OATS PROGRAMME

GK01/01, GK01/02, GK 01/03, GK 01/04: SEED MAINTENANCE OF SGI DEVELOPED SMALL GRAIN CULTIVARS
PROGRESS REPORT: APRIL 2012 – MARCH 2013

1. Project details

Number: GK 01/01
Title: Maintenance and supply of pre-basic (breeder) and basic seed of small grain cultivars in the summer rainfall region at Vaalharts (Irrigation, Northern Cape) and Bethlehem (Dryland, Free State).
Duration: Ongoing
Status: Continuation of existing project
Project leader: Ms Nicolette van der Merwe

Number: GK 01/02
Title: Maintenance and multiplication of nucleus seed of small grain cultivars and lines through single seed descent procedure in the summer rainfall region at Vaalharts (Irrigation, Northern Cape) and Bethlehem (Dryland, Free State).
Duration: Ongoing
Status: Continuation of existing project
Project leader: Ms Nicolette van der Merwe

Number: GK 01/03
Title: Maintenance and supply of pre-basic (breeder) and basic seed of small grain cultivars for the winter rainfall region in the Western Cape.
Duration: Ongoing
Status: Continuation of existing project
Project leader: Dr André Malan

Number: GK 01/04
Title: Maintenance and supply of pre-basic (breeder) and basic seed of small grain cultivars at Riet River, Northern Cape.
Duration: Ongoing
Status: Continuation of existing project
Project leader: Ms Nicolette van der Merwe

2. Objectives

2.1 Long-term objectives

The activities of these projects stay the same from year to year and therefore the objectives will also remain unchanged.

The commercial and newly commercialised wheat, oats and triticale cultivars of ARC-Small Grain Institute are totally dependent on the adequate supply of cultivar-pure seed (through multiplication) to its marketers in the seed industry and through them to the producers. Pure seed of the small grain cultivars, wheat, oats and triticale is produced and supplied, on order, a year in advance, by these projects.

With the erratic rainfall in the small grain cultivation areas as well as the price of Maize play a large role in the demand for small grain seed for the production as animal feed. The demand for especially oat and triticale seed differs significantly from year to year. For this reason the seed production of the different small grains crops are kept together in the different multiplication projects for the different production regions.

The main activities of these projects are as follows:

- The production of nucleus and breeder seed, are the first step in the production of cultivar-pure and true-to-type seed. This procedure lays the foundation for subsequent seed production. Nucleus seed is produced at Bethlehem (dryland cultivars) and Vaalharts (irrigation cultivars) – GK 01/02.
- The production of pre-basic and basic seed is on demand of the seed industry. The marketing companies turn produces commercial (mostly, certified) seed that is supplied to all the small grain producers. Pre-basic and basic seed are produced at Bethlehem (summer rainfall; winter and facultative dryland cultivars), Vaalharts and Riet River (summer rainfall; spring irrigation cultivars), as well as in the Western Cape (spring dryland cultivars) – GK 01/01, GK 01/04 and GK 01/03).

2.2 Short term objectives April 2012 – March 2013

- To ensure that sufficient, genetically and physically pure seed of all newly classified and commercialised cultivars is made available to all the producers and industry as quickly as possible.
- To ensure that the original genetic material of a cultivar is maintained and preserved to prevent genetic drift, which increases risk for both the producers and processing industry.
- To ensure that sufficient pre-basic, basic and certified seed of ARC-SGI commercialised cultivars is produced, marketed and supplied by licence and sub-license holders to meet the demand of producers and the industry, by supplying sufficient high quality seed (of the types needed) to license and sub-license holders annually.
- To meet the seed certification requirements and agreements with SANSOR and the license and sub-license holders.
- To function within the stipulations and regulations of the SA Seed Certification Scheme (as administered by SANSOR), the Plant Improvement Act, 1976 (Act 53 of 1976) and the Act on Plant Breeders' Rights, 1976 (Act 15 of 1976).

3. Report on these objectives

3.1 Nucleus and breeder seed production (GK 01/02)

Nucleus seed production from single ears was executed at Bethlehem and Vaalharts (Table 1). Good yields were obtained at Vaalharts. At Bethlehem bird damage caused low yields in some wheat and oat cultivars. Overall the climatic conditions were very favourable for small grain production in the past season.

Nucleus seed strips from the 2011 season's single plants such as Betta-DN, Elands, Gariep, Komati, Koonap, Limpopo, Matlabas and Senqu were multiplied to supply in the stock of nucleus seed for those specific cultivars at Bethlehem.

Seed strips of Buffels, Duzi, Kariega, Krokodil and Olifants, were planted at Vaalharts, rogued, evaluated and harvested separately for nucleus seed production at Vaalharts.

Post-control samples of all the certified seed sold, were also planted:

- dryland cultivars at Bethlehem
- irrigation cultivars at Vaalharts.

