SMALLHOLDER FARMER AGRICULTURE DEVELOPMENT PROGRAMME

GK 12/01: FARMER SUPPORT PROGRAMME FOR DEVELOPING AND RESOURCE POOR FARMERS
PROGRESS REPORT APRIL 2012 – MARCH 2013

1. Project Details

Project number: GK 12/01
Title: Farmer Support Programme for developing and resource poor farmers
Duration: Ongoing
Status: Continuation of existing programme
Project Leader: Dr Eric Morojele

2. Introduction

Wheat is the second most important grain crop produced in South Africa. The importance of wheat, compared to other cereal crops, is due to the fact that in addition to providing energy to the poor rural South Africans, it also provides a cheap source of protein. This position is necessary for the good health of the communities who cannot afford to buy proteins from other sources. Total national output of wheat is lower than the domestic consumption requirements and as a result, large quantities of wheat are imported to, supplement domestic production. A significant number of farmers who produce wheat in South Africa are the smallholder emerging farmers who occupy a reasonable area of land, but use it unproductively, due to lack of knowledge on farming. Wheat production can, therefore, be increased in the country by supporting these farmers as well as extension officers in the wheat producing areas through training on all aspects of wheat production. The extension officers, with the help of the Smallholder Farmer Development Programme staff, can therefore, assist the farmers in the management of wheat as well as choice of cultivars that are better suited for their different environments in terms of yield and quality. The ability of these farmers, to properly manage their wheat, crop might increase wheat production in the country and reduce dependence on imported wheat which may reduce prices of bread.

3. Objectives

3.1 Long-term objectives

The long-term objectives of this project are as follows:

- To contribute to the improvement of the standard of living of emerging and developing small grain producers, by ensuring that they secure food for themselves.
- To monitor and promote the sustainable production of small grains throughout the country.
- To ensure that producers get easy access to the services provided by ARC-Small Grain Institute (ARC-SGI) in order for them to be part of the mainstream of the economy of South Africa.

3.2 Short term objectives: April 2012 to March 2013

- To improve wheat production in communities of developing producers in the Eastern Cape, Free State and Limpopo Provinces.
- To identify new communities and individual producers with potential to produce small grains on a commercial basis.
- To train emerging farmers and extension officers on wheat production.

- To produce and distribute reading material on wheat production in the form of production guidelines and magazines.

4. Participating communities in the different Provinces.

The Smallholder Farmer Agriculture Development Programme Division of ARC-SGI provided the following services in a number of communities or groups of individual producers who participated during the reporting period (Table 1).

Table 1. Activities in the different Provinces for 2012/2013

Province	Community/Organisation	Activity
Limpopo	Marble Hall	Wheat production course
Eastern Cape	Burgersdorp	Wheat production course
	Mqanduli	Wheat production course
Free State	Glen	On-Farm trial, Farmers' Day
	Kestell	On-Farm trial, Farmers' Day
	Bothaville	Wheat production course
	Kaallaagte	On-Farm trial
	Fouriesburg	On-Farm trial
	Harrismith	On-Farm trial
	Ficksburg	On-Farm trial, Farmers' Day
	Thaba'Nchu	On-Farm trial, Farmers' Day, Wheat production course
	Tweespruit	On-Farm trial
	Welkom	Wheat production course
	Wesselsbron	On-Farm trial
	Hoopstad	On-Farm trial, Farmers' Day, Wheat production course

Table 2. List of stakeholders

Stake-holder	Role	Influence
Department of Agriculture: Free State, Eastern Cape and Limpopo	Identification of farmers' problems, linking farmers with SGI, collaborating with SGI on technology transfer activities.	Promotion and dissemination of new technologies
GrainSA	Provide extension services to the farmers	Organize study groups and invite persons with applicable resources
OVK, AFGRI, VKB and Omnia	Supply production inputs and extend credit facilities	Ensuring that inputs are readily available to the farmers timeously
ARC-Central Office	Coordinating SGI with other organizations at strategic level	Information dissemination
Financial Institution: FNB	Training on writing business proposals and assist farmers in building creditability for farm loans	To improve the farmers' credit ratings
Land Bank	Land transfer to emerging farmers	Increase area of land under emerging farmers

Networking has been established with other organisations involved in agricultural development in order to share and exchange ideas and assist the farmers' in resolving their problems. Duplication of efforts was identified and joint ventures formed.

Table 3. Networking that the Smallholder Farmer Development Programme was involved in

Place	Organizer	Activity	Attendance
Department of Agriculture and Rural Development (Fouriesburg, Bethlehem and Kestell)	GrainSA	Farmers' study groups	37
Warden	Department of Agriculture and Rural Development	Information Day	36
Thaba'Nchu	Department of Agriculture and Rural Development	Information Day	28
Sterkspruit	Department of Agriculture and Rural Development	Information Day	40
Department of Agriculture and Rural Development (Welkom)	Department of Agriculture and Rural Development	Stakeholders' meeting	28
Total number reached			**169**

5. Report on the objectives of 2012/2013

Objectives 1 and 2: *To improve wheat production in communities of developing producers in the Eastern Cape, Free State and Limpopo and to identify new communities and producers with the potential to grow small grains on a commercial basis*

Demonstration trials

Two irrigation and eight dryland demonstration trials were planted in the Free State Province. The irrigation trials were planted at Glen and Hoopstad, whereas dryland trials were planted at Harrismith, Kestell, Kaallaagte, Fouriesburg, Ficksburg, Wesselsbron, Tweespruit and Thaba'Nchu. Seven cultivars were planted at Glen, whereas eight cultivars were planted at Hoopstad. The irrigation cultivars planted were Olifants, PAN 3489, PAN 3471, Baviaans, Duzi, Steenbras and SST 835. Krokodil was planted only at Hoopstad. Dryland cultivars were Matlabas, Limpopo, Gariep, Elands, Komati, Caledon, SST 374, SST 347, PAN 3195, PAN 3161, PAN 3379 and PAN 3368. The two irrigation trials and eight dryland trials were successful, resulting in yield and quality data being generated.

