

SOJABOON KULTIVARAANBEVELINGS VIR 2009/2010

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Hoewel sojabone 'n gewas is wat bykans wêreldwyd verbou word, het individuele kultivars 'n beperkte gebiedsaanpassing. Gevolglik sal die kultivar wat die beste aangepas is vir 'n gegewe lokaliteit, dié een wees wat oor 'n aantal jare die hoogste opbrengs en saadkwaliteit lewer vir 'n spesifieke lokaliteit. Onder vergelykbare omgewings-toestande en produksiepraktyke kan 'n seleksie uit kultivars gemaak word wat 'n hoë opbrengs en 'n meer akkurate oesekerheids-waarde het. Die Nasionale Sojaboonkultivarproewe van die LNR-Instituut vir Graangewasse lewer in die opsig waardevolle inligting ten opsigte van verskillende produksie areas in Suid-Afrika.

BELANGRIKE INLIGTING VIR KULTIVARKEUSE

Die belangrikste inligting wat in ag geneem moet word ten opsigte van kultivarkeuse by sojabone, is **lengte van groeiseisoen**. Anders as by die meeste algemeen verboude gewasse, is sojabone gevoelig vir daglengte (fotoperiode) en sal 'n gegewe kultivar al hoe later ryp word hoe verder suid dit in Suider Afrika geplant word. Vir dieselfde rede sal plantdatum ook die lengte van die groeiseisoen beïnvloed en sal 'n gegewe kultivar heelwat gouer blom by 'n later plantdatum. Heersende temperatuur (veral nagtemperatuur) het ook 'n invloed en sojabone groei heelwat stadiger op die hoëveld, vergeleke met die

SOYBEAN CULTIVAR RECOMMENDATIONS FOR 2009/2010

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Although soybeans as a crop is grown worldwide, individual cultivars or genotypes demonstrate a limited adaptation to specific geographical areas. The best adapted cultivar is therefore the one that will, in the long term, give the best yield and quality for a specific locality within a specific geographical area. A selection can be made for cultivars with high yield and optimal yield reliability under comparable environmental conditions as well as production practises. The National Soybean Cultivar Trials conducted by the ARC-Grain Crops Institute render a valuable service in identifying such cultivars for different production areas in South Africa.

IMPORTANT INFORMATION FOR CULTIVAR CHOICE

The **length of the growing season** is the most important characteristic to take into consideration in terms of cultivar choice for soybean. Unlike the other most commonly cultivated crops, soybean are sensitive to day length (photo period) and a given cultivar will ripen later and result in a longer growing season cultivar the further south it is planted in Southern Africa. Planting dates will therefore also influence the length of the growing season and a given cultivar will flower much earlier should it be planted at a later planting date. Prevailing temperature also has an affect, with soybean gro-

warmer laeveld. Tabel 1 illustreer die invloed wat die lengte van groeiseisoene het ten opsigte van die verskillende kultivars asook vir 'n spesifieke kultivar in verskillende produksiegebiede. Dit is belangrik om te onthou dat vroeë en later plantdatums binne dieselfde gebied ook die groeiseisoenlengte van 'n kultivar beïnvloed.

Vir produsente met ondervinding van sojaboonproduksie kan die gevoeligheid vir daglengte en die genetiese variasie vir relatiewe groeiseisoenlengte, met vrug gebruik word vir byvoorbeeld hooiproduksie (gebruik van lang groeiseisoen kultivars), stroopskedulering (plant kultivars met verskillende rypword datums) en vir droogteontwyking of noodaanplantings (kultivars met 'n relatief kort groeiseisoen). Vir produsente wat nie ondervinding het van sojaboonproduksie nie, kan dié eienskap ook by wyse van verkeerde kultivarkeuse tot gevolg hê dat die sojabone, a) nie wil ryp word nie waar 'n kultivar met 'n te lang groeiseisoen in 'n tipiese kort-groeier gebied aangeplant is, b) reeds oesgereed is terwyl reën en hoë temperature stroop bemoeilik en kwaliteit benadeel waar 'n kultivar met 'n te kort groeiseisoen vir 'n gebied gekies is en c) onstroopbaar is as gevolg van 'n te lae peulhoogte.

