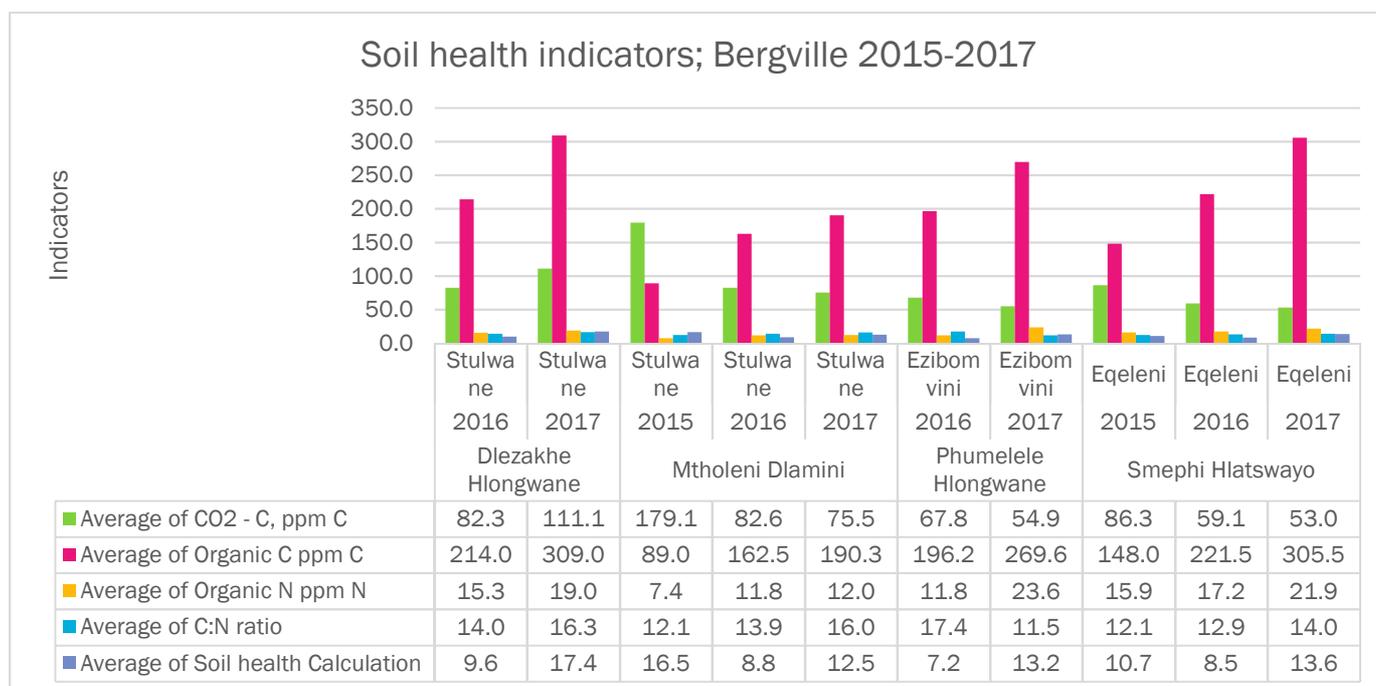


Figure 1: Soil health indicators for a selection of participants from Bergville 2015-2017

From Figure 1 above the following trends can be noted:

- The Organic Carbon content of the soil has increased for all four participants between 2015-2017.
- The Organic Nitrogen content of the soil has increased for all four participants between 2015-2017
- The C:N ratio of the soils has increased for three of the four participants. The only participant, Phumlelele Hlongwane, where this has decreased, is also the participant who has had the greatest crop diversity across her trial plots, as well as the most coherent crop rotation strategy.
- Soil health scores for all 4 participants have increased markedly between 2016-2017. Soil health scores decreased between 2015-2016 – this being an effect primarily of the amount of microbial activity in the soil. This is affected not only by cropping choices and patterns, but also by the general yearly climate in the area. The drought conditions in 2016 markedly decreased microbial activity.
- Microbial respiration (Solvita test) follows the same trend as the C:N ratios. There is a marked increase in soil health scores for all four participants from 2016-2017.

A comparison has been made of the different cropping options for a number of participants (N=9) for the three seasons in combination (2015-2017). Rotation has been practised along with these crop combinations. There are two assumptions:

1. Over time the differences between the cropping combinations will decrease, given the crop rotation and also general increase of soil health indicators.
2. The further assumption is that build- up of organic carbon and nitrogen over and above single crop options can be ascribed to the crop combination.