Harvesting of demonstration trials was performed from November 2012 to January 2013. Samples were cleaned, weighed and analysed for quality parameters. Yield, hectolitre mass, falling number and protein content were determined.

Table 4. Dryland wheat trial

Locality	Yield (ton/ha)	STD (Δ%)	Hecto-litre Mass (hlm)	STD (Δ%)	Protein Content (%)	STD (Δ%)	Falling Number (sec)	STD (Δ%)
Wesselsbron	1.78	1.4	75	1.7	12.5	3.0	322	29.5
Tweespruit	1.69	1.5	78	1.6	13.2	0.2	289	32.4
Thaba'Nchu	1.89	2.3	77	1.5	13.5	0.1	300	30.9
Harrismith	2.30	1.7	81	1.7	12.7	3.1	267	42.3

Kaallaagte	1.99	2.2	79	1.6	12.6	3.1	289	35.6
Fouriesburg	2.29	1.8	80	1.6	13.6	0.2	278	38.3
Kestell	2.12	1.9	77	1.5	12.2	3.2	258	49.1
Ficksburg	2.06	2.1	79	2.9	13.6	0.3	270	40.7
Average	**2.02**	**1.8**	**78**	**1.8**	**13.0**	**1.7**	**284**	**37.4**

STD = Commercial farmer's trials
Δ% = comparison +high, -low than commercial farmers' trials

The results of the demonstration trials planted under dryland conditions were compared with the results of commercial farmers' trials and the difference thereof established. The yields at all localities were lower than that of the commercial farmers. In Tweespriut, Wesselsbron and Thaba'Nchu, the low yields were attributed to soil moisture content, which was limited at planting and during the growth of the crop. The limited soil moisture resulted in poor emergence and establishment of the crop. Nonetheless, fine showers that fell during growing season, were able to take them through to harvesting. The average yield under commercial conditions was 2.4 ton/ha, while poor resource conditions resulted in 2.02 ton/ha. The highest yield was obtained in Harrismith, followed by Fouriesburg. Lowest yield was obtained in Tweespruit, due to prevalence of drought. This still emphasizes the importance of employing moisture conservation techniques by emerging farmers. Similarly, Harrismith and Fouriesburg were leading in the highest hectolitre mass. Only Wesselsbron had a hectolitre mass below the recommended standard of 77 hlm. The average hectolitre mass of the eight localities was 78 hlm, which was slightly above the standard. Protein content in all localities was higher than that of the commercial farmers and the recommended standard of 12%. Ficksburg and Fouriesburg outperformed all the other localities by reaching 13.6%. The average protein content was 13.0%. All localities obtained high falling numbers compared to both the commercial farmers and the recommended standard of 220 seconds. The highest falling number was 322 sec and the lowest was 258 sec. The average falling number was 284 sec. In general, all parameters measured, except yield, showed values that were high and within acceptable limits in all localities.

Table 5. Irrigation wheat trials

Locality	Yield (ton/ha)	STD (Δ%)	Hecto-litre Mass (hlm)	STD (Δ%)	Protein Content (%)	STD (Δ%)	Falling Number (sec)	STD (Δ%)
Glen	4.78	-3.7	76	-3.5	15.3	+2.4	355	+2.1
Hoopstad	4.72	-3.7	74	-5.0	13.6	+1.2	352	0

STD = Commercial farmer's trials
Δ% = comparison +high, -low than commercial farmer's trials

The results obtained from the irrigation trials were compared with those of the commercial farmers' trials. The yields for the two localities were lower than from the commercial farmers' trials. The hectolitre mass for wheat produced at the two localities was lower than that of the commercial farmers' trials and also lower than the standard recommended value of 77 hlm. Protein content of wheat harvested from both sites was higher than that of commercial farmers' trials and the standard recommended value of 12%. Falling number for Glen was higher, whereas that of Hoopstad was equivalent to that of commercial farmers' trials. Both were higher than the standard recommended value.

Farmers' days

Farmers' days were held where demonstration trials were conducted (Table 6). A total of 144 farmers attended the farmers' days and a total of 17 presenters from different institutions shared information with the farmers. Institutions who sent presenters to the farmers' days are ARC-SGI, Land Bank, Land Reform, Omnia, Water Affairs and the Department of Agriculture.

Table 6. Farmers' days held in 2012/2013

Place	No. of attendants	No. of presenters	Institutions
Hoopstad	43	5	ARC-SGI, Land Bank, Land Reform, Omnia and Water Affairs
Ficksburg	30	5	ARC-SGI, Land Bank, Land Reform, Water Affairs and Department of Agriculture
Glen	20	4	ARC-SGI, Land Bank, Water Affairs and Department of Agriculture
Thaba'Nchu	38	2	ARC-SGI and Department of Agriculture
Kestell	13	1	ARC-SGI
Total	**144**	**17**	

Objective 3: *Training of producers and extension officers on all aspects of wheat production*

Seven training courses were organized and conducted at community level during 2012/2013 (Table 7). Researchers from ARC-SGI presented material that cover all aspects of wheat production, from seed-bed preparation to marketing of the produce. Each course took three days, involving theory and practical. In Thaba'Nchu, Hoopstad and Bothaville, farmers were taken to cooperatives that buy wheat, to see how their produce is weighed, graded and stored. The participants of these courses expressed great appreciation for conducted courses and imparting of the knowledge. Most of them indicated that it was an eye-opener and requested us to help them to acquire inputs and machinery to produce wheat in their respective areas. They promised to be in contact with us for assistance once they start planting. Certificates of attendance were conferred to them upon completion of the courses.