Table 1. Nucleus seed planted at Bethlehem and Vaalharts in the 2012 season (GK 01/02)

Locality	Wheat	Oats	Triticale
Bethlehem	**Betta DN** **Elands** **Gariep** **Komati** **Koonap** **Limpopo** **Matlabas** **Senqu**	**Drakensberg** **Heros** **Maluti** **SWK001** **Witteberg**	**Falcon** **Kiewiet**
Vaalharts	**Buffels** **Duzi** **Kariega** **Krokodil** **Olifants**		

3.2 Certified Pre-basic and basic seed production (GK 01/01, GK 01/03 and GK 01/04)

Seed orders for certified basic seed of the oat cultivars, Malutii, Kompasberg, Simonsberg, SWK001, Towerberg and Witteberg were received. Of these, only SWK001 had insufficient seed to meet seed orders. The birds caused tremendous crop losses and damage at Bethlehem multiplications. Wheat seed (certified pre-basic and/or basic) of the cultivars Duzi, Kariega, Koonap, Krokodil, Kwartel, Matlabas, Ratel, Sabie, Senqu and Tankwa were ordered. All-gro seed in Brits is the marketer of all these SGI wheat cultivars, except for Matlabas, who is marketed by Klein Karoo seed (K_2).

Sufficient rain and favourable temperatures in the cultivating season resulted in a very good seed production environment at Bethlehem (GK01/01). The wheat seed multiplications were sprayed against Yellow rust and aphids. In spite of the bird-damage, good yields were obtained.

The climatic conditions at Riet River (GK 01/04) and Vaalharts (GK 01/01) were favourable for seed production and in high quality seed were obtained. In these last two areas seed production is done under irrigation. At Vaalharts only 4.2 hectares of seed multiplications could be planted, due to maintenance of the irrigation system of the Centre Pivot. All seed order were met by using the 2012 production and existing seed stocks.

Certified pre-basic seed of the three wheat cultivars, Kwartel, Ratel and Tankwa, as well as the two oat cultivars, Simonsberg and Towerberg, were multiplied successfully (project GK 01/03) at Moorreesburg and Caledon in the Western Cape, respectively. This is the first time that this Western Cape project was responsible for multiplications of this magnitude. The ARC-SGI does not have storage and seed processing facilities in the Cape. Under these difficult circumstances and with a huge effort, the personnel managed this great accomplishment. All-gro Seed, in Brits, is also the markets of these cultivars and has ordered seed for the current season.

All the seed orders for wheat and oats were executed successfully.

4. Future of these projects

This programme is a critical extension of the breeding programme and ensures that sufficient, physically and genetically pure seed of new and existing commercialised cultivars is supplied timely and continuously to the

industry. This is the initial and certainly the most important stage in the success of the commercialisation of any newly developed cultivar.

The practice of farm-saved seed is posing an increased risk to this programme. This practice can lead to a significant decrease in pre-production contracts for these seed multiplication projects what will lead to the deteriorating of pure genetic stock of the commercial cultivars. This will increase the risk for the wheat farmers to be successful with the cultivation of small grains.

5. Objectives: April 2013 - March 2014

These seed multiplication projects will continue to play a vital role in the production of cultivar-pure seed by delivering on the following objectives:

- To maintain and preserve the original genetic material of cultivars and to prevent genetic drift.
- To supply sufficient pre-basic seed of high quality to sub-license holders in order to meet the demands of producers and the industry.
- To meet all demands of basic seed of ARC-Small Grain Institute developed cultivars and still maintain our own high standards for genetically and physically pure seed.
- To ensure an adequate supply of all newly commercialised and improved cultivars to the wheat producers and industry.
- To meet the seed certification requirements of SANSOR and the licensing agreements with license and sub-license holders.
- To function within the stipulations and regulations of the SA Seed Certification Scheme, the Plant Improvement Act, 1976 (Act 53 of 1976) and the Act on Plant Breeders' Rights, 1976 (Act 15 of 1976).

GK 01/01, GK 01/02, GK 01/03, GK 01/04:	SEED MAINTENANCE OF SGI DEVELOPED SMALL GRAIN CULTIVARS PROGRESS REPORT: APRIL 2012 – MARCH 2013

Summary

Number: GK 01/01, 01/02, 01/03, 01/04
Title: Seed maintenance of SGI developed small grain cultivars
Duration: Ongoing
Status: Continuation of existing project
Project Leader: Ms N van der Merwe

It is imperative that all these projects are executed with the necessary precision. The main aim of the Seed Multiplication Projects is to ensure the adequate supply of cultivar-pure nucleus, breeder, pre-basic and basic seed of cultivars developed by ARC-Small Grain Institute, to the industry. The seed productions adhere strictly to the South African Seed Certification Scheme as established in terms of the Plant Improvement Act, 1976 (Act 53 of 1976). Pure seed of small grain cultivars, consisting of wheat, barley, oats and triticale are produced.

Nucleus and breeder seed production was executed successfully in the summer rainfall region at Bethlehem and Vaalharts. One hundred cultivar-pure and homogenous plants were planted, rogued, evaluated and harvested separately for breeder seed production at Bethlehem. At Vaalharts one or two thousand single ears (depending on the demand for seed of this cultivar) were planted, rogued, evaluated and harvested separately for breeder seed production – GK 01/02.

