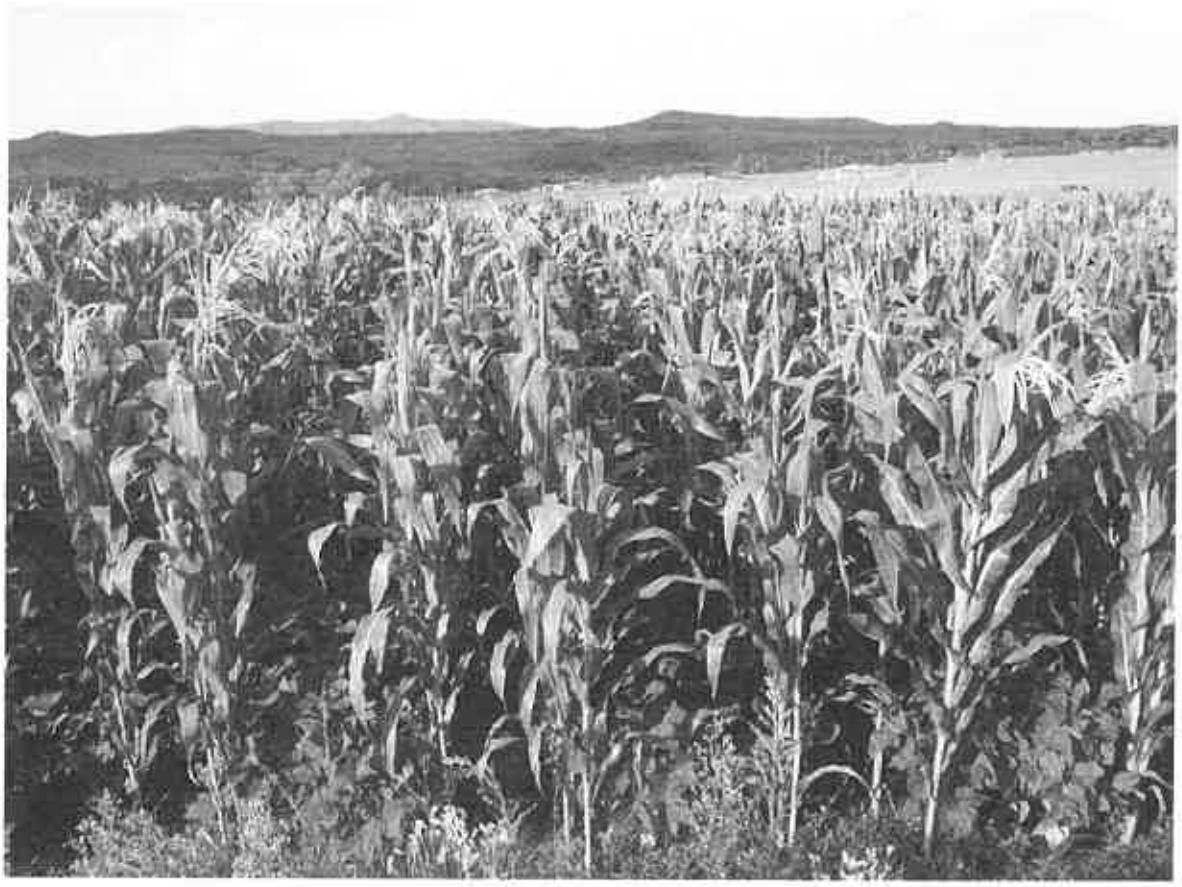
APPENDIX 2: BERGVILLE ANNUAL REPORT

CA Farmer Innovation Programme (CA-FIP) for smallholders, Grain SA

July 2014 to September 2015

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



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EXECUTIVE SUMMARY

Farmer Centred Innovation in Conservation Agriculture in Bergville, KwaZulu-Natal
Compiled by: Mahlathini Organics
September 2015

This report outlines the progress of the 2nd year of the CA SFIP programme supported through GrainSA. Smallholder farmer work together in village based learning groups. Some among their number undertake the farmer experiments and the others join in the observation and learning sessions. The farmer level experiments are done on small plots within their fields and smallholders undertake to provide all labour for the trial plots as well as planting their own control plots. This season 2nd level farmer experimentation (2nd year) in CA was undertaken for 25 participants in Stulwane and Emmaus villages around Bergville, KZN. In these two villages the number of farmer experimentation participants was increased using a farmer volunteer model, where each 2nd level farmer brings on board 5 new farmers and supports them throughout the season. A further 58 1st level farmer participants (1st year) have been brought on board from 7 more villages. Potshini was largely removed as a participating village due to a lack of participation, but one farmer was still supported there. The support from local facilitators in each of the more established participating villages has been invaluable.

The partnership with the NGO SaveAct, which works through commodity interest groups focussed on a value chain approach was continued and worked well. These smallholders all belong to community based saving and credit groups, which enables them to be able to save for agricultural inputs and other household needs. This has provided a farmer level platform for setting up bulk buying within these groups.

This season a number of variations were introduced into the basic planting regime for the 2nd level participants. Those in their second year were given a number of variations to choose from. These included; earlier planting, different varieties of OPV and hybrid maize (both white and yellow), two varieties of sugar beans, Dolichos cowpeas and a local runner bean and a choice between the generalised fertilization regime or one specific to their soil sample results. Only one planting method per participant was used; choosing between hand hoes, MBLI hand planters and animal drawn planters. Different combinations of herbicides were used to reduce costs and minimise the use of systemic herbicides. This was only partially successful.