Table 7. Training courses conducted in 2012/2013

Venue	Attendance
Thaba'Nchu	25
Bothaville	40
Hoopstad	21
Marble Hall	23
Welkom	21
Burgersdorp	20
Mqanduli	29
Total	**179**

Objective 4*: To produce and distribute reading material on wheat production in the form of production guidelines and magazines*

Two hundred and sixteen Sesotho and isiXhosa versions of production guidelines and production calendars were distributed to the farmers and extension officers who attended the wheat production courses, as well as those who attended study groups to enrich their knowledge on wheat production. The production calendar shows the different activities undertaken throughout the year in the production of wheat and the researcher who can be contacted for the particular activity. Twelve SMS'es were sent in Sesotho, isiXhosa and English to 166 wheat farmers and extension officers. Four radio programmes on different activities of wheat production were carried out on Lesedi FM (Table 8).

Table 8. Radio programme carried out on Lesedi FM in 2012/2013

Date	Topic
30 May 2012	Why do farmers have to plant good quality seed?
27 June 2012	Choosing a cultivar suitable for your area
25 July 2012	Calibration of wheat planter for seed and fertilizer
29 August 2012	Weed control in wheat

6. Objectives 2013/2014

The Farmer Support Programme will continue with the following specific objectives for 2013/2014:

Objectives	Outcomes
1. To improve wheat production in communities of developing producers in the North-West, Free State, Mpumalanga, Eastern Cape, Northern Cape and Limpopo Provinces	• Demonstration trials on different cultivars, weed control and liming regime will be conducted in areas where wheat has a potential and the soil acidity is correct. • Farmers' days will be organised for the farmers to compare the performance of different cultivars in terms of growth and yield components. • Information from other internal and external research programmes to be incorporated into the Technology Transfer Programme.
2. To identify new communities/producers with potential to produce small grains	• Conduct demonstration trials in collaboration with newly identified producers who own more than 35 ha and have a potential to grow wheat and become commercial producers. • Individual people aspiring to produce wheat and have equipment and funds to operate a farm will be identified, trained and guided in wheat production.
3. To develop a database of wheat producers	• Assist producers in financial planning, which will ensure that they farm profitably. • Assist producers in providing the relevant technical information on production inputs and marketing.
4. To establish a linkage mechanism to facilitate feed-back from producers to researchers through the support programme	• Need assessment will be conducted to identify the problems of the wheat producers, after which solutions will be found and the producer be guided in the process. • To identify the research specialists that would address the problem of the farmer at hand. • To attend meetings/workshops/gatherings organised by other stake-holders to exchange information and find the best solutions to producers' problems.
5. To train producers and Extension Officers on wheat production	• Producers will be up-dated with the newly generated technology on wheat production. • Extension Officers will be trained and will be able to advise wheat producers on proper agronomic practices.
6. To network with other organizations that are agriculturally oriented	• To attend meetings, conferences and open days to share ideas and exchange views. • To solicit for technical and financial support from other organisations. • To collaborate with organisations that are agriculturally orientated.

7. Future of the project

The project will proceed to the next season with the six objectives stipulated above. The need to continue with the project has been expressed by the producers and other stake-holders. More emphasis will be placed on knowledge acquisition and skills development for wheat production. Collaboration and networking with other relevant organisations will be undertaken.

GK 12/01: FARMER SUPPORT PROGRAMME FOR DEVELOPING AND RESOURCE POOR FARMERS
PROGRESS REPORT APRIL 2011 – MARCH 2012

Summary

Number: GK12/01
Title: Farmers Support Programme
Duration: Ongoing
Status: Continuation of existing programme
Project leader: Dr M E Morojele

Previously, South Africa was producing 90% of the country's annual wheat requirement. Nowadays it has declined sharply, necessitating high volumes of importation from other countries. Among the factors that lead to this drop in national wheat production, is the increase in the number of emerging farmers who are unproductive due to lack of resources, capabilities, unattractive market prices and the effects of the Land Reform Act. The advent of the Land Reform and Distribution Act resulted in a high influx of emerging farmers who joined the wheat industry without any background of farming and the technical know-how. Many of these farmers were confronted with numerous challenges, which made them under-utilise the land, rendering it unproductive. Concerted efforts are being made by the Government and other private organization to assist emerging farmers in producing wheat profitably and land efficiently. Among the organizations involved is the Agricultural Research Council through Small Grain Institute (SGI), which deals with research in various aspects of wheat production. The Smallholder Farmer Development Programme Division of SGI deals directly with the emerging farmers. The following services are rendered to the farmers; training extension officers and emerging farmers, conducting demonstration trials, hold farmers' days, farm visits and consultations, produce publications and networking with other stakeholders who are involved in agriculture to share and exchange ideas, thereby eliminating duplication. A lot has been achieved with this intervention, which has resulted in some producers forming associations, working groups and forums.

The long-term objectives of this project are as follows:

- To contribute to the improvement of the standard of living of the emerging and developing small grain producers by ensuring that they secure food for themselves.
- To monitor and promote the sustainable production of small grains throughout the country.
- To ensure that the producers get easy access to the services provided by SGI in order for them to be part of the mainstream of the economy of South Africa.

The short term objectives for April 2012 to March 2013 were as follows:

- To improve wheat production in communities of developing producers in the Eastern Cape, Free State and Limpopo.
- To identify new communities and individual producers with potential to produce small grains on a commercial basis.
- To train producers and extension officers on wheat production.
- To produce and disseminate reading material to the farmers to up-date them on the latest technology being generated.

The following are some of the accomplishments:

On-farm demonstration trials were conducted in ten localities, from which data were generated for recommendation to the farmers.