The figure below compared 6 different cropping options over a period of 3 years/ seasons for nine participants in Bergville

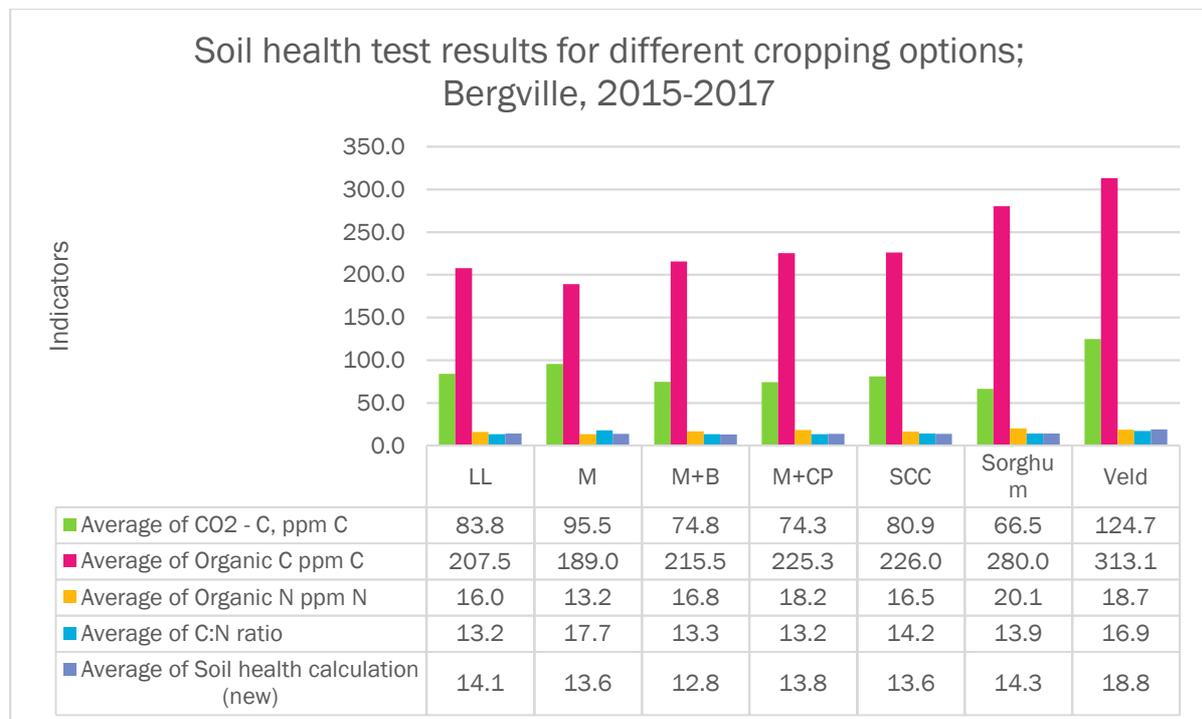


Figure 2: Soil health test results for different cropping options; 2015-2017 for Bergville

From the figure above the following observations can be made:

- Accumulation of organic Carbon is higher for all the cropping options besides maize; thus Lab-Lab (LL), maize and beans (M+B), maize and cowpeas (M+CP) summer cover crops (SCC) and fodder sorghum, in that order.
- Accumulation of Organic Nitrogen is higher for all cropping options besides maize, but in a different order; LL, SCC, M+B, M+CP, Sorghum in increasing order
- The C:N ratio is lower for the cropping options besides maize – and is lowest for the options that include legumes.
- The soil health scores for SCC, M+CP, LL and Sorghum are higher than for maize. The maize and bean intercrop has the lowest soil health calculation.

It is clear that planting more than one crop in a plot increases the accumulation of organic carbon and nitrogen in those plots more than planting single crops. Intercropping with maize and cowpeas provides increased soil health benefits to intercropping with maize and beans. Benefits of planting cover crops such as fodder sorghum and Lab Lab beans are higher in terms of soil health than just intercropping maize with a legume (beans or cowpeas). Planting a mixture of summer cover crops (SCC), increases organic carbon substantially, but not Organic Nitrogen – which is expected as the mix does not contain a legume.

If one explores the nutrient cycling for Nitrogen in a little more detail and interesting trend comes to the fore. The nutrient cycling capability of natural veld in the Bergville area is generally higher than any of the cropping options employed, including CA. The one exception to this is Ezibomvini. See the table below.