Good growth and yields were obtained and many farmer participants in their 2nd year of experimentation expanded their plantings considerably and also used CA on their control plots instead of ploughing. Generally yields were slightly lower than the previous season due to adverse weather conditions, with a trial plot average of 3,6tons/ha for maize. Control plot yields averaged 2,3tons/ha. Yields for sugar beans and cowpeas were exceptionally low this season. The average yield for last season was 1,3 tons/ha and the present season only 0,29tons/ha. Cover crops also have not fared too well in the intercropped close spaced scenario being implemented. Different regimes for beans and cover crops are to be tested in the next season.

The intention has been to use a number of different types of indicators and processes for monitoring, to be able to compare these and consolidate the process into a 'best bet' option for monitoring that is both robust enough for the inaccuracies and difficulties of smallholder monitoring processes but sensitive enough to pick up yearly changes in individual management practices. The processes used include measurement of yields of the trial plots compared to the control plots, the CA monitoring scores (made up of a visual assessment of percentage ground cover, weed infestation, pest occurrence and general growth of the crop) and for this year the VSA scores (Visual Soil Assessment Scores).

For the CA monitoring scores, It is possible to make a cautious suggestion that these scores can be used for assessment in an incentive based system – although it may mean that participants are penalised quite heavily for late weeding, while they had undertaken the rest of the CA practices reasonably well. Measurement or estimation of yields have also become more reliable since the introduction of a standard bag size for all participants to use.

KEY ACTIVITIES

The table below outlines the key activities and deliverables planned for the period of July 2014-June 2015.

TABLE 1: KEY ACTIVITIES, OUTPUTS AND DELIVERABLE FOR BERGVILLE: JULY 2014-JUNE 2015; PLANNED BUDGETS AND ACTUAL EXPENDITURE.

CA smallholders in Bergville: Milestones/ Outputs				
Key activities	**Expected Outcomes/ Deliverables**	**Planned Budgets**		**Expenditure**
Reporting, documentation, administration, sundries	Meeting and monthly reports	Administration and sundries (R8 850/ month)	R 105 080,00	R 105 671,02
Farmer level experimentation (1st and 2nd level)	List of participants, interviews and contracts, awareness and training	Farmer led experimentation (R24 000/ month)	R 240 000,00	R 218 499,44
Set up experimentation	Commodity interest group MoU's, inputs, materials, farmer centres	Farmer led experimentation	R 103 248,00	R 141 601,99
Monitoring and evaluation, market based mechanisms, students and interns	Quarterly reports, monitoring reports, baselines , presentations	Reporting and Administration	R 20 748,00	R 19 735,15
Innovation platforms and awareness		Innovation platforms	R 9 396,00	R 10 412,28
Totals			**R500 072,00**	**R 500 058,08**

The budget for input and materials was overstepped notwithstanding input support and donations through the Southern African Conservation Agriculture thrust of the FAO. This is due to the inclusion of 3 new areas and around `7 more farmer experimentation trials than budgeted for. This was absorbed into the field work component under the farmer experimentation budget.

Above left: A plot in Stulwane where the intercropped CA trial worked very well, with quick canopy cover and minimal weeding required after the 1st weeding 2-3 weeks post planting. (Thulisile Hlongwane) Above right: Mrs Smpehi Hlatswhayo's CA experimental plot in Emmaus. She has done very well with the planting process and does not need to do any weeding. She does however fastidiously weed regardless.

Above left: One of Mr Dlezakhe Hlonwgwane's CA trial plot. He experimented herewith planting early and found that the stalk borer load in this field was quitey high, despite good growth. He realised a yield of 7,9t/ha for his trial plots. Aobve Right. Mrs Zamani Dladla's trial plot.

In some of the villages the extreme weather conditions created adverse conditions, mostly in the form of heavy rain storms and hail and in Okhombe specifically very low to no yields were realised because of this. In Emoyeni the new participants worked together in one field, creating the age old problem of only some participants doing the actual work. The trial was a little neglected and yields were not determined here.

Detailed observations regarding performance of the different varieties of maize and beans

1. PAN 6479 (white maize hybrid) tassels well before the OPV varieties and can thus be planted alongside without too much inter breeding.

Far left: PAN 6479 and Ukulinga: PAN 6479 tassels earlier than Colarado. Ukulinga grows in an indeterminate fashion and flowers later and for longer than PAN 148.

Left: The Colarado has a more variable stand than PAN 6479. The PAN 148 bean grows in a more determinate fashion and flowers earlier than the Ukulinga.

2. PAN 53(White maize hybrid) however tassels later and will mix freely with the OPVs.
3. PAN 148 (hybrid sugar bean) is preferred over the Ukulinga, because it flowers in one flush and it is easier to harvest the crop once off. It is very time consuming to be harvesting over a longer period of time and participants did not do that. A lot of the harvest then went to waste in the field.
4. The OPV maize varieties Border King and Colorado showed more symptoms of disease infestation with a few cases of grey leaf spot in Emmaus and one likely case of Phaeosphaeria leaf spot. The latter is somewhat in question as the beans in this field were heavily affected with similar symptoms. Herbicide damage is also suspected.

Above: Grey Leafspot (Cercospora zeae maydis) infection on Border King OPV maize in Emmaus –Mrs Hlatshwayo) Right: Suspected Phaeospaeria leafspot on Border King OPV maize in Potshini – Mr Ntuli)

Intercropping

Intercropping in tramlines with a close spacing regime, which performed very well in the 1st season, was continued as a best practice option in the 2nd year of experimentation. Legumes used as the intercrop (with maize) include sugar beans, cowpeas, lablab beans (Dolichos) and a local runner bean known as 'Lesotho beans'.