- Two hundred and sixteen wheat production guidelines and calendars were distributed to the farmers to enrich their knowledge and develop their skills on wheat production.
- Twelve SMSes were sent in Sesotho, isiXhosa and English to 166 wheat farmers and Extension Officers.
- Four radio talks on different activities of wheat production were broadcasted on Lesedi FM.
- One hundred and seventy-nine producers and Extension Officers attended wheat production courses conducted in seven communities.
- SGI researchers partook in information days where 129 people participated.
- One of the SGI staff members attended a series of courses on facilitation, moderation and assessing in order to prepare for accreditation of the wheat production course offered by SGI.

The programme will continue in the 2013/2014 season with the following objectives:

- To improve wheat production of resource poor producers by providing information, new technology, training courses and planting of on-farm trials.
- To undertake research and technology transfer in the new areas to improve wheat production.
- To develop a database of wheat producers to ensure they get the necessary support in terms of financial management, production inputs and market related issues.
- To conduct demonstration trials to focus on addressing the challenges of acidic soils, weeds and tillage systems to show producers the importance of good management.
- To produce and disseminate reading material to the farmers to update them on latest technology being generated.
- To network with other organizations dealing with emerging farmers producing wheat.

GK 12/02: MONITORING THE SOIL FERTILITY STATUS IN RESOURCE POOR ENVIRONMENTS PROGRESS REPORT APRIL 2012 – MARCH 2013

1. Project details

Number: GK 12/02
Title: Monitoring the soil fertility status in resource poor environments
Duration: Ongoing
Status: Continuation of existing project
Project Leader: Dr M E Morojele

Introduction

Soil testing gives an indication of a soil's ability to supply needed nutrients for plant growth, which will result in a good yield. The test results also identify possible problems regarding soil acidity of salinity. Wheat grows the best at soil pH's above 4.8 and an acid saturation of lower that 8%. It is important to rectify pH problems with lime, because nutrients become unavailable at very low soil pH's. Soil nutrients constantly undergo change. The quantity and availability of plant nutrient change as a result of removal by the growing crop, leaching, erosion, or the addition of fertilizer, manure, or compost. The soil test reveals the current fertility status and provides the information necessary to maintain the optimum fertility conditions for wheat to be planted.

2. Objectives

2.1 Long-term objectives

- To develop a database containing representative data of all the resource limited areas where ARC-Small Grain Institute (ARC-SGI) has projects. The database will be used to assess the current soil fertility status and to identify pressing problems if they occur. This will help to improve the quality of technology transfer in future.
- To identify trends and threats like increases in soil acidity or salinity for specific areas.
- To make available sound recommendations based on soil analysis to individual farmers participating in the project.

2.2 Short term objectives April 2012 – March 2013

- Taking of soil samples by the Smallholder Agricultural Development Team, where needed.
- Analysing of soil samples.
- Capturing of data in database.
- Recommendations and discussion thereof with farmers
- Communicate the results to the farming community as a whole

3. Report on the objectives of 2012/2013

The Matatiele area in the Eastern Cape Province was visited for soil sampling in February 2013. A total of hundred and fourteen samples were taken on fourteen different farms. The 10 samples that were taken per farm were sampled as five top and five sub-samples. More areas across the country are envisaged for sampling, as soon as the funds are available.

Table 1. List of farm owners in the Eastern Cape where soil samples were taken

Number	Farmer (surname)
1	Mohari
2	Likatlaya
3	Kgitledi
4	Mr Bam
5	Lehatlanya
6	Malandu
7	Lefa
8	Mafunda
9	Ndzunga
10	Magageng
11	Radebe
12	Pauleni
13	Madubela
14	Lesotho

3.1 Results

The results of soil samples are depicted in a tabular form showing pH status and essential nutrients of soils in different farms, for both top and sub soils. The normal range for all nutrients is indicated to alert the farmers on the minimum acceptable value.

The pH status of all the soils was above the minimum limit of 4.5, except in Ndzunga where the pH was 4.2. This necessitates an application of lime to raise it above pH 4.5. The average pH value of top soils was pH 4.85, while the average pH value of sub-soil was pH 4.91. The phosphorus content of the soil was very low in both top- and subsoil samples and requires a supplementation before wheat can be planted. It was only on the farms of Mohai, Lehatlanya, Ndzunga and Pauleni where the phosphorus content was above the minimum value 15 mg/kg. Approximately 81.43 % of the soil samples were P-deficient, which is an indication of a lack in P-fertilisation. Potassium content in all the soil samples were in abundance and no supplementation is needed. The average potassium content was 155.16 mg/kg and 143.23 mg/kg for top and sub-soil, respectively. Calcium and magnesium contents were found in large quantities and meet the requirements of all crops that can be grown. No supplementation is required. Sodium (Na), if present in high quantities, can become toxic to crops. All the soil samples had low sodium content, except at Magagengs' farm where measures have to be taken to reduce it to the tolerable limit.

Table 2. Summary of 140 samples taken at Matatiele

Top samples	**pH**	**P**	**K**	**Ca**	**Mg**	**Na**	**EA**
(70 samples)	**(KCl)**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**mg/kg**	**%**
Average	4.85	11.86	155.16	1155.01	454.14	7.21	0.10
Median	4. 83	10.57	148.0	1099.64	443.49	5.09	0.09
Highest	6.9	55.1	455.3	3005	1816	145.2	0.51
Lowest	3. 8	0.7	34.4	91	15.8	0	0
Norm	<4.5	<15	<60	<200	<40	<10	>8
% Results outside norm	17.14%	72.85%	14.29%	12.86%	7.14%	88.57%	0%