**TABLE 5: ORGANIC AND INORGANIC NITROGEN IN BERGVILLE; 2017**

2017	R value of Org N-CA	R value of Org N-Veld	N Long term release-CA	N Long term release-Veld	N(kg/ha) Total-CA	N(kg/ha) Total-Veld
Eqeleni	405	510	342	537	388	582
Ezibomvini	434	370	377	344	425	384
Stulwane	346	437	393	463	424	501
Mhlwazini	358	519	381	502	420	549
Grand Total	403	440	375	442	418	484

For all the different CA trial options tried in Bergville – Eqeleni (3-4 years), Stulwane (3-4yrs) and Mhlwazini (1-2yrs) the benchmark values (veld samples) for Nitrogen in the soil are higher than the trials. This indicates really good soil quality and shows also that there is still room for improvement in the implementation of the trials, given that the ideal situation is that the cropping practices can build soil health – store up and make available Organic N. The only exception here

is Ezibomini. Here the participants have managed to build up both the long- term release N and the total N in their soils to values above those for the veld benchmark.

Organic Nitrogen to a Rand value of R64 above the veld benchmark is available in the trial plots in Ezibomvini, indicating a potential saving of around 5.9% on fertilizer applications.

This is borne out in the soil sample results for three participants in Eqeleni, as an example. Here soil samples were taken at the start of their experimentation 2013-2014, then in 2016 and again in 2017. The idea is to see whether the implementation of CA has an effect on the amount of fertilizer required. The results are shown in the figure below and the assumption is that over time the amount of fertilizer required should decrease.

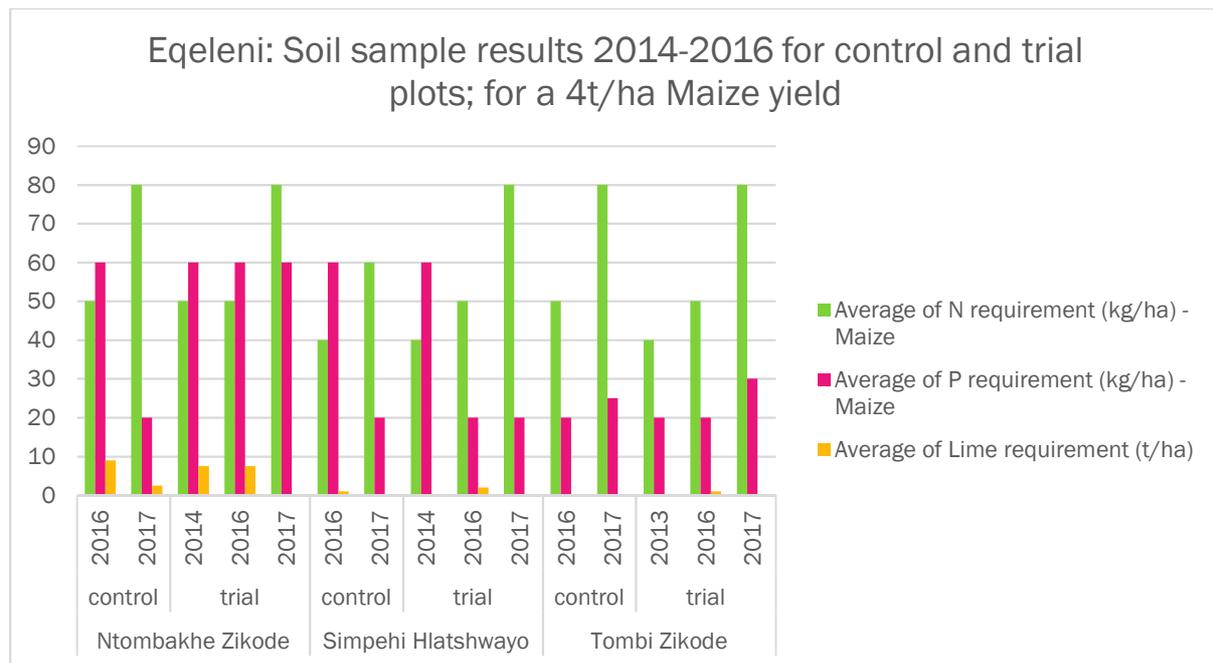


Figure 3: Soil sample results for three participants in Eqeleni for 2014, 2016 and 2017

From the above figure the following observations can be made:

- The application of maintenance amounts of lime (1t/ha) has managed to reduce acid saturation and also the amount of lime required. By 2017, none of the participants have required any more lime in their trial plots.
- The amount of Nitrogen required in both the control and trial plots has increased every season. This means that crops are using more Nitrogen (organic and inorganic) than is being supplied by inorganic means and that the intercropping practices employed by these participants are not enough to reduce the required N. The average N required for the control and trial plots is the same at 73kg/ha, for the 6 participants for whom repeat samples were taken.