Prosedure vir kultivarkeuse op grond van groeiseisoenlengte is dan as volg: Die lokaliteite waar sojaboonkultivarproewe uitgevoer is, is groepeer om warm-, matig- en koel gebiede aan te dui (Tabel 2). Dit is belangrik dat u moet bepaal of die gebied waar u sojabone produseer, 'n klimaat soortgelyk aan die warm, matig of koel groe-

wing much slower on the Highveld compared to the warmer Lowveld. Table 1 illustrates the substantial variation for length of growing season among cultivars as well as for the different production areas.

Producers well experienced in soybean cultivation can utilize the photoperiod sensitivity of soybean, along with the genetic variation for relative length of the growing season with great success, for example, for hay production (a long growing season cultivar can be used), for scheduling of harvest (plant cultivars with different ripening dates) and for drought avoidance or emergency planting (use relatively short growing season cultivars). For producers with little or no experience in soybean cultivation, this characteristic could prove to be hazardous when the wrong cultivar choice is made and optimal yield is not realised because a) the cultivar does not ripen where a too long grower has been planted for the area, b) is ready for harvesting while rain and high temperatures hamper harvesting and adversely affect quality where a too short grower has been planted for the area, and c) the cultivar is unable to be harvested because of a too low pod height.

Procedure for Cultivar choice using length of growing season:

Localities where soybean trials were conducted during the past season were divided into warm-, moderate- and cool production areas (Table 2). It is important for a soybean producer to determine whether the area that will be used for soybean production is similar to the grouping of localities indicated by the warm-, moderate- and cool

pering van lokaliteite het. As algemene reël word aanvaar dat kultivars met 'n langer groeiseisoen die beste sal doen in gebiede met 'n warmer klimaat, medium groeiseisoen kultivars in gebiede met 'n gematigde klimaat en korter groeiseisoen kultivars in gebiede met 'n koeler klimaat. Dit is egter belangrik om te onthou dat daar ook uitsonderings op die reël is en daarom word aanbeveel dat sowel opbrengs en aanpassingsvermoë van kultivars soos aangedui in Tabelle 4 & 5, 7, 8, 9 en 10 & 11 saam met groeiseisoenlengte gebruik sal word om 'n meer akkurate kultivarkeuse vir 'n spesifieke gebied te maak.

Plantdatum beïnvloed sojabone se aanpassing en gevolglik kultivarkeuse. Die optimale plantdatum is normaalweg tydens November. In warmer gebiede kan produsente egter tot die eerste week in Januarie nog plant, maar dan word nouer rywydte, hoër plantpopulasie en 'n vinniger-groeiende kultivar aanbeveel. Waar grond- en lugtemperatuur aanvaarbare vlakke vroeg in die seisoen bereik, word 'n Oktober plantdatum, veral op die hoërliggende gebiede aanbeveel. Dit is belangrik om te onthou dat 'n vroeër of 'n later plantdatum in al die produksiegebiede kultivarkeuse kan beïnvloed.

Peul- en planthoogte beïnvloed die stroopbaarheid en die staanvermoë van sojabone en is faktore wat in ag geneem moet word by kultivarkeuse. Oor die algemeen is daar 'n verband tussen peul- en planthoogte en relatiewe lengte van die groeiseisoen. Relatief kort groeiseisoenkultivars het gewoonlik 'n laer peul- en planthoogte as langgroeiseisoenkultivars onder

production areas in Table 2. It is generally accepted that cultivars with a longer growing season will perform better in the warmer growing areas, cultivars with a medium growing season in the moderate growing areas and cultivars with a shorter growing season in the cooler production areas. There are however exceptions to the rule and it is therefore recommended to also use yield performance and cultivar adaptation presented in Tables 4 & 5, 7, 8, 9 and 10 & 11 in combination with length of growing season during cultivar selection for a specific area.