Sub samples (70 samples)	pH (KCl)	P mg/kg	K mg/kg	Ca mg/kg	Mg mg/kg	Na mg/kg	EA %
Average	4.91	9.53	143.25	1213.44	488.56	10.93	0.08
Median	4.89	8.58	126.4	1196.43	473.67	7.62	0.06
Highest	7	57.2	389.8	4063	2346	235.9	0.5
Lowest	3.8	0.5	20	105	20.6	0.1	0
Norm	<4.5	<15	<60	<200	<40	<10	>8
% Results outside norm	11.43%	81.43%	21.43%	10%	10%	82.84%	0%

3.2 Discussion

The soil pH in the Matatiele district is acceptable for the growth and development of most crops, except for Ndzunga farm, where it is slightly below the threshold. No liming is required, but pH should be monitored continuously every three years. Phosphorus is a major concern on these farms and needs immediate attention. The situation can only be alleviated by applying different forms of phosphorus fertilisers, which are not acid based. The quantity to be applied will always depend on the crop to be grown, phosphorus level in the soil, the target yield and the type of phosphorus fertiliser to be applied. Potassium, calcium and magnesium levels are adequate. Sodium, which is undesirable when found in larger amounts, is within tolerable limits, except at the Magagengs' farm. Precautionary measures should be taken to rectify the situation, as it affects the growth and development of crops to be planted.

4. Objectives April 2012 – March 2013

- Networking and soil sampling in new and existing areas where ARC-SGI work.
- Analysing of soil samples
- Capturing of data in the database.
- Discussions with farmers.

5. Future of the project

This project is on-going and has already made a positive impact in areas where Small Grain Institute operates. The contact with the farmers, through the Extension Officers, is valuable to the Soil Analyses Laboratory. The project gives the Small Holder Farmer team the opportunity to promote the important role that soil analyses play in optimising the yield and mitigating risk management.

GK 12/02: MONITORING THE SOIL FERTILITY STATUS IN RESOURCE POOR ENVIRONMENTS PROGRESS REPORT APRIL 2012 – MARCH 2013

Summary

Number: GK 12/02
Title: Monitoring the soil fertility status in resource poor environments
Duration: Ongoing
Status: Continuation of existing project
Project Leader: Dr M E Morojele

Soil sampling and analysis plays an important role in determination of soil fertility status, after which crucial decisions and recommendations can be made regarding wheat production. Developing farmers should therefore be fully aware of the advantages that soil analysis holds for their development and sustainability. This could be achieved through collaboration of Extension Officers with the Small Holder Agricultural Development Programme of ARC-SGI to ensure the development of resource poor farming communities. The main objective of this project is to have soil fertility information available to ARC-SGI researchers when they need it for planning of experiments, making recommendations to farmers in the areas where they work, or when they prepare for farmers' days.

A total of 140 soil samples were taken from the Matatiele area in the Eastern Cape Province. These samples were analysed for soil pH status, phosphorus, potassium, calcium, magnesium and sodium. All the nutrients, except phosphorus, were in abundance and no supplementary nutrients have to be applied. Phosphorus deficiency appeared to be a major problem that should be given immediate attention, as the deficiency of one element affects the impact of other elements on the crop. Sodium content is also within tolerable limits, with the exception of one farm. In general, the current soil fertility status of Matatiele is acceptable, but should be maintained and monitored to ensure sustainable wheat production.

GK 12/07: THE VERIFICATION OF WHEAT CULTIVARS SUITABLE FOR PRODUCTION IN RESOURCE LIMITED AGRICULTURE
PROJECT PROGRESS REPORT: APRIL 2012 – MARCH 2013

1. Project details

Number: GK 12/07
Title: The verification of cultivars suitable for production in resource limited agriculture
Duration: Ongoing
Status: Continuation of existing project
Project leader: Dr M E Morojele

Introduction

Many wheat cultivars are released into the market by different seed companies, which differ in one or more aspects. These cultivars perform differently under varying environmental conditions. Where conditions are favourable, the genetic make-up of the cultivars expresses themselves fully and all the traits perform to their optimum levels. However, in a case where conditions are less favourable, traits are not fully expressed. The conditions may be soil type, soil fertility status, soil preparation, climate or crop management. Commercial farmers always grow their wheat crop under favourable conditions, due to the experience and knowledge they have acquired over time. They ensure that the crop requirements are all met in appropriate quantities and timeously so that the yield plateau is reached and other parameters meet the optimal standards. Contrarily, most emerging and subsistent farmers produce their wheat crop under unfavourable conditions, resulting in low yield and quality. These farmers are new in the industry and are not conversant with farming techniques that can optimise the yield and quality. They lack knowledge on production technology, farming equipment, funds to purchase required production inputs and cannot manage the risks involved in the production. Under these conditions, there are some cultivars that can produce a substantial amount of yield and quality, meeting market requirements. It is therefore, with this reason that varietal trials are conducted to identify wheat cultivars that give substantial yield under sub-optimal conditions. Experience has shown that no one cultivar can perform consistently higher across all the locations. Thus trials are planted in many different areas to determine which one is suitable for which area and to then be able to recommend a cultivar that can out-perform the others.

2. Objectives

2.1 Long-term objectives

- To determine the suitability of wheat cultivars and new lines for production under different resource limited agricultural regions.
- To characterise cultivars in terms of yield potential and yield stability in selected resource limited areas under dryland and irrigated conditions.
- To compare cultivars in terms of agronomic characteristics and quality parameters over these different environments.
- To assist small scale wheat producers with reliable recommendations that is based on applicable scientific research.
- To ensure that the relevant technology created by this project is made available to small-scale farmers in the respective regions by means of production guidelines, farmers' days and demonstrations.

2.2 Short term objectives April 2008 – March 2009

- To successfully conduct cultivar evaluation trials at the different localities under resource poor environments.
- To compare the results obtained from resource poor environments with those of commercial farmers, thereby establishing yield and quality gap.
- To identify new collaborators who are producing wheat under resource poor environment.
- To compile a progress report on results obtained from this project and present it to the funders.