The amount of P required has reduced substantially for two of the three participants (Nthombakhe Zikode and Simpehi Hlatshwayo, for both their control and trial plots. The average P required for the control plots in Eqeleni is 31 kg/ha and that for the trial plots is 41k g/ha.

## Farmer Centres

The Ezibomvini farmer centre is doing well and the owners in Mam Phumelele Hlongwane and Mam Zodwa Zikode have taken a lot of responsibility upon them to make sure that the centre is operational. This season the pair have sourced their own transport for the inputs available at the farmer centre. From the records below inputs such as fertilizer, seed, and herbicide are in high demand during the in season and these are readily available at the centre.

**TABLE 6: EZIBOMVINI FARMER CENTRE RECORDS: JULY2017-FEB 2018**

Date	Description of input	Total	Mark up 20-25%
25/07/2017	12 bags Savana seed	R1740	
27/07/2017	Quick force pesticide Bulala zonke pesticide	R162.03	
22/11/2017	Seed:-10x2kg	R690.00	
22/11/2017	Fert 3:2:1(25)+ZN-1X50KG Roundup(1L) 540 Glyphosate Powermax Seed maize PAN 6479 -1 X10KG Seed maize PAN 413 - 1X2KG Seed maize PAN 413 - 1X5KG	R2185.42	
24/11/2017	Seed PAN 6671 1X5KG	R367.10	
24/11/2017	Fert MAP+0.75% ZN- 1X50KG Kynoch Fert KAN(28)- 1X50KG Fert 3:2:1(25)+ZN- 1X50KG	R1806.40	
<b>Farmer Centre records continued below....</b>			
24/11/2017	Seed maize PAN 413 - 1X5KG	R357.90	
24/11/2017	Roundup(1L) 540 Glyphosate powermax	R865.40	
06/12/2017	Plastics jumbo 100'S	R61.99	
07/12/2017	Round up (1L) 540 Glyphosate powermax Fert 3:2:1(25)+ZN- 1X50KG	R1384.90	
07/12/2017	Seed PAN 6671- 1x5kg	R367.10	
08/12/2017	Fert 3:2:1(25)+ZN- 5X50KG	R1460.68	
08/12/2017	Round up (1L) 540 Glyphosate powermax	R216.30	
14/12/17	Round up (1L) 540 Glyphosate powermax	R216.30	
01/11/18	Fert LAN 28% 50kg	R 1771.80	
01/02/18	Fert LAN 28% 50kg	R 759.30	
<b>Sub total</b>		<b>R 12 368.54</b>	<b>R 3 092.14 (Profit)</b>
<b>Total</b>			<b>R15 460.68</b>

The markup on inputs provided at the farmer centre has increased from 12.5 % to 20-25%. This is because of increased cost of inputs in markets and also as a result of increased transport cost

since the farmer centre has on its own initiative financed the delivery of 90% of the inputs sold at the farmer centre.

### Progress per area of implementation

The monitoring process has seen the achievement of 20%-30% of monitoring for all participants (260) of the programme to date with the process still being continued. This is due to the number of participants in the programme.

The areas has felt the hard hitting effects of consistent hot and dry conditions that prevailed just before the growing season which carried on into the growing season. The effects of this was seen by poor germination in most fields which led farmers to replant in cases of inconsistent germination especially for the maize. The dry bean plants have also struggled to an extent showing signs of Nitrogen deficiency in the yellowing of the lower leaves.

A series of trainings were undertaken by Mahlathini Development Foundation field staff which were aimed at further entrenching the principles of CA and looking at the significance of different practices, fertilizer and spraying regimes and the significance of cover crops. The benefits of this trainings are seen through increased experimentation with cover crops where even first year participants are experimenting with cover crops after having heard of their importance.

Below are snapshots of implementation for a selected number of villages.

### Eqeleni

The village of Eqeleni is situated in Emmaus and is in its 5<sup>th</sup> year of programme participation The learning group is led by Mam Smephi Hlatshwayo as the community facilitator and currently has 25 participants, 6 (six) of which are new participants of the programme having joined in the current 2017/2018 season.