Pre-basic (breeder) and basic seed are produced at Bethlehem (summer rainfall: winter and facultative dryland small grain cultivars), Vaalharts and Riet River (summer rainfall: spring irrigation small grain cultivars) and Western Cape (winter rainfall: spring dryland small grain cultivars) according to the cultivars that were ordered – GK 01/01, GK 01/03 and GK 01/04. Pre-basic and basic seed are ordered by the marketers, which in turn produce certified seed, that is then supplied to the producers.

As Riet River (GK 01/04) fall in the area where the quarantine disease Karnal Bunt can occur, only seed of oat and barley is multiplied at this locality. Since wheat and triticale are susceptible to this particular fungus, seed multiplications of these two crops are not conducted here.

The work of our breeders is furthered by these projects and ensures that sufficient genetically and physically pure certified pre-basic and basic seed of ARC-Small Grain Institute developed cultivars (brand new and existing) is supplied swiftly to license holders and seed merchants, in order to meet the demands of the industry and producers. All seed supplied to the marketers were certified in accordance with the rules and regulations enforced by SANSOR.

The practice of farm-saved seed poses an increasing risk to this programme. This practice leads to a significant decrease in pre-production seed orders for these seed multiplication projects. Producers who apply this practice are not protected by the laws applicable on certified seed.

GK 02/04, GK 02/05 OAT CULTIVAR EVALUATION
PROGRESS REPORT : APRIL 2012 – MARCH 2013

1. Project details

Number: GK 02/04
Title: Oat cultivar evaluation in the winter rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Terry Walsh

Number: GK 02/05
Title: Oat cultivar evaluation for grain production in the summer rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Willem Kilian

2. Objectives for April 2012 – March 2013

The objectives of the oat cultivar evaluation projects were as follows:

- To characterise cultivars in terms of yield performance and yield stability over environments and production years.
- To compare cultivars in terms of agronomic characteristics, yields and hectolitre mass.
- To make reliable and scientifically sound recommendations to producers and other role-players in the respective production regions by compiling guidelines for the production of oats in terms of cultivar choice, agronomic properties and planting spectrum.
- To evaluate Australian, as well as existing and released South African oat cultivars in terms of yield and hectolitre mass and to release the best performing Australian cultivars for commercialisation.

3. Report on these objectives

3.1 Winter rainfall region: dryland

Project number: GK 02/04
Project title: Oat cultivar evaluation in the winter rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Terry Walsh

3.1.1 Background

Trials were planted at six sites in the Swartland and six sites in the Rûens during 2012. The Swartland trials were at Langgewens, Halfmanshof, Koringberg, Malmesbury, Hopefield and Velddrift. The six trials in the Rûens were planted at Tygerhoek, Voorstekop, Bredasdorp, Protem, (Kleinfontein), Alpha and Roodebloem. All the trials were harvested and processed.

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The oats trials were planted with a DBS conservation tillage planter at a seeding rate of 250 seeds/m^2, using the thousand-kernel mass determination method. The trial plot size was 7 rows x 30 cm between rows and a plot length of 5.0m.

Nitrogen fertilisation was applied at 60 kg N/ha with 40 kg N/ha applied at planting and the balance ± 42 days after planting. Phosphate and potassium were applied as per requirement. Weed and pest control were applied where and when necessary, in accordance with the weeds and pests encountered.

Harvesting was carried out with a Wintersteiger plot harvester. The grain yield, hectolitre mass and pit:grout ratio were determined in all the trials. ANOVA's were carried out on the individual trial data for yield and hectolitre mass and the data was also analysed using the AMMI - model to determine the genotype x environmental interaction.

The following eight cultivars and lines were included in the adaptation trials:

Origin	Entry	Cultivar	Released
Agricol Seed	Pallinup	Pure Line	Unknown
Small Grain Institute	Kompasberg	Pure Line	2001
Small Grain Institute	Simonsberg	Pure Line	2011
Small Grain Institute	Towerberg	Pure Line	2011
Small Grain Institute	Overberg	Pure Line	Unknown
Klein Karoo Koöperasie	SSH 405	Pure Line	2001
Klein Karoo Koöperasie	SSH 421	Pure Line	2001
Klein Karoo Koöperasie	SSH 491	Pure Line	2001

3.1.2 Yield results

The analysed grain yield of the oat cultivar evaluation trials planted in the Rûens and Swartland, as well as the ANOVA's and AMMI-biplots are reflected in the following tables. Twelve trials were planted during the 2012 season and all the localities were harvested and the data processed for analysis. However, the results from the following trial sites were not used in the statistical analysis, due to high CV%'s:

- Kleinfontein: 23.90%
- Halfmanshof: 21.40%
- Tygerhoek: 19.40%
- Koringberg: 17.80%

Due to the limited number of trials per region, the Swartland and Rûens trials have been combined for analytical purposes.