1. ***Weed suppression:*** With weeding done at 2-3weeks, after pre-planting herbicide application it is possible for the crop mixture to provide full crop cover within 5-7 weeks of planting. This means that no further or very little further weeding is required. If this is done in combination with early November planting impressive growth and yields are possible.

Above Left; A control plot planted by Mr Dlezakhe Hlongwane (16 November 2014). He used CA practises for his control but used single cropping and wide spacing. Weeds are a problem and germination is somewhat patchy.

Above right: The trial plot planted (13 November 2014). Here the soil cover and growth of the crop is a lot more impressive. Top dressing and weeding was done before Christmas.

It is however not that popular with the small holders, who continue to plant single crop blocks when given the freedom to do so- especially on slightly larger areas of ground. The plot layout becomes an effort as does having to change the plates and fertilizer quantities for planting- both with the hand and animal drawn planters.

Above Left: Mrs Hlatshwayo's intercrop trial in Emmaus in Jan 2015, planted 18 Nov 2014. The maize is tasseling and full crop cover was reached before Christmas. Middle and right: Control plots of maize and beans planted using CA on 14 Dec 2014. Wider spacing was used. Weeding has been a constant and losing battle.

2. ***Growth of inter-crops:*** A number of points have been raised by participants regarding inter-cropping that they still find difficult.

PAN6479 - 4ton/ha,

PAN 53 – 2,52ton/ha

Colarado-3,35ton/ha

The differences in the average yields are not significant, given that yields ranged from around 0,9tons/ha to 8,1tons/ha.

Some reasons for the inter changeability of yields can be considered to be the following:

- The maize varieties crossed with each other and with other maize grown in close proximity and thus did not yield predictably according to type and
- The quality of the maize harvested is extremely variable and generally not as good as commercially grown maize.
- Hybrid maize do not yield their full potential in drought years for which the OPVs are better adapted.

Above: The separated harvests for Colarado (OPV yellow maize) and PAN6479 (hybrid white maize) for Mrs Nelisiwe Msele from Stulwane. It can be seen that the sizes and shapes of the cobs vary greatly. As does the seed set in the cobs. This is partly due to growing different varieties so close together and close to traditional varieties and partly due to management and weather conditions.

4. ***Yields of different bean varieties:*** PAN148 and Ukulinga were supplied. The Ukulinga specifically is semi-determinate and seeds over a longer period of time, which created problems with harvesting. But as mentioned the major problem was lack of seed set. The PAN 148 far out-performed the Ukulinga.

   Average Yield for PAN 148 =0,73 ton/ha (min Min 0,17; max 2,25t/ha) and Average yield of Ukulinga = 0,30tons/ha (min 0,08-max 0,54tons/ha)

Right: Khulekani Dladla's (Stulwane)PAN148 (left) and Ukulinga (right) bean yields once harvested

Cover Crop planting

A cover crop mix was bought from Southern African Cover Crop Solutions, somprising Fodder rye, black/saia oats and fodder radish. Participants were urged to plant as early as possible and link it to the late weeding and harvesting of beans in late February early March at the latest.

The idea is that the cover crops are planted in between the maize rows, the seed being scattered and incorporated through the actions of harvesting of beans and weeding. Raking is difficult as there is too much roughage and soil cover and or the soil can be quite hard. A few participants opted to make shallow furrows and planted the seed as the idea of scattering seed did not strike them as a workable option. Below is a summary of cover crop mixes that were planted by participants in Bergville

TABLE 3: SUMMARY OF COVER CROP PLANTING, GERMINATION AND GROWTH IN BERGVILLE FOR 2014-2105.

Area	No participants	Germination				Growth		
		0%	1-10%	11-20%	90-100%	Poor	Good	Very good
Stulwane	16/18	3/16	9/16	2/16	2/16	8/13	3/13	2/13
Emmaus	12/18	4/12	6/12	1/12		7/12		
Ezibomvini	3/10	2/10			1/10	1/3		

Participants have not yet fully grasped the reasoning for planting cover crops in terms of soil improvement. For them the immediate benefit of having livestock fodder is an attraction, which is dampened considerably by the fact that fields in this area are not fenced and livestock are regulated entirely through movement into the mountains and back down to the villages. Dates are set by the Nkosi and Indunas. Participants who own livestock tend to ensure that their cattle graze in their own fields as soon as they are brought back down from the mountains, to ensure that other owners' livestock do not get the benefit of their attempts. This means that the growth is grazed down within days. A few participants cut, dried and kept some of the cover crops for later feeding. The women who do not own livestock have not prioritised this activity. Thus in Emmaus, where most of the participants are women there are fewer participants who have planted the cover crops.

Broadcasting of seed has been very unsuccessful this year as it would appear that participants did not do the weeding and harvesting just after the broadcasting to ensure some working in of the seed. Thus around 80% of participants had less than 10% germination of their cover crops. Cover crops also did not grow very well this year once germinated. Although they were planted substantially earlier in the season than last year, shading and moisture competition appear to be limiting.

Right: Sibongile Hlongwane's (Ezibomvini) cover crops germinated but did not grow well, due to shading and competition.

MONITORING INDICATORS

Indicators have been chosen that can be monitored visually and throughout the growth season of the crop. The intention is twofold:

1. To assess different indicators for their reliability, robustness, sensitivity to depict changes in management practices and
2. To design a system that can be locally implemented by facilitators and farmers, primarily as a learning tool.