**TABLE 7: SUMMARY OF MONITORING OF EQELENI VILLAGE.**

Name and Surname	Size (m <sup>2</sup> )	% of residue	% Germination- Maize	Beans	Cowpeas	Summer cover crops(yes/no)	Crop rotation	Comments
Smephi Hlatshwayo	1000	1-2	80.3	54 (Gadra) 76.2 (usuthu)	Not planted	yes	yes	Good maize & beans stand, stalk borer in maize, beetles in beans.
Khishiwe Cebekhulu	400	0-1	60.6	55.2	Not planted	no	no	Maize grew well, some of beans rotten after germination
Sibongile Zikode	1000	0-1	70.5	21.7	86	yes	no	Good maize stand, Stalk borer damage, poor bean germination

Ntombakhe Zikode	1000	2-3	90.2	53.3	70	yes	no	Good maize, beans, cowpeas, summer cover crops stand, stalk borer, heat stress
Thokozile Mphambo	400	0	64	43	65	Yes		Lot of weeds, poor germination in beans.
Philile Zondo		0	80.3	57	88	yes	no	
Tombi Zikode	600	0-1	65.2	51.6	69.5	no	no	Too much weeds, beetles damage beans
Thulile Hlongwane	400	0	47.1	32	50	no	no	Lot of weeds, stalk borer damage
Nonhlanhla Dlamini	400	0	66.2	36.5	67.7	no	no	Lot of weeds
Thulile Zikode	1000	0-1	55.2	52.2	55	yes	no	Stalk borer damage, heat stress, too much weeds

### Ntombakhe Zikode

Ntombakhe Zikode, a 4<sup>th</sup> year participant in the programme, was chosen for a specific liming experiment, given her ongoing difficulties with soil acidity and run-off and resultant yield losses. In the last season her lime requirement was 10,25t/ha. The experiment consisted of ploughing in lime at a rate of 10t/ha or surface application on her CA plots (also 10t/ha). The results obtained in terms of yield increases are summarised again in the small table below

Names	Ntombakhe Zikode (Eqeleni)	
	2013	2016
Surface liming plot (maize yield (t/ha))	1.72	3
Lime and plough plot (maize yield (t/ha))	2.5	2.6

Given that result, a further maintenance lime application equivalent to 1 ton/ha has been applied to her trial this 2017/18. The results from the season 2017/2018 season showed that for her control she required lime to applied at a rate of 4.5 ton/ha and 3 tons/ha for her trial plot. This is a significant decrease in lime requirements from the previous season.

The current season's soil sample results show a 0.3 increase in pH of her trial plot from 3.85 in the 2016/2017 season to 4.15 this current season and an improved acid saturation decreasing from 36% to 15%.

Below is a diagram of Mrs. Zikode's trial plot layout and control;

Control		
Sole maize		
SCC mix Sunflower, millet & Sunnhemp mix (10m x 10m)	Maize & beans intercrop (20m x 20m)	Maize & beans intercrop (20m x 20m)

Maize & cowpeas Intercrop (10m x 10m)	Maize & beans intercrop (20m x 20m)	Maize & beans intercrop (20m x 20m)
---	--	--

Mrs. Zikode planted her trial in the 24<sup>th</sup> of November 2017, using PAN 53 (Maize) and Gadra (dry beans), awa mixed brown cowpeas. Germination percentages in her field were good ranging at 80-90% for her maize (replanted) and ranging 50%-60% beans and 60-70% cowpeas. Subsequent maize growth has been somewhat stunted, with heavy infestations of stalk borer. Sunflower and millet germinated and grew well. The Sunnhemp however, did not germinate.

25kg of MAP fertilizer was applied as micro dosage in 1000m<sup>2</sup> trial at a rate of 5g/basin. She used the same MAP dosage in her control (5g/basin). An inter- and intra-row spacing of 50 cm × 50 cm was used for planting the maize and 25cm x 25cm for planting beans and cowpeas. Two seeds were planted per basin. Mrs. Zikode top dressed her trial plots with 12kg of LAN (Lime Ammonium Nitrate) around 6 weeks after planting. She used a hand hoe for planting as her soils were very dry at that time and the MBLI planter was ineffectual.

Mrs. Zikode used a post-emergence herbicide called “Clear Out” – a glyphosate based herbicide similar to Roundup, 2 days after planting for controlling weeds in her trial and weeds died after spray. She used 320ml/ 16L knapsack sprayer and 10 ml of Decis Forte. The timing of spraying the herbicide is not part of the recommendation given- which is 2 weeks prior to planting. It is becoming clear however that very few participants manage this provision.