The average yield of the trials in the Swartland was 2.63 ton/ha, with the trials in the Rûens yielding an average of 2.93 ton/ha. The highest yielding trials in the Rûens were at Roodebloem (4.61 ton/ha), Alpha (3.28 ton/ha) and Voorstekop (3.02 ton/ha) and in the Swartland at Malmesbury (4.15 ton/ha) and Hopefield (2.98 ton/ha).

Cultivars producing above the average yields were Kompasberg, Simonsberg, SSH 491 and Towerberg, with average yields of 4.05, 3.41, 3.34 and 3.23 ton/ha respectively.

Average yield (ton/ha) of oats cultivars in the Swartland and Rûens during the full or partial period from 2009 - 2012

Cultivar	2012	R	2010	R	2009	R	3 year average 2009-2012	R	2 year average 2010-2012	R
H06/15			2.22	4	2.47	6				
H06/19					2.29	9				
H07/04			2.03	7	2.63	3				
H07/05					2.42	8				
Heros			1.63	12						
Kompasberg	4.05	1	2.68	1	3.08	1	3.27	1	3.36	1
Overberg	2.93	6	1.76	10					2.35	6
Pallinup	3.12	5	2.23	3	2.93	2	2.76	2	2.67	4
Sederberg			1.88	8	2.44	7				
Simonsberg	3.41	2	2.11	5	2.50	5	2.67	3	2.76	3
SSH 405	2.37	8	1.76	9	1.85	12	1.99	6	2.07	7
SSH 421	2.43	7	1.70	11	1.85	11	1.99	7	2.06	8
SSH 491	3.34	3	2.52	2	1.99	10	2.62	4	2.93	2
Towerberg	3.23	4	2.09	6	2.52	4	2.61	5	2.66	5
Average	**3.11**		**2.05**		**2.41**		**2.56**		**2.61**	
$LSD_t(0,05)$	**0.17**		**0.17**		**0.17**		**0.10**		**0.12**	

3.1.3 Hectolitre mass

The four best cultivars for hectolitre mass were SSH 491 (55.13 kg/hl), Pallinup (53.05 kg/hl), SSH 405 (52.81 kg/hl) and SSH 421 (52.21 kg/hl). The average hectolitre mass for the trials was 51.85 kg/hl. The only cultivars to meet the minimum requirements for Grade 1 (53 kg/hl) were SSH 491 and Pallinup.

Environments where the hectolitre mass was good were Langgewens, Bredasdorp and Hopefield. (56.34 kg/hl, 54.55 kg/hl and 53.64 kg/hl respectively).

Average hectolitre mass (kg/hl) of oats cultivars in the Swartland and Rûens during the full or partial period from 2009 – 2012

Cultivar	2012	R	2010	R	2009	R	3 year average 2009-2012	R	2 year average 2010-2012	R
H06/15			46.84	10	45.73	10				
H06/19					47.25	4				
H07/04			47.36	8	46.47	9				
H07/05					44.44	11				
Heros			47.50	6						
Kompasberg	50.52	6	46.62	11	46.94	7	48.03	7	48.57	7
Overberg	49.24	8	47.15	9					48.20	8
Pallinup	53.05	2	47.49	7	48.17	1	49.57	3	50.27	3
Sederberg			45.16	12	44.22	12				
Simonsberg	51.69	5	48.28	4	47.59	3	49.19	4	49.99	5
SSH 405	52.81	3	48.41	3	47.73	2	49.65	2	50.61	2
SSH 421	52.21	4	48.07	5	47.22	5	49.17	5	50.14	4
SSH 491	55.13	1	51.83	1	46.99	6	51.32	1	53.48	1
Towerberg	50.18	7	48.70	2	46.91	8	48.60	6	49.44	6
Average	**51.85**		**47.78**		**46.64**		**49.36**		**50.09**	
LSD_t(0,05)	**0.17**		**0.17**		**0.17**		**0.61**		**0.60**	

3.2 Summer Rainfall area

Project number: GK 02/05
Project title: Oat cultivar evaluation for grain production in the summer rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Willem Kilian

Field trials to evaluate the performance of existing oat cultivars as well as new promising oat lines were planted under irrigation and dryland conditions. Irrigation trials were planted at Bethlehem, Vaalharts and Riet River, while the dryland programme was executed at Bethlehem.

3.2.1 Entries

Eight cultivars that are currently commercially available for grain production were planted under irrigation as well as dryland conditions. The cultivars included in these trials were mainly developed for grain production. The full list of cultivars and lines are summarised in the table below.

Origin	Entry	Cultivar
Agricol Seed	Pallinup	Pure Line
Small Grain Institute	Kompasberg	Pure Line
Small Grain Institute	Overberg	Pure Line
Small Grain Institute	H 06 / 15	Pure Line

Origin	Entry	Cultivar
Small Grain Institute	H 07 / 04	Pure Line
Klein Karoo Koöperasie	SSH 491	Pure Line
Small Grain Institute	Simonsberg	Pure Line
Small Grain Institute	Towerberg	Pure Line

3.2.2 Test Procedure

A seeding density of 250 seeds/m^2 was used for all tested cultivars under irrigation, with plot sizes of 5 m x 16 rows x 0.17 m. Fertilization of 120 kg N/ha, 30 kg P/ha and 20 kg K/ha was applied at planting. A standard micronutrient product was sprayed during the tillering to stem elongation growth stages. Disease prevention and control was applied at flag leaf stage. Trials under irrigation were optimally irrigated and at maturity, yield and hectolitre mass were measured following the prescribed procedures.