3. Report on these objectives

Varietal trials were planted in six localities in resource poor environments. Two of these trials were under irrigation, while the remaining four were planted under dryland conditions. Irrigation trials were planted at Colenzo in the KwaZulu-Natal Province and Grobersdal in the Limpopo Province. Dryland trials were at Wesselsbron and Theunissen in the Free State Province, and Matatiele and Ongels'nek in the Eastern Cape. It was also intended to plant two varietal trials at Qamata and Ncora, but the farmers declined to offer the areas for trials at a very late stage and there was no way new sites could be secured. An attempt will be made next season to identify suitable collaborators in the region in good time and a contract be entered into, to avoid change of minds. Wheat cultivars used in the trials were Matlabas, Limpopo, PAN 3195, SST 374, Gariep, SST 347, Elands, PAN 3161, Komati, PAN 3379, Caledon and PAN 3768.

Under irrigation, the size of the experimental area was 48 m x 4.4 m consisting of 48 plots. Each plot measured 5 m x 1.1 m with inter-row spacing of 0.17 m. The trial lay-out was a randomised complete block design with four replications. A Wintersteiger plot planter was used for planting seeds. All management practices were done according to recommendations. Under dryland conditions, the dimension of an experimental plot was 48 m x 12 m with inter-row spacing of 0.50 m, consisting of 48 plots. Each plot measured 5.0 m x 3.0 m. The modified Gasparo planter was used to plant wheat seeds and distribute fertilizer after being calibrated to the recommended rates. Wheat cultivars used in trials were Baviaans, Steenbras and Olifants

3.1 Dryland experimental trials

The production conditions in the Central Free State at planting were constrained by low soil moisture content in the top soil. This caused delayed and poor emergence of seedlings at both Wesselsbron and Theunissen. Rain fell very late in the season. Similarly, at Matatiele and Ongels'nek optimum yields could not be obtained as the soil moisture content was inadequate to sustain the crop throughout the growing season. Tables 1 and 2 summarises the results for the dryland trials.

3.1.1 Wesselsbron

The average yield for Wesselsbron was 2.10 ton/ha, with Matlabas (2.66 ton/ha) outperforming other wheat cultivars. PAN 3368 had the lowest yield achieving 1.8 ton/ha. Matlabas was followed by Elands and SST 347 with yields of 2.57 ton/ha each. Other wheat cultivars fell in-between Matlabas and PAN 336. The average yield obtained in this locality was below the average for the commercial farmers, which was 2.5 ton/ha. In terms of hectolitre mass, SST 347 got the highest value of 80.22 kg hlm, followed by Komati and Gariep, which obtained values of 79.28 and 79.01 kg hlm, respectively. The cultivar that measured the lowest value was PAN 3195 with 75.00 kg hlm followed by Limpopo obtaining 76.84 kg hlm. The minimum tolerable value for hectolitre mass was 75 kg hlm and all cultivars obtained above it. The average hectolitre mass achieved was 78.03 kg hlm.

The average protein content for Wesselsbron was 14.1%. Matlabas obtained the highest protein content of 17.1% followed by Limpopo and Gariep, both with a protein content of 15.0%. PAN 3195 had the lowest value of 12.7%, followed by Elands and Komati with protein contents of 12.8 and 12.9%, respectively. The minimum acceptable protein content is 12%. The average value for falling number was 317.9 s with SST 347 leading with 359 s, followed by PAN 3161 with 358 s, then Komati with 352 sec. Elands measured the lowest

value of 281 s among all the cultivars, followed by Limpopo and PAN 3768 with falling numbers of 298 s each. The minimum recommended value for falling number is 220 s and all the cultivars obtained values higher than this. From these results, it was deduced that Matlabas is the best wheat cultivar for the locality in terms of the characteristics measured.

3.1.2 Theunissen

The average yield obtained in Theunissen was 2.04 ton/ha with Limpopo achieving the highest yield of 2.51 ton/ha, followed by Matlabas with 2.48 ton/ha and SST 374 with 2.34 ton/ha. Caledon was the lowest yielder with 1.50 ton/ha followed by PAN 3368 with 1.66 ton/ha. The highest hectolitre mass was obtained by Matlabas recording 81.04 kg hlm while the lowest was SST 374 with a hectolitre mass of 76.47 kg hlm, followed by PAN 3768 with 77.10 kg hlm. All the wheat cultivars reached values above the minimum threshold, which is 75 kg hlm. The average hectolitre mass for the locality was 78.64 kg hlm.

Protein content for all wheat cultivars included in the locality was 13.5% average. PAN 3768 reached the highest value of 15.1%, followed by Limpopo with 15.0%. Gariep and PAN 3379 obtained 11.2% and 11.7%, respectively. These two cultivars were the only ones that achieved values below the minimum threshold of 12% protein content. The average falling number for the twelve cultivars was 317.4 s with the highest value of 357 s obtained by Caledon, followed by PAN 3195 with 352 s. Conversely, the lowest falling number was reached by Matlabas with the value of 288 s. SST 374 and Elands followed with 299 s each. All the cultivars reached falling numbers of above 220 s, which is the minimum requirement. Limpopo and Matlabas were the most suitable cultivars for the area.

3.1.3 Ongels'nek

The average yield for this locality was 2.26 ton/ha with Elands leading by 2.51 ton/ha followed by Caledon with 2.46 ton/ha. The lowest yields were obtained by Matlabas, PAN 3368 and PAN 3379. Hectolitre mass averaged 78.65 kg hlm for the twelve cultivars with PAN 3161 reaching the highest value of 81.40 kg hlm, followed by Matlabas with 80.91 kg hlm. The lowest value was achieved by SST 347 with hectolitre mass of 75.10, which was on the minimum threshold. No cultivar was below the minimum requirement.