Left: Ntombakhe Zikode's plot to summer crop mix (sunflower, sunnhemp and millet); Right: Maize and cowpea intercrop



### Emabunzini

The village of Emabunzini, an extension of Ngoba village was affected by heavy rains and hail storms ( 8<sup>th</sup> December,) Crops were severely damaged, calling for replanting in some instances. Seed and fertilizer has been provided in these respective villages to replace the damaged plants. Although the effects of the storm were seen in other villages such as Ezibomvini and Vimbukhalo these were not as severe as in the case of Emabunzini and Ngoba. *Right: Valindaba Khumalo's plants washed away by heavy rains.*



### Magangangozi

For the past three or more seasons the programme has been operational in the Magangangozi village but progress has been slow, with questionable commitment from participants especially toward the maintenance of the trials.

Many farmers in the village are also part the Grain SA farmer development programme and often there has been limited understanding on the differences between the two programmes, type of seed used and management thereof.

This season more attention has been given to this group to alleviate these confusions and ensure smooth operation of both programmes. Review and planning meetings were held prior to the growing season aimed at outlining the principles of CA practice and procedure of experimentation with CA trials. On the 4<sup>th</sup> December the team engaged in a planting workshop with the group to assist in the establishment of trials following the programme's outline.

*Left and right;  
Demarcation of plots  
and preparation of  
rows applied with  
lime for bean planting*



Monitoring for the group this season has shown much more effective implementation, although growth of the trials has been very average, given the difficult weather conditions of the season.



*Left: Maize and Bean Intercrop Mam Thulile Zondo (Magangangozi)- signs of yellowing especially of beans due to excessive hot and dry conditions.*

### Stulwane

The Stulwane village is in its fifth year of programme participation and in recent years has been seen to be growing from strength to strength. During the drought season of 2015/2016, the farmers did not plant maize, but opted for a late season bean crop. This was quite successful and is now a practice that is incorporated annually. This season again showed difficulties in germination and growth due to extreme heat and dry conditions. This was followed by heavy rains late in the season and has led to excessive late season weed growth. Apart from the weather extremes stray livestock have been a challenge damaging some of the planted crops.

There are a total number of 19 participants for the 2017-2018 seasons. 15 Participants planted 1000m<sup>2</sup> trials and 4 participants planted 400m<sup>2</sup> plots.

### Nelisiwe Msele

Nelisiwe Msele is a 4<sup>th</sup> year participant of the programme and assists as a local facilitator in the village because of her good administration skills. She quickly took on learning how to fill out the plant and crop growth monitoring forms, which the team filled out with her in the early stages. This was a huge weight lifted of the team's shoulders and good transfer of skill.



*Left: Mahlathini Development Foundation staff orientating Mam Msele on Plant and crop growth monitoring*

### Phasazile Sthebe

Mam Phasazile Sthebe is a 58 year old unemployed woman, who joined the programme in 2013. She has planted her 1000m<sup>2</sup> trial to:

- Intercrop (Maize and beans) and (Maize and cowpea)
- Sole crop (beans) and (maize)
- Summer cover crop mix (sunflower, sunhemp and millet)

In previous growing seasons Mam Sthebe was experiencing poor growth and crop quality in her fields due to her highly acidic soils; pH 3.81 and an acid saturation of 53% for the 2016/2017 season. She was also included in the liming trial of that year, having a recorded requirement of 11,5t/ha of lime. She applied the equivalent of 11,5t/ha both in her control plot (ploughed in 0 and as a surface application in her trial plot. The small table below summarises her yields from that trial.

Names	Phasazile Sthebe (Stulwane)	
	2013	2016
Surface liming plot (maize yield (t/ha))	2.67	3.4
Lime and plough plot (maize yield (t/ha))	-	1.6

This season she continued with the maintenance lime application at a rate of 1 ton/ha. Overall her plots were characterized by good growth and good germination even though stray livestock grazed in her maize and cowpea plot during the early stages of growth.

*Right and below are photos of Mam Phasazile Sthebe in her field and her trial plots pictures, Note: Poor picture quality due to bad weather on day of monitoring*





*Above Left and right: Mam Sthebe beans showing yellowing of leaves and beans sole crop plot*

### **Diezakhe Hlongwane**

Mr. Hlongwane, is also in his 5<sup>th</sup> year of implementation. He used an animal drawn planter to plant his control of sole maize. He used his own oxen for planting but is however open to help other people with oxen if he/she wanted to plant with them as these have become limited in the village due to theft and death of livestock.

His trial plots he planted by hand. He used a rotation of plots combining intercropping; with 2x maize and bean plots (10mx10m), 2 x maize and cowpea plots, and 3-4 single crop plots of maize and beans. He planted one plot of summer cover crops on a plot at the edge of his field with low fertility.