One of the overall intentions is the design of a payment for ecosystem services model for provision of incentives for continued implementation of CA by the smallholder farmer participants. This monitoring system can provide the basis for peer review and assessment of farmers' practices for provision of incentives, in a participatory and transparent way.

An initial set of indicators were chosen to be monitored for visual improvement during the cropping cycle. These are explained below:

- ***% soil cover at planting*** (From 0% no cover to 100% full cover; %Cover of the soil is estimated looking from 1m directly above; it can be crop residue, weeds, mulch, grass, etc)
- ***% crop canopy cover at 6-8 weeks*** (From 0% no cover to 100% full cover; %Cover of the soil is estimated looking from 1m above; crop canopy cover at its widest diamater)
- ***% Weed infestation*** (0% - very high weed incidence, complete yield loss; to 100% - no weeds zero yield loss)
- ***% Pest occurrence*** (0% - very high infestation , complete yield loss, to 100% - no insect pests and zero yield loss)
- ***% growth*** (% germination, then a rough estimate of colour, height, health)

The intention of these indicators is to find a way in which field observations can be used to assess the level or quality of implementation, and change (development or improvement) for each participant. These criteria have been chosen to have a management element within them, although they would of course be sensitive also to environmental changes and conditions. These indicators have now been used for two seasons with a number of the participants.

The criteria/indicators need to be robust enough to:

- Be easily observed or measured by;
- Be used by a number of different 'enumerators'
- Be used across different areas and sites;
- Be sensitive enough to show the effects of changes in management practices by participant smallholders.

In this report the indicators used thus far are assessed and discussed and recommendations are made for adaptations into the future.

For the 2014-2015 season the a variation of the Visual Soil Assessment (VSA) methodology pioneered by the UK Soil Management Initiative and Väderstad in Sweden, has also been tested, to include a number of more overt soil health indicators into the monitoring process.

The Visual Soil Assessment (VSA) Methodology

Many physical, biological and, to a lesser degree, chemical soil properties show up as visual characteristics. Changes in land use or land management can markedly alter these. Research shows that many of the visual indicators are closely related to key quantitative (measurement-based) indicators of soil condition.

The ***plant indicators*** have been slightly altered and reduced. These indicators will still need some work but at present the following indicators have been observed and measured.

- ***Germination rate /crop emergence***; germination rate is observed after planting and this percentage is changed into a score. A weighting factor of 3 has been given as germination or lack thereof can be an issue more specific to planting practices in CA systems.
- ***Growth and height/ crop height at maturity***; A mid season growth assessment is made visually around 6-8 weeks after planting and then again around the period of tasseling. A percentage is given for overall growth, colour and heath of plants and this is then changed into a score. The weighting factor of 3 has been retained.
- ***Diseases and pest incidence***; this should be given a visual assessment during the growth phase – but was not done coherently in this season. A weighting of 1 is suggested
- ***Weed incidence/weed infestation***; A weighting of 2 is suggested here as weed infestation plays a major role in CA systems
- ***Crop yields***; are measured at the end of the season. The weighting factor of 3 has been retained

Thus far the size and development of the root system and root diseases have not been overtly included. Surface ponding/water logging and production costs have also not been included. A potential indicator for the rate of water infiltration into the soil should be found.

The GSA-SFIP VSA Score card

After the first draft and the full season monitoring the score card has been finalised as shown below and in **Appendix 2.6**.

PLANT INDICATORS

Land Use:

Location/Field Name:

Date:

Visual indicator of Soil Quality	Visual Score (VS) 0 = Poor conditions 1 = Moderate conditions 2 = Good conditions	Weighing	VS Ranking
Crop emergence (% germination)		× 3	
Crop growth and height (%; overall growth and colour-relative height at time of assessment)		× 3	
Weed infestation		× 2	
Crop yield		× 3	
Size and development of root system		*× 2*	
Surface ponding / water infiltration		*× 2*	
Production costs		*× 2*	
Ranking Score (sum of VS rankings) Max =22			

Soil Quality Assessment	Ranking score
Poor	< 7
Moderate	7 – 15
Good	> 15

COMBINED INDICATORS

Ranking score		Do the soil and plant scores differ and why?
Soil indicators	Plant indicators	

DISCUSSION ON IMPLEMENTATION OF MONITORING INDICATORS

It is considered that appropriate indicators would need to be used in combination and that the overall management changes for each participant would be enough to show a difference in the overall score. For each individual characteristic however, this might be more difficult as seasonality also plays a large role as well.