A dryland trial was planted at Bethlehem, with the same entries as in the irrigation trials. Seeding density was 60 plants/m^2, with a standard application of 200 kg 7:2:1 (30)/ha. Plot sizes were 5 rows x 5 m with an inter row spacing of 45 cm and a harvest area of 13.5 m^2.

3.2.3 Results

Irrigation

The oats cultivar trial under irrigation conditions at Riet River could not be used due to hail damage that influenced the data, while the Bethlehem trial was also excluded due to a high CV. The average yield of the remaining irrigation trial at Vaalharts was 5.71 ton/ha. SSH 491 had the highest yield, followed by Pallinup and Kompasberg. The average hectolitre mass value in this trial was 49.55 kg/hl.

The data on grain yield and hectolitre mass for the past year are included in the tables below:

Average yield (ton/ha) of oats cultivars under irrigation during the full or partial period from 2008 – 2012

Cultivar	2012 *	R	2010	R	2009	R	2008	R	4 year average 2008-2012	R	3 year average 2009-2012	R	2 year average 2010-2010	R
H06/15	5.73	4	4.59	4									5.16	4
H06/19			4.19	11										
H07/04	5.64	5	4.62	3									5.13	5
H07/05			4.43	8										
Heros			3.91	12	3.09	6	5.04	1						
Kompasberg	5.77	3	5.02	1	4.07	1	3.73	8	4.65	2	4.95	1	5.40	2
Overberg	5.32	7	4.21	10	3.03	8	4.82	2	4.34	4	4.19	4	4.76	7
Pallinup	5.90	2	4.57	5	3.72	2	4.23	5	4.61	3	4.73	3	5.24	3
Sederberg			3.42	14	3.12	5	3.94	7						
Simonsberg	4.89	8	3.84	13									4.36	8
SSH 405			4.67	2	3.64	3	4.26	4						
SSH 421			4.47	7	3.09	6	4.19	6						
SSH 491	6.98	1	4.32	9	3.23	4	4.59	3	4.78	1	4.84	2	5.65	1
Towerberg	5.41	6	4.56	6									4.99	6
Average	**5.71**		**4.34**		**3.37**		**4.35**		**4.59**		**4.68**		**5.09**	
LSD_t(0,05)	**0.65**		**0.41**		**0.50**		**0.44**		**0.25**		**0.31**		**0.37**	

* Only Vaalharts data

Average hectolitre mass (kg/hl) of oats cultivars under irrigation during the full or partial period from 2008 – 2012

Cultivar	2012 *	R	2010	R	2009	R	2008	R	4 year average 2008-2012	R	3 year average 2009-2012	R	2 year average 2010-2010	R
H06/15	48.15	7	49.83	7									48.99	6
H06/19			50.16	4										
H07/04	47.75	8	50.09	5									48.92	7
H07/05			49.15	11										
Heros			48.35	13	50.99	6	52.05	5						
Kompasberg	48.75	5	48.02	14	47.36	8	51.43	6	48.89	4	48.04	4	48.39	8
Overberg	50.45	2	50.68	1	51.03	5	51.30	7	50.87	3	50.72	2	50.57	2
Pallinup	50.40	3	49.79	8	51.74	4	53.06	1	51.25	2	50.64	3	50.10	3
Sederberg			48.98	12	50.38	7	50.90	8						
Simonsberg	48.70	6	49.37	10									49.04	5
SSH 405			49.73	9	53.44	1	52.45	3						
SSH 421			50.60	2	52.71	2	52.06	4						
SSH 491	52.50	1	50.37	3	52.15	3	52.54	2	51.89	1	51.67	1	51.44	1
Towerberg	49.70	4	49.95	6									49.83	4
Average	**49.55**		**49.65**		**51.23**		**51.97**		**50.72**		**50.27**		**49.66**	
LSD_t(0,05)	**1.50**		**1.05**		**1.87**		**0.94**		**0.55**		**0.63**		**0.68**	

* Only Vaalharts data

Dryland

The average yield in the dyland trial at Bethlehem was an excellent 3.53 ton/ha. The best cultivars in the 2012 season were Pallinup, Kompasberg and Towerberg.

The hectolitre mass values showed an average of 49.69 kg/hl. The best hectolitre mass was obtained by the SSH 491 (54.5 kg/hl). SH 491 was the only cultivar with a hectolitre mass of above 53 kg/hl, which is required for Grade 1.

The data generated under dryland conditions in the summer rainfall region are summarised in the tables below.