*Above left to right: Mr. Hlongwane while he was planting his control of sole maize using animal drawn planter, growth of his summer cover crops and explaining the layout of his intercropping trial (maize and cowpeas).*

### Ezibomvini

Ezibomvini has a total number of 24 participants. There are 12 participants experimenting on 1000m<sup>2</sup> trial plots and another 12 experimenting 400m<sup>2</sup> trial plots.

**TABLE 8: SUMMARY OF MONITORING FOR EZIBOMVINI VILLAGE.**

Name and Surname	Size (m <sup>2</sup> )	% ground cover	% Germ Maize	% Germ Beans	% Germ Cowpeas	% Germ Lab lab	SCC (yes/no)	Crop rotation	Comments
Zodwa Zikode	1000	1-2	64.4	52 (some already harvested)	27.5	no	yes	yes	Wind damage, hail damage, Mbili planter not performed very well.
Tozi Zikode	1000	1-2	48.5	Already harvested	70	85	yes	yes	SCC germinated very well, uneven spacing, beans not germinated very well

Ntombenhle Hlongwane	400	0-1	36.5	19.2	15.2	no	no	no	Too much weeds, very poor germination in maize beans & cowpeas.
Phumelele Gumedede	1000	0-1	46.2	24.5 (some already harvested)	25.7	no	yes	yes	Did not spray due to heavy rains followed, Too much weeds, uneven growth,
Velephi Zimba	1000	1-2	57.9	Already harvested	70	no	yes	yes	Stalk borer damage, too much weeds,
Cabangile Hlongwane	1000	0-1	48.3	Already harvested	67.5	70	yes	yes	Uneven growth in SCC, termite damage
Mantombi Mabizela	1000	0-1	44.4	Already harvested	70.5	39	yes	yes	Weeds sprayed but not die, lot of weeds cause crop suffocation
Balungile Mhkwanzazi	1000	0-1	44.6	Already harvested	45	no	yes	yes	
Gcinekile Zikode	400	0-1	49.5	Already harvested	45	no	30	yes	Poor germination in maize & SCC

### Velephi Zimba

Velephi Zimba is a 67 year old woman, a mother of 4 children. She joined the Grain SA conservation agriculture programme in 2013. She has a vegetable garden in her homestead planted to spinach, cabbage, onions and chillies and has 6 indigenous chickens. She has been a member of a VSLA called Ukuzama for 4 years; saving primarily for household purposes. Mrs Zimba's trial was heavily affected by stalk borer at the beginning of the season. Decis Forte pesticide 10 ml/16l was applied at top dressing stage and it worked very well. Mrs. Zimba also experimented with summer cover crops; sunflower, millet and Sunnhemp. Sunflower grew very well followed by millet and Sunnhemp which did not grow well.



*Right: Mam Velephi Zimba standing next to her SCC mix (sunflower, sunhemp and millet) plot*

### Emangweni –Emaqeleni

The village of Emangweni –Emaqeleni, in the Loskop area, is currently in its second year of implementation. The group has a total of 15 participants of which 7 are new. All are planting 400m<sup>2</sup> trial plots.

This area is some distance away from the other sites and led to a bit of a lack of focus in the last season. This has been rectified in this current season, by providing learning workshops and planting demonstrations to ensure full involvement of the participants.

Workshops have proved to be extremely helpful because the previous years with the involvement of other programmes which use GMO seed farmers tend to be confused and end up using GMO chemicals for non genetically modified seeds. We observed that farmers now have a clearer understanding of these different factors.

On the 23<sup>rd</sup> of November 2017 a planting workshop was held in this village. The workshop included the illustration of the CA principals.



*Above Left to right: Participants measuring the field and applying lime in preparation of planting, Khathazile Hadebe's trial plot and a maize and cowpea intercrop plot in Emangweni*

### **Innovation platforms and Farmers days**

The Land Care unit of the KZN DARD has provided some support to the SFI programme in this present season. Part of this support consisted of co-hosting open days in our areas of operation.

One such awareness day was held in Bergville, Emmaus on the 3<sup>rd</sup> November 2017. A total 78 people including farmers from Ezibomvini, Eqeleni, Thunzini, Stulwane, Vimbukhalo and Emazimbeni, Mahlathini development foundation staff and the local department agriculture personnel in Bergville were in attendance with the theme of the day being *Conservation agriculture principles and the importance of cover crops*.

Under the same theme another awareness day was held in the village of Ndunwana on the 15 February 2018 where participants from other villages including Mhlwazini, Magangangozi, Ngoba, Emabunzini, Thamela, Nsuka, Okhombe and farmers from Emmaus (Ezibomvini and Eqeleni).