7	Landile Nsele	Ploughed	3:2:1 (22)	20% grass, 30%weeds and 12% residue	15%	20% residue, 30% weeds and grass	20%	35%	30%
8	Thulisiwe Hlongwane	No Till	MAP	40% weeds, 15% grass and 13% residue	34%	20% kraal manure, 10% residue and 5%weeds	10%	23%	95%
9	Zamani Dladla	Ploughed	3:2:1 (30)	20% grass and weeds, 10% residue	8%	20% residue, 30% weeds and grass	20%	35%	95%
10	Chazile Zimba	No Till	MAP	90% grass	45%	40% residue, weeds and grass		20%	95%
11	Cuphile Buthelezi	Ploughed	MAP	35%weeds, 20%grass and 10% residue	16%	40% residue, 10%weeds	40%	45%	90%
12	Nokwaliwa Hlongwane	Ploughed	MAP	30%weeds and grass, 13% residue	10%	40% residue, 30% weeds and grass	40%	55%	60%
	Thandiwe Mazibuko	No Till	DAP/ MAP	20% weeds and grass, 10%residue	15%	30% residue, 20% weeds and grass	30%	40%	40%
14	Khethabahle Miya	Ploughed	MAP	30% weeds and 10% residue	10%	40% residue, 30% weeds and grass	40%	55%	
15	Khombisile Msele	No Till	MAP	90% grass and 10% weeds	50%	45%residue, 20% weeds and grass	45%	55%	80%
16	Xabanisile Mabaso	Ploughed	DAP	40% grass, 15%weeds and 10% residue	16%	50% grass		25%	70%
17	Matolozana Gumbi	Ploughed	DAP	60%grass, 10% weeds and 10% residue	20%	60%grass		30%	75%
18	Thulani Dlamini	No Till	DAP	75% grass, 9% residue	42%	50% grass, 10% weeds		30%	85%

NOTE: Assumptions:

- *Once ploughed cover reduced to 25% of that before ploughing.*
- *For No till once sprayed and die back has occurred cover reduced to 50% of that prior to spraying.*
- *Residue cover is not reduced through die back from herbicides*

It is most likely that the amount of crop residue remaining for the next season is more a function of whether the participant owns livestock than of whether the participant is actively accumulating residue in their field. Thus in reality for these cropping systems where livestock are allowed to graze in the fields in winter the amount of residue is unlikely to change much from the present value of 10%-45%. The groundcover provided by weeds and grasses is obviously not ideal as this denotes a high weed infestation rate for the fields and causes considerable headaches for the participants during the cropping season. Other options for increasing groundcover need to be considered. These are to include cover crops and organic matter, such as improved manure.

To date the percentage soil cover for the control plots and the trial plots have varied considerably as participants plough their control plots – given that they use their standard practice for those plots. In the 2014-2015 season, however 7 participants in Stulwane also used CA in their control plots. Of these 3 have been new participants in this season. They are thus comparing two no till plots with each other rather than a no till and conventional till plot.

A visual representation of the different soil covers considered for each participant is shown in Figure 1 below.

This indicator has been easier to assess than percentage ground cover. The trick here is that weed infestation needs to be considered at times that are crucial to the crop growth and should really be assessed more than once during the growth cycle of the crop.

In the present monitoring process, this has been assessed at 6-8 weeks after planting when monitoring is done during top-dressing. At this time percentage germination is also considered and a general assessment of crop growth and colour is given. It could be a little late for these assessments, but the intensity of monitoring and time and resources also need to be considered. The table below compares the weed infestation and crop growth for each participant with their overall score (which also includes other criteria). Generally there is a good correlation between the scores and trends, visually, so that with lower weed infestations there is also a concurrent increase in germination, colour and growth of the crop. This is further shown in Figure 2 below.

TABLE5: WEED INFESTATION AND CROP GROWTH COMPARED TO THE OVERALL SCORE FOR EACH PARTICIPANT; STULWANE 2014-2015 PLANTING SEASON.

Name of participant	Weed infestation (0) – high weed infestation – to (1) no weeds	Growth (germination, colour, height,) (0) – no germination, yellow, stunted,– to (1) 100% germination, dark green, tall, healthy	Overall score (10)
Bangeni Dlamini	0,70	0,86	6,38
Cazile Zimba	0,75	0,78	6,41
Cupile Buthelezi	0,73	0,74	6,75
Dlezakhe Hlongwane	0,76	0,91	6,93
Khetabahle Miya		0,75	7,00
Khombisile Msele	0,90	0,90	8,20
Khulekani Dladla	0,63	0,86	6,91
Landile Nsele	0,38	0,71	5,13
Makethi Dladla	0,54	0,65	5,56
Matolozana Gumbi	0,65	0,75	6,50
Mtholeni Dlamini	0,59	0,76	6,06
Nokwaliwa Hlongwane	0,70	0,70	6,86
Phasazile Sithebe	0,75	0,76	5,89
Thandiwe Mazibuko	0,93	0,75	6,78
Thulani Dalmini	0,93	0,85	7,46
Thulislie Hlongwane	0,73	0,80	6,74
Xabanisile Mabaso	0,80	0,75	6,60
Zamani Dladla	0,75	0,86	6,81
Average	**0,68**	**0,79**	**6,42**

Outcomes of using the ranking for two seasons

The four monitoring criteria set out initially (Cover, weeds, pests and growth) have been used for two consecutive seasons for some of the participants. These scores have been compared and for the most part there is an increase in the scores from year to year, that reflect, at least in part the changes in management practices of the farmers involved.

The monitoring results were summarised for Stulwane in Bergville as an example (See Appendix 2.1). A summary of the scores are as shown in Table 6 below.

TABLE 6: CA MONITORING SCORES FOR STULWANE BERGVILLE FOR 2 SEASONS (2013-2015) (11 OF 18 PARTICIPANTS).