The highest protein content was reached by Matlabas with the value of 15.1%, followed by PAN 3195 with 13.1%. The lowest protein content of 10.3% was achieved by PAN 3379. An average protein content of 12.2% was obtained, which was the minimum amount required. Six cultivars were found with values below the minimum requirement. The highest falling number of 344 s was reached by Caledon, followed by Limpopo with 341 s. The average falling number for all wheat cultivars was 304 s. No single cultivar reached below the minimum requirement of 220 s.

3.1.4 Matatiele

The wheat cultivar that outperformed the others in yield was Elands, achieving 2.51 ton/ha, followed by Gariep with 2.50 ton/ha and then Limpopo with 2.40 ton/ha. The lowest yield obtained was 2.10 ton/ha from Matlabas and PAN 3368. The average yield of the twelve wheat cultivars planted was 2.29 ton/ha. The hectolitre mass with the highest value was 81.20 kg hlm reached by Matlabas, followed by Elands with 79.61 kg hlm. The average hectolitre mass obtained was 78.59 kg hlm while the lowest was 76.37 kg hlm achieved by SST 347. No cultivar had hectolitre mass values lower than the minimum standard of 75 kg hlm.

The average protein content of this locality was 12.4% with the highest content being 14.0% realised by Matlabas, followed by Komati with 13.8%. The lowest protein content was 10.4% reached by PAN 3161, which was seconded by SST 374 with 10.5%. Five cultivars produced a protein content value of less than 12%, which is the minimum recommended. These were PAN 3195, SST 374, PAN 3379, PAN 3161 and Elands. The highest falling number was observed from PAN 3195 recording 355 s while the lowest was obtained Gariep in 299 s. The average falling number was 323 s. No cultivar had a falling number below the recommended 220 s.

Conclusion

The cultivars that performed well and consistently across the environments in terms of yield, were Elands, Gariep and Matlabas. For quality parameters such as hectolitre mass, protein content and falling number,

most cultivars reached an acceptable level above the recommended. Nonetheless, protein content in Matatiele was below the recommended level in most wheat cultivars planted. This can be attributed to low nitrogen content and soil moisture content.

Table 1. Yield and quality parameters of wheat grown in Wesselsbron and Theniussen

Cultivars	Wesselsbron				Theniussen			
	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling num-ber (sec)	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling number (sec)
Matlabas	2.60	78.24	17.1	301	2.48	81.04	14.2	288
Limpopo	2.22	76.84	15.5	298	2.51	78.62	15.0	310
PAN 3195	2.10	75.41	12.7	310	2.21	77.09	12.4	352
SST 374	2.31	77.61	14.9	289	2.34	76.47	13.7	299
Gariep	2.48	79.01	15.0	341	2.01	77.91	11.2	302
SST 347	2.57	80.22	13.9	359	1.69	82.40	12.9	314
Elands	2.57	79.64	12.8	281	1.90	79.26	13.4	299
PAN 3161	2.07	77.44	13.0	358	2.07	78.41	14.7	311
Komati	2.18	79.28	12.9	352	2.24	77.29	13.2	321
PAN 3379	1.86	76.61	13.1	307	1.88	78.63	11.7	344
Caledon	1.90	77.14	14.7	321	1.50	79.51	14.9	357
PAN 3768	1.70	78.87	13.9	298	1.66	77.10	15.1	312
Mean	2.21	78.03	14.1	317.9	2.04	78.64	13.5	317.4
LSD	1.025	0.6	0.95	1.534	0.98	0.85	1.002	1.78
CV	13.7	9.8	17.2	6.7	19.3	10.0	16.9	22.7

Table 2. Yield and quality parameters of wheat grown in Ongels'nek and Matatiele

Cultivars	Ongels'nek				Matatiele			
	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling num-ber (sec)	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling number (sec)
Matlabas	2.00	80.91	15.1	299	2.10	81.20	14.0	312
Limpopo	2.24	79.20	12.9	341	2.40	78.53	12.9	341
PAN 3195	2.39	77.99	13.1	285	2.35	77.10	11.4	355
SST 374	2.27	78.24	12.7	310	2.20	79.15	10.5	311
Gariep	2.22	79.10	11.9	325	2.50	79.50	13.2	297
SST 347	2.40	77.88	12.3	319	2.23	77.56	12.9	299
Elands	2.50	75.10	12.8	298	2.51	76.37	11.8	301
PAN 3161	2.31	79.22	11.7	257	2.37	79.61	10.4	315
Komati	2.14	81.40	10.5	244	2.28	77.53	13.8	312

Cultivars	Ongels'nek				Matatiele			
	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling num-ber (sec)	Yield (ton/ha)	Hecto-litre mass(kg hlm	Protein content (%)	Falling number (sec)
PAN 3379	2.11	77.10	10.3	312	2.14	78.88	11.9	344
Caledon	2.46	78.28	11.9	344	2.30	79.10	12.1	350
PAN 3768	2.10	79.40	11.4	323	2.10	78.49	13.4	333
Mean	2.26	78.65	12.2	304	2.26	78.59	12.4	323
LSD	0.88	1.03	0.45	2.67	0.45	1.19	1.34	3.13
CV	12.7	17.3	21.9	11.8	6.8	15.2	8.8	13.7

4.1 Irrigation Experimental trials

The results of trials planted under irrigation conditions are summarised below in tabular form (Table 3).