Yield of oat cultivars under dryland conditions at Bethlehem

Cultivars	2012	R	2010	R	2009	R	2007	R	2006	R	Average	R
H 06/15	3.36	6	0.80	5	2.63	7					2.26	9
H 06/19			0.59	12	2.72	5					1.65	13
H 07/04	2.90	8	0.67	8	2.88	4					2.15	10
H 07/05			0.65	11	2.59	10					1.62	14
Heros			0.66	9	2.98	2	4.24	4	1.98	5	2.47	6
Kompasberg	3.77	2	1.07	1	2.98	3	4.16	5	2.28	3	2.85	3
Overberg	3.47	5	0.87	4	2.62	8	3.78	8	2.06	4	2.56	4
Pallinup	4.34	1	1.02	2	3.03	1	3.95	7	2.84	2	3.03	1
Sederberg			0.20	14	2.06	14	4.51	1	1.31	7	2.02	12
Simonsberg	3.19	7	0.57	13	2.49	12					2.09	11
SSH 405			0.66	10	2.36	13	4.48	2	1.93	6	2.36	7
SSH 421			0.76	6	2.50	11	4.24	3			2.50	5
SSH 491	3.52	4	0.97	3	2.59	9	4.08	6	3.23	1	2.88	2
Towerberg	3.70	3	0.68	7	2.65	6					2.34	8
Average	**3.53**		**0.73**		**2.65**		**4.18**		**2.23**		**2.34**	
CV%	**9.70**		**21.90**		**14.20**		**12.10**		**13.4**			
LSD_t(0,05)	**0.51**		**0.23**		**0.54**		**0.74**		**0.30**			

Hectolitre mass of oat cultivars under dryland conditions at Bethlehem

Cultivars	2012	R	2010	R	2009	R	2007	R	2006	R	Average	R
H 06/15	49.2	5	45.40	11	55.00	7					49.87	12
H 06/19			46.30	6	54.90	8					50.60	10
H 07/04	48.1	7	45.70	9	56.65	2					50.15	11
H 07/05			44.90	13	54.25	12					49.58	13
Heros			45.60	10	56.90	1	51.95	8	53.71	2	52.04	2
Kompasberg	45.6	8	48.40	1	56.10	3	53.52	2	52.01	5	51.12	7
Overberg	51.1	2	47.20	3	55.65	5	52.12	7	52.95	3	51.79	4
Pallinup	49.6	4	48.20	2	55.87	4	52.65	4	52.65	4	51.80	3
Sederberg					52.50	14	52.27	6	49.91	7	51.56	6
Simonsberg	49.0	6	45.20	12	54.35	10					49.52	14
SSH 405			45.90	8	54.67	9	52.38	5	50.2	6	50.79	8
SSH 421			47.10	4	54.30	11	53.35	3			51.58	5
SSH 491	54.5	1	47.00	5	54.22	13	54.07	1	56.44	1	53.24	1
Towerberg	50.5	3	46.20	7	55.30	6					50.67	9
Average	**49.69**		**46.39**		**55.05**		**52.79**		**52.55**		**51.02**	
CV%	**2.20**		**3.30**		**2.00**		**3.3**		**2.90**			
LSD Cultivar	**1.57**		**2.07**		**1.55**		**2.58**		**1.53**			

3.4 Technology transfer objectives

The data collected in the three production areas were summarised in three project reports and submitted to the National Cultivar Evaluation Workgroup on 13 February 2013. The reports were accepted by Workgroup. Recommendations regarding the production of oats were updated and included in the 2013 issue of the "Guidelines for the production of small grains in the summer rainfall region" and the similar Guidelines for the winter rainfall area.

4. Future of the project

Results indicate that there are cultivars available for quality oat grain production under dryland and irrigated conditions. There is however, a lack of new cultivars with improved disease resistance coming into the market. It is important that these projects continue to ensure the release and commercialisation of improved oat cultivars, not only in terms of quality, but also in terms of yield potential, agronomic characteristics and disease resistance. This valuable information is needed on an annual basis to enable researchers to make sound and reliable recommendations to producers.

- Continued evaluation of South African and new cultivars for yield and quality characteristics.
- The continued update of relevant oat production information for use by producers.
- Screening of available cultivars for their respective disease profiles (crown and stem rust).

GK 02/04, GK 02/05: OAT CULTIVAR EVALUATION IN THE SUMMER RAINFALL REGION PROGRESS REPORT APRIL 2012 – MARCH 2013

Summary

Number: GK 02/04
Title: Oat cultivar evaluation in the winter rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Terry Walsh

Trials were planted at six sites in the Swartland and six sites in the Rûens during 2012. The Swartland trials were at Langgewens, Halfmanshof, Koringberg, Malmesbury, Hopefield and Velddrift. The six trials in the Rûens were planted at Tygerhoek, Voorstekop, Bredasdorp, Protem, (Kleinfontein), Alpha and Roodebloem. All the trials were harvested and processed.

The average yield of the trials in the Swartland was 2.63 ton/ha, with the trials in the Rûens yielding an average of 2.93 ton/ha. The highest yielding trials in the Rûens were at Roodebloem (4.61 ton/ha), Alpha (3.28 ton/ha) and Voorstekop (3.02 ton/ha) and in the Swartland at Malmesbury (4.15 ton/ha) and Hopefield (2.98 ton/ha).