Such platforms are a good way to encourage learning both between farmers themselves and also from stakeholders present but more so as a good platform to share ideas and find solutions to common problems. The presence of limited stakeholder engagement was a means to centre the proceeding of the day around farmers themselves and encourage them to share their experiences practicing the different systems, i.e. intercropping, crop rotation, mixed cropping and also the inclusion of cover crops in systems for not only additional soil health benefits but also as a way of using cover crops to include livestock and form a more integrated system. And with this increase adherence and understanding of systems would be achieved.

Discussed on the day was:

- The importance of soil cover by Local extension officer – Mr Msimang(KZN DARD)
- Conservation agriculture in the context of Bergville- Ms T. Mathebula (MDF)
- Testimonies from farmers Stulwane, Ezibomvini , Vimbukhalo, Speaking about a wide variety of items from benefits of intercropping( Nelisiwe Msele), crop rotation and experimentation with cover crop and their significance (Phumelele Hlongwane) as well as testimonies regarding different trials i.e liming and the differences observed before and after experiment (Phasazile Sithebe). As well other farmers who shared an improvement in yields obtained in their fields.

Seen as most important was that many farmers present left with an increased interest in the experimentation with cover crops after having heard from other farmers who have experimented with them.

Before invasion of stray livestock was the biggest issue leading to non experimentation but from other presentations given on the day about the immeasurable benefits on the overall soil health status of one's soils, the team was confident that we would see an increased number of farmers in this growing season who have experimented with cover crops and indeed we did.



*Above left and right: Local Induna & Local Extension Officer Mr Msimang addressing farmers present at the Awareness day*

The Ndunwana awareness day was attended by not only the participants of the programme but this day was attended by other stakeholders including the Kwazulu Natal Department of Agriculture (provincial and local) officials and other NGO's including Lima Rural development Foundation.

Speakers on the day shared invaluable information with the farmers about the significance of nitrogen and how it contributes to crop growth, quality and yields obtained (Bright Mashiyana) Significant pest and diseases were discussed along with relevant preventative and control measures (Taslos Magubane). Nutrient cycling and the importance of cover crops was discussed

by Charmaine Mchunu outlining the importance of CA practices including cover crops as a means to improve the health of one's soils. Farmers also shared their testimonies on their experiences experimenting with conservation agriculture principles.



*Above left and right: Mr Bright Mashiyana and Mr Taslos Magubane (KZNDARD) addressing farmers*

### **Problems encountered, milestones not achieved and reasons for that**

1. Support for transport of inputs to the respective villages, from TWK in Winterton, was promised but not forthcoming in this present season. A new manager has been employed, who is not as supportive. This meant an inordinate amount of driving for the field team who had to undertake the deliveries and this slowed the implementation. Planting was thus delayed by a few weeks.
2. The maintenance quantities of lime of 1t/ha were supplied for all trial participants. The field team is aware that there are individual participants who require much larger quantities of lime- but the programme is unable to assist in this regard- due to budget and resource constraint.
3. Consolidation of the 17 existing villages has been a good idea – as the team is at the limit of their implementation capacity. This does mean that bringing new villages on board – of which there are a number will be a huge challenge going into the next season.
4. More care needs to be given in assisting, or working with the longer term trial participants; 4<sup>th</sup> and 5<sup>th</sup> years in their layout of their trial plots. Their understanding of crop rotation is reasonably superficial and they rotate only two crops maize and beans. This will not be a strong enough rotation system in the longer term.
5. With respect to the payment of subsidies for the trials, this year payment in some of the groups has been very promising. We have however seen a bit of attrition in the older groups as some participants have fallen away through not being able to pay for their trial inputs. This is not a problem in and of itself, but it does mean that the poorer participants, or those less organised are being excluded. Overall not enough is being recouped from

these subsidies to cover the trial input costs for such a large group of participants. Further financial support for this process will need to be found.

6. Monitoring has been streamlined in the present season, with different field team members being responsible for certain aspects such as the visual soil assessments, the soil fertility sampling and analysis, and the quantitative measurements. There has however been a bit of a lack of communication between the team members and so not all the data has been coherently recorded. The issue was picked up mid-season and has been rectified, but some of the early season data is now unavailable.
7. Not much progress is being made with the PES system development. It has however been decided to work primarily from the 3 major CA principles instead of the more detailed indicators that have been used previously. Some time will be set aside in April and May this year to focus on this aspect.