Average of Overall score (10)	Control			Trial plot			Combined
	Year 1	Year 2	Average	Year 1	Year 2	Average	Average
Bangeni Dlamini	6,38	5,75	6,06	6,88	6,38	6,63	6,34
Cazile Zimba	5,25	5,63	5,44	7,13	7,50	7,31	6,38
Cupile Buthelezi	5,25	7,13	6,19	6,00	7,88	6,94	6,56
Nlezakhe Hlongwane	6,13	6,50	6,31	7,13	7,90	7,51	6,91
Khulekani Dladla	5,63	6,75	6,19	7,13	7,88	7,50	6,84
Landile Nsele	5,25	3,75	4,50	6,75	4,63	5,69	5,09
Makethi Dladla	3,88	3,00	3,44	7,13	7,88	7,50	5,47
Mtholeni Dlamini	4,75	5,25	5,00	6,38	7,50	6,94	5,97
Phasazile Sithebe	5,88	5,13	5,50	7,13	5,75	6,44	5,97
Thulisile Hlongwane	5,13	6,75	5,94	7,13	7,75	7,44	6,69
Zamani Dladla	5,75	6,00	5,88	6,88	8,13	7,50	6,69
Grand Total	**5,39**	**5,60**	**5,49**	**6,88**	**7,20**	**7,04**	**6,26**

From the scoring results a few interesting observations can be made:

- The scores for the CA trial plots are all higher than the scores for the control plots, with the averages being respectively 7,20 and 5,60 for year two and 6,88 and 5,39 for year one. The scores are quite a bit higher in most cases, between 6 to ~40%. This is borne out in the field inspections where mostly the CA trial plots have fared a lot better than the control plots.
- The overall average difference in the control plot scores from season one to season two is an increase of 0,20, which means that there has been an overall improvement in the performance of the control plots of about 2% (the range of difference was -15% to 19%).
- The overall average difference in the trial plot scores from season one to season two is an increase of 0,10, which means that there has been an overall improvement in the performance of the trial plots of about 1%. (the range of difference was 20% to 26%)

Also, as with the separate indicators, as opposed to these combined ones, the range of values is extremely varied. What can be said is the following:

1. If there is an increase in an individual's score from 1 year to the next it is most likely the outcome of a positive action on that person's management practices- even if the increment is small. For the two farmers highlighted thus, ▭ their management practices were already good in the first season. They both managed an increment in their trials for the second season as well
2. If there is a decrease in the score from one year to the next it is most likely the outcome of a negative action on that person's management practices (e.g. late weeding,). Some of the participants (3) had a lower score in their second season; highlighted thus ▭ . Mostly this had to do with increased weed presence and lower percentage of cover from their crops 6-8 weeks after planting (only around 60% cover from the crops after weeding) as well as yellower overall crop colour.

cobs into 50kg feed bags as a 'standard' measurement unit .This has worked quite well for the trial plot yields, but was not done for the participants' control plots and thus yields for the latter have been a little harder to obtain.

Above left: Khishiwe Cebekulu's maize (Emmaus 2015) drying in her yard post harvest. Above right: A typical example of a traditional storage structure in the Bergville area (Tombi Hlongwane – Magangangozi 2015)

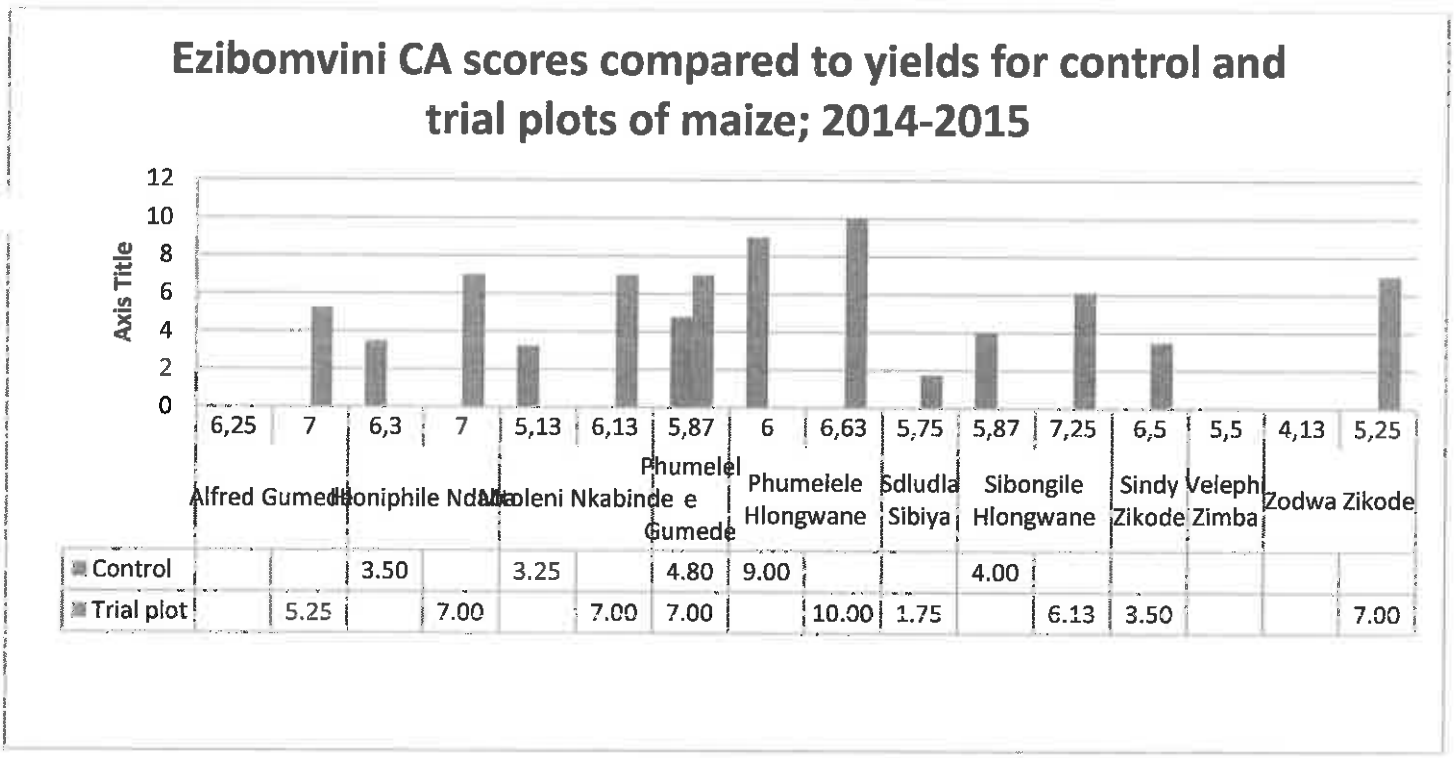
Figure 4 below indicates yields for both seasons where available for the maize, beans and cowpeas planted in the trial plots