The four best cultivars for hectolitre mass were SSH 491 (55.13 kg/hl), Pallinup (53.05 kg/hl), SSH 405 (52.81 kg/hl) and SSH 421 (52.21 kg/hl). The average hectolitre mass for the trials was 51.85 kg/hl. The only cultivars to meet the minimum requirements for Grade 1 (53 kg/hl) were SSH 491 and Pallinup.

Number: GK 02/05
Title: Oat cultivar evaluation for grain production in the summer rainfall region
Duration: Ongoing
Status: Continuation of existing project
Project leader: Willem Kilian

Field trials to evaluate the performance of existing oat cultivars as well as new promising oat lines were planted under irrigation and dryland conditions. Irrigation trials were planted at Bethlehem, Vaalharts and Riet River, while the dryland programme was executed at Bethlehem.

Irrigation
The oats cultivar trial under irrigation conditions at Riet River could not be used due to hail damage that influenced the data, while the Bethlehem trial was also excluded due to a high CV. The average yield of the remaining irrigation trial at Vaalharts was 5.71 ton/ha. SSH 491 had the highest yield, followed by Pallinup and Kompasberg.

The average hectolitre mass value in this trial was 49.55 kg/hl.

Dryland
The average yield in the dyland trial at Bethlehem was an excellent 3.53 ton/ha. The best cultivars in the 2012 season were Pallinup, Kompasberg and Towerberg.

The hectolitre mass values showed an average of 49.69 kg/hl. The best hectolitre mass was obtained by the SSH 491 (54.5 kg/hl). SH 491 was the only cultivar with a hectolitre mass of above 53 kg/hl, which is required for Grade 1.

Future of the project

Results indicate that there are cultivars available for quality oat grain production under dryland and irrigated conditions. There is however, a lack of new cultivars with improved disease resistance coming into the market. It is important that these projects continue to ensure the release and commercialisation of improved oat cultivars, not only in terms of quality, but also in terms of yield potential, agronomic characteristics and disease resistance. This valuable information is needed on an annual basis to enable researchers to make sound and reliable recommendations to producers.

- Continued evaluation of South African and new cultivars for yield and quality characteristics.
- The continued update of relevant oat production information for use by producers.
- Screening of available cultivars for their respective disease profiles (crown and stem rust).

GK 09/12: OATS DEVELOPMENT AND SELECTION PROGRAMME
PROGRESS REPORT MARCH 2012 – APRIL 2013

1. Project Details

Number: GK 09/12
Title: Oats development and selection programme
Duration: Ongoing
Status: Continuation of existing project
Project leader: Petrus Delport

2. Introduction

Oats as a crop is of Mediterranean origin: not as old as wheat and barley, but its domestication dates back to ancient times. Oats have many uses:

- a cereal
- a feed grain
- green or conserved fodder
- more recently, as a winter cover crop in no-till rotations.

Oats rank sixth in world cereal production statistics, following wheat, maize, rice, barley and sorghum. Oat grain has always been an important form of livestock feed and provides a good source of protein, fiber and minerals. However, global oat production declined as mechanization on farms increased between 1930 and 1950. Yet oats remain an important grain crop for small grain producers in marginal production regions to produce enough grain for the developing world as well as for specialist uses in developed economies.

In many parts of the world, oats are grown for use as grain as well as for forage and fodder, straw for bedding, hay, silage and chaff. Livestock grain feed is still the primary use of oats, accounting for an average of around 74% of the world's total consumption.

Apart from yield, disease resistance is the most important trait of commercial oats. Unfortunately, the level of crown rust resistance in South African oat cultivars is unacceptably low. Oats are mainly cultivated as a grain crop in regions where the risk of crown rust infection levels is high, such as in the Western Cape. The Small Grain Institute evaluated all commercial oats cultivars for resistance against the prevailing rust pathotypes and they were confirmed to be susceptible.

Yield, hectoliter mass and disease resistance are therefore the main selection criteria against which new lines are being tested.

3. Goals and Objectives

3.1 Long-term goal

The goal of this project is to introduce and evaluate new international germplasm in order to release new cultivars with high grain yield potential that are adapted to the oats production areas, are disease resistant and have acceptable grain quality.

3.2 Objectives for 2012/2013

Due to the fact that the project indefinitely discontinued in 2011, small amounts of seed were placed in storage at the ARC-SGI's Germplasm Bank, with the hope that the project would be continued in the future. These small amounts of seed were planted in single rows and small plots during the 2012 cultivation cycle to be multiplied and for further selections.

4. Report on objectives achieved for 2012/2013

4.1 Quaker Nursery

231 Rows were planted at Bethlehem – The 2012 QION. From these rows, 56 selections were made with agronomical and morphological seed selections (seed colour and shape). They will be planted as Phase 1 plots in 2013 at Langgewens and Tygerhoek so that single plume selections can be made. The rationale behind this decision is so that we can't develop pure lines from the segregating populations that form part of the QION nursery each year and also to further "purify" the more advanced component of the nursery.