4.1.1 Colenso

The average yield at Colenso was 6.01 ton/ha with the highest obtained from Duzi recording 7.110 ton/ha, followed by PAN 3489 with 7.003 ton/ha. The lowest yield was reached by Baviaans with 4.986 ton/ha. Olifants, PAN 3471, Steenbras and Krokodil showed a slight yield differential, which was between 5.500 and 5.978 ton/ha. Hectolitre mass obtained, averaged 73.86 kg hlm with the highest SST 835 and Krokodil reaching 15.1 kg hlm. The lowest hectolitre mass was 70.2 kg hlm achieved by PAN 3489. A large number of wheat cultivars used in this trial obtained a value below the recommended 77 kg hlm.

Protein content realised an average of 13.85%, with both Olifants and PAN 3489 reaching the highest value of 15.1%. The lowest protein content was 12.5 %, which is slightly above the minimum threshold of 12%. The minimum value was accomplished by Steenbras, followed by SST 835. The average falling number was 277.9 s with the highest being 342 s obtained by Steenbras, followed by Baviaans with 314 s. All the wheat cultivars reached falling number above the required standard.

4.1.2 Glen

The highest yield at Glen was achieved by Duzi reaching 7.010 ton/ha, followed by Olifants and Baviaans with 6.678 ton/ha and 6.165 ton/ha, respectively. The lowest yield was reached by Krokodil with 4.598 ton/ha. The average yield of the twelve wheat cultivars used for this trial, was 5.776 ton/ha. The highest hectolitre mass obtained was 81.3 kg hlm from Olifants, followed by Krokodil with 80.4 kg hlm. The average hectolitre mass was 79.6 kg hlm. No cultivar reached the value below 77 kg hlm recommended.

The protein content of all the cultivars was high with a maximum recorded percentage of 15.4% and the minimum of 13.4%. The average protein content realized was 14.6%. The minimum tolerable protein content is 12%, which no cultivar reached. Falling number for the highest cultivar was 399 sec, which was achieved by Krokodil, seconded by PAN 3489. The lowest falling number of 249 s was accomplished by Baviaans. The average falling number for the varieties tested was 301 s.

Conclusion

For the two localities where eight cultivars were tested, Duzi and Olifants outperformed all cultivars in terms of yield and other quality parameters. All cultivars reached the recommended minimum quality requirements at Glen. At Colenso, hectolitre mass was low for all the cultivars except SST 835. In general, Glen performed much better than Colenso.

Table 3. Yield and quality parameters of wheat grown in Colenso and Glen

Cultivars	Colenso				Glen			
	Yield (ton/ha)	Hecto-litre mass(kg hlm)	Protein content (%)	Falling num-ber (sec)	Yield (ton/ha)	Hecto-litre mass (kg hlm	Protein content (%)	Falling number (sec)
Olifants	5.751	71.4	15.1	249	6.678	81.3	14.0	321
PAN 3489	7.003	70.2	15.1	286	5.450	79.6	15.2	311
PAN 3471	5.521	72.6	14.2	231	5.670	80.1	15.1	269
Baviaans	4.986	74.4	13.9	314	6.165	77.2	15.4	249
Duzi	7.110	73.4	13.9	221	7.010	79.9	14.6	321
Steenbras	5.978	75.3	12.5	342	4.986	78.4	13.4	277
SST 835	6.231	78.1	12.8	311	5.654	79.6	14.7	263
Krokodil	5.500	75.5	13.3	269	4.598	80.4	14.2	399
Mean	6.010	73.86	13.85	277.9	5.776	79.6	14.6	301
LSD	1.156	0.99	1.06	3.453	1.009	0.87	1.1	4.6
CV	17.4	6.8	12.9	8.8	9.7	14.4	13.6	10.3

5. Future of the project

Because of the release and availability of new cultivars, cultivar evaluation remains an ongoing process. These new cultivars are continually evaluated to ensure maximum profitability for the producer. This project will therefore, continue to ensure available results on cultivars for all the different emerging wheat producing areas of the country.

6. Objectives: April 2013-March 2014

- To successfully conduct cultivar evaluation trials at the different localities under resource poor environments.
- To compare the results obtained under resource poor environments and commercial farmers, thereby establishing yield and quality gaps.
- To identify new collaborators who are producing wheat under resource poor environments.
- To compile a progress report on results obtained from this project and present them to funder.

GK 12/07: THE VERIFICATION OF WHEAT CULTIVARS SUITABLE FOR PRODUCTION IN RESOURCE LIMITED AGRICULTURE
PROJECT PROGRESS REPORT: APRIL 2012 – MARCH 2013

4. Project details

Number: GK 12/07
Title: The verification of cultivars suitable for production in resource limited agriculture
Duration: Ongoing
Status: Continuation of existing project
Project leader: Dr M E Morojele

Field experimental research was conducted in six localities to verify wheat cultivars suitable for resource poor environments. The localities were Wesselsbron, Thenuissen, Matatiele, Ongels'nek, Colenso and Glen. Four trials were under dryland and two under irrigation conditions. Eight wheat cultivars were planted under irrigation, while twelve were under dryland. A Randomized complete block design was used to layout trials. Under irrigation, the dimension of the experimental plot was 32 m X 5 m, consisting of 48 sub-plots. Each sub-plot measured 5m x 1.17m. Under dryland, experimental plots measured 60m x 12m, comprising 48 plots. Each plot was 5 m x 3 m.

Under dryland, in terms of yield, the cultivars that performed well and consistently across the environments were Elands, Gariep and Matlabas. For quality parameters such as hectolitre mass, protein content and falling number, most cultivars reached an acceptable level above the recommended. Nonetheless, protein content in Matatiele was below the recommended level in most wheat cultivars planted. This can be attributed to low nitrogen content and soil moisture contents, which was inadequate to sustain the crop growth.

Under irrigation, where eight cultivars were tested, Duzi and Olifants outperformed all cultivars in terms of yield and other quality parameters. All the cultivars reached the recommended minimum quality requirements in Glen. At Colenso, hectolitre mass was low for all cultivars except SST 835. In general, Glen performed much better than Colenso.