Planting date influences the adaptation of soybean cultivars and therefore also cultivar choice. The optimum planting date is usually during November. In warmer areas though, soybean can be planted until the first week of January. With later planting dates narrow rows, higher plant populations and shorter growing season cultivars are recommended. A planting date during October, especially in areas with a higher altitude, will be recommended where soil and air temperatures reach acceptable levels early in the growing season. Planting at an earlier or later planting date will affect cultivar choice.

Pod- and plant height have an impact on the ability to harvest the crop, and are characteristics that should be taken into account during deciding on what cultivar to plant. A relationship exists between pod- and plant height and relative length of the growing season. Cultivars with a shorter growing season tend to have lower plant- and pod heights compared to longer growing season cultivars under similar

vergelykbare toestande. Beide eienskappe word egter ook deur produksiepraktyke beïnvloed. 'n Nouer tussenry- en binnery spasiëring sal peulhoogte betekenisvol verhoog. In die Nasionale Kultivarproewe word by gestandaardiseerde toestande vir peulhoogte geëvalueer en kan kultivars met aanvaarbare peulhoogtes gekies word. Peulhoogte word aangedui in Tabel 3.

Staanvermoë kan beïnvloed word deur die aantal bewolkte dae wat tydens die seisoen voorkom. Dit kan tot gevolg hê dat kultivars wat normaalweg goed staan, hoër groei en dus word die risiko van omval verhoog.

Groeiwyse onderskei tussen bepaalde en onbepaalde groeiers. Kultivars met 'n bepaalde groeiwyse word verkieslik onder besproeiing geplant, terwyl kultivars met 'n onbepaalde groeiwyse (wat nie lengtegroei tydens blom staak nie) onder droëland- en koelweergroeitoestande verkies word. Die groeiwyse van geregistreerde kultivars word in Tabel 3 aangedui.

Genetiese **weerstand teen siektes en insekte** kan goed gebruik word waar die siektes en insekte die oes kan verlaag. Die kultivar met weerstand teen sojaboon mosaïekvirus is Ibis, terwyl SCS 1 teen phytophthora bestand is. Inligting ten opsigte van die vatbaarheid/bestandheid van kultivars vir plantparasitiese knopwortelaalwurms, word in Tabel 3 aangedui.

Rywydte kan ook kultivarkeuse beïnvloed aangesien 'n betekenisvolle interaksie tussen die twee bestaan. Kultivars wat geneig is tot

growing conditions. Both characteristics are also influenced by production practices. More narrow inter- and intra row spacing will increase pod height significantly. Pod clearance for the cultivars evaluated is reported in Table 3.

Standability is influenced by the number of overcast days experienced during the growing season. Plant height tends to increase when overcast weather occur and could result in a higher lodging percentage of plants.

Growth habit distinguishes between determinate and indeterminate genotypes. Cultivars with a determinate growth habit are preferably planted under irrigation, while indeterminate cultivars (that do not stop vertical growth during flowering) are preferred under dry land and cool weather growing conditions. Growth habit for registered cultivars is indicated in Table 3.

Genetic resistance against diseases and pests are characteristics that are relevant where the probability of such risks exists. Ibis is a cultivar with known resistance against soybean mosaic virus, while SCS 1 has resistance against phytophthora. Host suitability of registered cultivars to root-knot nematode is also reported in Table 3.

Row width will also influences cultivar selection, since a significant relation exists between cultivars and row width. Cultivars with more side branches and leaves are better adapted to wider rows, while cultivars with less side branches

sytafvorming en 'n digte blaredak het, is beter aangepas in wye rye, terwyl kultivars met 'n oop blaredak en min sytakke, beter aangepas is by relatief nouer ryydtes.

Weerstand teen oopspring van peule kan 'n belangrike rol speel tydens ongunstige toestande gedurende die oes van sojabone. Volgens inligting uit die Nasionale Kultivarproewe is dit duidelik dat relatief kort groeiseisoenkultivars die grootste risiko vir oopspring het, terwyl relatief lang groeiseisoenkultivars die minste daardeur geraak word. 'n Aanduiding ten opsigte van genetiese weerstand tussen kultivars van dieselfde groeiseisoenlengte wat oopspring aanbetref, kon egter nie verkry word nie. Kultivars word geëvalueer op 'n skaal van 1 (goed) tot 9 (swak) wat oopspring aanbetref en die resultate word in Tabel 3 aangebied.