One hundred and sixty eight selections from the 2010 Quaker nursery were planted at Tygerhoek as 4m rows. From these rows, 45 selections were made and will be planted as part of the 2013 Oat Phase2 trial at Tygerhoek and Langgewens.

4.2 Segregating material

Two hundred and fifty eight entries of the previous selection from the 2012 Quaker nursery, were planted as 4m rows at Tygerhoek as a F5 population. From these entries, 45 entries were selected to be advanced to the 2013 Oat Phase 1 trial.

4.3 Advanced Trials

Oats Phase 1 material
Phase1 A and B trials were planted as small plots at Langgewens and Tygerhoek. These trials consisted of respectively 91 and 95 entries of selections made in 2010. From the Phase1 A trial 352 plume selections were made, and 475 plumes were selected from the Phase1 B trial. These 827 plumes will be planted as single rows at Riet River in 2013 to optimally multiply the seed as well as to generate pure breeding seed lots.

Oats Phase 2 material
Twenty entries were planted at Tygerhoek. After agronomical evaluation (biomass and lodging resistance) (Figure 1), determination of hectolitre mass and yield potential (Table 1), selections were made and 10 lines were advanced to the 2013 Elite trial for evaluation in the target areas.

Figure 1. Agrotypes selected for (leave biomass, plume structure and tillering ability)**.**

Table 1. Hectolitre mass and yield potential of the selected Phase 2 lines.

Year of evaluation				2010		2011		2012	
Elite entry	Snr Entry	Entry	QION Source	Hectolitre mass kg/ha	Yield ton/ha	Hectolitre mass kg/ha	Yield ton/ha	Hectolitre mass kg/ha	Yield ton/ha
1	6	296	2008 QION ENTRY: 25	62.50	1.80	No data	No data	50.20	2.43
2	8	302	2008 QION ENTRY: 52	49.00	1.13	No data	No data	48.60	1.93
3	9	303	2008 QION ENTRY: 55	52.00	1.15	No data	No data	47.60	2.45
4	12	306	2008 QION ENTRY: 60	53.75	1.77	No data	No data	49.60	2.90
5	14	308	2008 QION ENTRY: 67	52.50	1.78	No data	No data	46.60	3.54
6	15	309	2008 QION ENTRY: 69	55.75	1.86	No data	No data	47.40	3.88
7	17	311	2008 QION ENTRY: 72	55.75	2.54	No data	No data	47.60	4.09
8	18	312	2008 QION ENTRY: 80	56.50	1.89	No data	No data	47.40	2.89
9	19	313	2008 QION ENTRY: 85	61.75	2.29	No data	No data	51.20	3.41
10	20	314	2008 QION ENTRY: 86	61.00	2.46	No data	No data	49.40	3.57

GK 09/12: OATS DEVELOPMENT AND SELECTION PROGRAMME
PROGRESS REPORT MARCH 2012 – APRIL 2013

Summary

Number: GK 09/12
Title: Oats development and selection programme
Duration: Ongoing
Status: Continuation of existing project
Project leader: Petrus Delport

Oats production is small in comparison with other grain crops. It does, however, contribute significantly to the animal feed and breakfast cereal industries. Oats in rotation with wheat is used to suppress take-all in wheat, especially in the irrigation areas.

Oats for the breakfast cereal industry is imported because of the lack from producers to continuously supply oats with an acceptable (≥52 kg/hl) quality. This is due to environmental conditions like diseases (crown rust) and old cultivars (genetics). Before promising lines can be released as new cultivars, they have to comply with the quality requirements as prescribed by the industry.

The levels of crown rust resistance in South African oats cultivars are unacceptably. Oats are mainly cultivated for grain in regions where the risk of natural crown rust infection is high. All oats cultivars released by the ARC-Small Grain Institute and currently produced commercially, were evaluated for resistance against the new rust pathotypes and were confirmed as susceptible.

The long-term aim of this project is to introduce and evaluate new international germplasm regarding grain production potential, hectolitre mass, adaptation for dryland and irrigation and disease resistance.

The objectives for 2012/2013 were to:

- To restart the programme
- Evaluate the Quaker Oats Nursery and select adapted genotypes from these lines;
- Selecting single plumes from Quaker plots
- Multiply and evaluate Phase 1 and 2 material.

The 2012 Quaker International Oats Nursery (QION) was planted under quarantine at SGI facilities in Bethlehem. Fifty six selections were made from the 231 entries, to be planted as plots in the Winter Rainfall Area (WRA) during the 2013 season.

186 Phase 1 plots were planted at Tygerhoek and Langgewens. They consisted mainly of segregating material of the 2006 and 2007 QION. 827 plumes were selected and will be multiplied in 2013.

426 Segregating lines were planted as single rows at Tygerhoek in 2012. 90 Lines were selected to be planted as Phase 2 material in 2013 to be further screened for disease, yield and agronomic properties.

20 Phase 2 lines were planted at Tygerhoek in 2012. 10 Lines were selected to be multiplied in 2013 for further adaptability tests.