they were still busy helping the rest of the group to plant. A system of weeding needs to be designed into the next planting season that can accommodate for this constraint.

4. Bean yields ranged from 0,3-2,36 tons/ha in the first season. For the second season, much lower yields ranging from 0,08-0,5 tons/ha were obtained. Constraints mentioned by participants included predominantly more limited flowering and seed set in the second season. The reasons for this are not clear.

As a further example the maize yields for CA trial and control plots have been compared with the CA monitoring scores for one of the new areas; Ezibomvini in Bergville for the 2014 - 2015 season (See Appendix 2 for the results). Figure 4 below summarises this information.

FIGURE 4: EZIBOMVINI (BERGVILLE) SUMMARY OF CA SCORES COMPARED TO MAIZE YIELDS; 2014-2105 SEASON.



Note on table: The figures provided directly below the bar graph are the CA scores and figures provided in the small table below are the maize yields in t/ha.

A similar trend is visible as for Stulwane:

1. Maize yields for CA trial plots (Ave: 6,07 t/ha) are consistently higher than control plots where they were measured (4,9t/ha) and there is great variability in yield between participants (1,75t-10t/ha for the trials) .
2. The CA scores and yields do not follow easily recognisable trend as lower yields can be associated with higher scores and vice versa.

Figure 5 below shows the score and yield comparison data for two seasons in Stulwane.

FIGURE 5: YIELD AND CA SCORE COMPARISONS FOR 2 SEASONS IN STULWANE, BERGVILLE

From Figures 4 and 5 above it can be seen that the yield data and the CA scores do not necessarily follow the same trends as would be expected. The CA scores may be high with related high yield or yields could be much lower. The most likely factors in the present system that can contribute to this are:

- Inefficient harvesting ,drying and yield estimation techniques employed by some of the participant smallholders,
- Weather conditions that impact on seeding rates of crops and
- An over estimation of the ground cover scores at planting if stands of weeds are included in the assessment.

The intention has been to use a number of different types of indicators and processes for monitoring, to be able to compare these and consolidate the process into a 'best bet' option for monitoring that is both robust enough for the inaccuracies and difficulties of smallholder monitoring processes but sensitive enough to pick up yearly changes in individual management practices.

If a composite picture is provided of the CA monitoring scores the VSA scores and the yields, a broad trend can however be seen. The participants who do not fit into these broad categories are the ones where inefficient harvesting and an over estimation of ground cover percentages have been noted. See Table 7 and Figure 6 and the graph below for the summary of the categories and the comparison of the sets of indicators used.

In summary there is a definite correlation between the CA scores, the VSA soil indicator scores and yields.

TABLE 7: A SUMMARY OF THE SETS OF INDICATORS USED FOR MONITORING INTO THREE BROAD CATEGORIES

	CA monitoring scores	VSA Soil scores	VSA plant scores	Yields
Above average	≥7	>28	>15	3-8.9 tons/ha
Average	5-6.9	11-28	7-15	1-2.9tons/ha
Below average	3-4.9	<11	<7	≤1ton/ha

During the 2014-2015 season the farmer based trials have generated significant interest from other members in the communities through observation and word of mouth. More people want to be part of the process and there is an understanding that some will do the trails and others will try out some of the ideas and principles of CA in their own fields. Expansion of involvement in each of the present sites is to be initiated, as well as moving to other areas where local community members have specifically requested this intervention.

In Bergville area there is now an increased interest in being part of SCGs and working in the SCGs to form specific groups for saving for inputs of field crop production. Three new SCGs have been formed specifically for the purposes of saving for inputs, namely in Emmaus, Ezibomvini and Stulwane. An understanding is developing for preparing in time and starting to save earlier in the year, as well as doing soil samples in preparation for planting.

Local facilitators and the field work team are very motivated by the pro-activity of the community members and the building of momentum that is community based. This model assumes a horizontal expansion (scaling out) in the area into villages surrounding already active groups. This idea has worked well and will continue into next year. It does however mean that every year new participants are brought on board that need to be familiarised with the process nd do experimentation so that they can make informed decisions about use of CA into the future. Thus for every group a 3-4 year process is envisaged and a further assumption is that the process will be ongoing for a reasonably long period. Smallholders are very rarely part of larger forums that share information and work together on a scale larger than their villages of local area. Thus this level of farmer organisation will need to be introduced through the CA awareness raising process.

Learning and awareness raising workshops and farmers days were held in each of the 8 villages involved in the process. The intention was to showcase the work of the participants and the Commodity Interest Groups to the broader community and also to involve stakeholders and role players in the maize value chain.

Farmers' days

A very successful farmer's Day open to all stakeholders and communities was held this year in Emmaus. Around 240 people attended from a wide range of takeholders; including the national and provincial DAEA and No-Till representatives, KwaNalu, UKZN (Crop Science Rural Resource Management), CEDARA Research Station, Grain SA, the No- Till Club, Afritrac, Pannar and NGOs such as World Vision, SaveAct, FDG, Philakahle as well as smallholders from Nkandla, Donnybrook, Estcourt, Matatiele and the local villages. The event was hosted and managed by the local traditional leadership in the area.

Slide shows were presented by the SFI team to outline progress, and Simon Hodgson from Cover Crop Solutions to outline working with cover crops and introduce participants to different types. Talks were hosted by the Dept of Agriculture, Dr H Smith and Mr J Mentz from Grain SA, and Ms L Dube from SaveAct.

Right top to bottom: Hendrik Smith and Thabani Madondo laying out the principles of Conservation Agriculture, the audience and Simon Hodgson giving a presentation on cover crops.

5. Work on a model for including more organic matter into the soil and reducing the level of external inputs – by focusing on 'improved kraal manure, mulching and summer cover crops as well as the winter cover crops already introduced.
6. Introduce a system of crop rotation an alternative to the inter cropping presently being explored.
7. Explore systems of mechanical weed control that are more efficient than hand hoes

7	Landile Nsele	Trial plot	Year 1	no	5-9cm		30%		70%	90%	80%	**6,8**	1,25	1,08	2,4
			Year 2	no	5-9cm	Yes (10%)	35%	40 %	20%		75%	**4,3**	0,08		2,2
		Control	Year 1	no	8cm		10%		40%	90%	70%	**5,3**			
			Year 2	no	8cm		15%	40 %	20%		60%	**3,4**			
8	Phasazile Sithebe	Trial plot	Year 1	no	5-10cm		30%		80%	90%	85%	**7,1**	2,36	0,85	5
			Year 2	no	8-12cm	Yes (2,5%)	18%	40 %	80%		75%	**5,3**	0,24		5,1
		Control	Year 1	no	5cm		10%		60%	90%	75%	**5,9**			
			Year 2				6%	30 %	80%		70%	**4,7**			
9	Cupile Buthelezi	Trial plot	Year 1	no	10cm		15%		60%	90%	75%	**6,0**	0,9	1,14	4,3
			Year 2	no	9-13cm	yes (5%)	45%	90 %	90%		85%	**7,8**	0,48		4,8
		Control	Year 1	no	10-15cm		5%		60%	80%	65%	**5,3**			
			Year 2	no	10-15cm		16%	70 %	80%		70%	**5,9**			1,2
10	Zamani Dladla	Trial plot	Year 1	no	10-15cm		15%		80%	90%	90%	**6,9**	1,7	0,7	3,6
			Year 2	no	10-15cm	Yes (10%)	35%	95 %	90%		90%	**7,8**	0,5		1,8
		Control	Year 1	yes	10cm		5%		60%	80%	85%	**5,8**			2,25
			Year 2				8%	60 %	70%		80%	**5,5**			3,5
11	Cazile Zimba	Trial plot	Year 1	no	10-15cm		15%		90%	90%	90%	**7,1**			4,3
			Year 2	no	10-15cm		20%	95 %	80%		85%	**7,0**	0,32		3,6
		Control	Year 1	no	12cm		5%		60%	80%	65%	**5,3**			
			Year 2	no	12cm		45%	65 %	70%		70%	**6,3**			1,3
12	Nokwaliwa Hlongwane	Trial plot	Year 1	no	8-13cm		55%	60 %	70%	80%	70%	**6,7**	1,65		2,7
		Control	Year 1	no			10%	55 %	70%	70%	65%	**5,4**			4,6
13	Thandiwe Mazibuko	Trial plot	Year 1	no	7-13cm		40%	40 %	93%	80%	75%	**6,6**	0,21		1,8
		Control	Year 1				15%	30 %	60%	80%	65%	**5,0**			0,3
14	Khombisile Msele	Trial plot	Year 1	no	9-14cm	Yes (90%)	55%	95 %	90%	80%	90%	**8,2**	1		7,15
		Control	Year 1				55%	55 %	65%	80%	75%	**6,6**			6,4
15	Xabanisile Mabaso	Trial plot	Year 1	yes	5-11cm		25%	70 %	80%	80%	75%	**6,6**	0,55		2,35
		Control	Year 1				16%		60%	80%	65%	**5,5**			4,7
16	Matolozana Gumbi	Trial plot	Year 1	no	10-15cm		30%	75 %	65%	80%	75%	**6,5**	0,8		4,5
		Control	Year 1				20%	75 %	60%	80%	74%	**6,2**			1,75
17	Thulani Dalmini	Trial plot	Year 1	no	10-15cm	Yes (15%)	30%	85 %	93%	80%	85%	**7,5**	1,1		3,1

APPENDIX 2.5: GSA input packs subsidised costs; 2015-2016

Area	CA input costs	No in Bgvl	*COST NON TRIAL (67% or cost price)*	*COST TRIAL (33% of cost price)*	
			PER PARTICIPANT		COST GSA
0,1ha	R 962,37	210	***R 615***	***R 318***	R 52 890,00
0,04ha	R 384,95	25	***R 255***	***R 127***	R 7 125,00
1 ha	R 9 623,70	10	***R 6 150***	***R 3 179***	
TOTAL COST					**R 60 015,00**