Gevoeligheid vir onkruidodder kan in sommige gevalle kultivarkeuse beïnvloed. Geen sojaboonkultivar is bestand teen die atrazine-tipe onkruidodders nie en die volle wagperiode moet nagekom word voordat die plant van sojabone oorweeg word. Sommige kultivars soos Dumela, Ibis, Komatie en Edgar is besonder gevoelig vir metribusin. In alle gevalle moet seker gemaak word dat aanwysings op die onkruidodderetiket voorsiening maak vir die kultivar wat aangeplant gaan word.

Saadgrootte, hilumkleur, proteïengehalte en GMO-status is eienskappe wat 'n premieprys kan beding. Saadgrootte is geneties, maar word sterk beïnvloed deur omgewingstoestande. Gunstige toestande tydens saadvulperiode sal saadgrootte positief beïnvloed.

and leaves are better adapted to more narrow rows.

Resistance against seed shattering can play an important role during unfavourable harvesting conditions. Information obtained during the National Soybean Cultivar Trials indicates that cultivars with a relative short growing period tend to shatter more than cultivars with a longer growing period. Rating of cultivars in terms of their susceptibility to shattering are done on a scale from 1 (good) to 9 (poor) and are presented in Table 3.

Sensitivity to herbicides can, in some cases, influence the choice of a cultivar. No soybean is resistant to the atrazine type herbicides and the full waiting period have to be maintained before the planting of soybean can be considered. Some cultivars, such as Dumela, Ibis, Komatie and Edgar, are extremely sensitive to metribusin and should under no circumstances be used when these cultivars are planted.

Seed size, hilum colour, protein qualities and GMO status are characteristics that can negotiate a premium price for soybean assignments. Seed size is genetically regulated, but is greatly influenced by the environment conditions. Favourable conditions during the seed filling period will positively influence seed size. The protein content of soybean seed is also genetically regulated and can be adversely affected by environmental conditions (rainfall, temperature, stress) and crops management (poor or no nodulating, acidic soil and low soil fertility). Protein contents of soybean seed below 36 % are unsatisfactory, while that

Proteïeninhoud van die saad is ook geneties maar kan nadelig beïnvloed word deur omgewingstoestand (reënval, temperatuur en stremming) en bestuur (swak of geen nodulering, suur grond en lae grondvrugbaarheid). Proteïeninhoud (vogvrye basis) onder 36% is onbevredigend en bokant 40% is uitstekend wat sojabone aanbetref.

Saadopbrengs gee 'n aanduiding van 'n kultivar se genetiese aanpassing en geskiktheid vir 'n bepaalde gebied. Vir die 2008/2009 seisoen is 18 kultivars geplant en geëvalueer en was die data van 22 proewe aanvaarbaar vir statistiese analises. Die oesekerheidswaardes van die 18 kultivars vir die drie verbouingsgebiede (warm, matig en koud) word in Tabelle 4 & 5, 7, 8 & 9 en 10 & 11 aangebied. Tabela 4, 7 en 10 asook Tabela 5, 8 en 11 bevat inligting oor kultivars wat vir onderskeidelik drie en twee jaar in dié proewe ingesluit was. Tabela 6 en 12 bevat inligting aangaande die opbrengs van die kultivars vir die 2008/2009 produksieseisoen op die onderskeie lokaliteite. Dit is belangrik dat u die verdeling van lokaliteite in Tabel 2 gebruik om te bepaal in watter gebied u plaas geleë is. Vergelyk dan die kultivars in die oesekerheidstabel wat u gekies het met mekaar by die realistiese opbrengsmikpunt vir u plaas.

VERDERE INLIGTING

Volledige inligting oor die Nasionale Sojaboon Kultivarproewe en twee nuttige bronne van inligting oor sojaboonproduksie nl “Jou Gids tot Suksesvolle Sojaboonproduksie” en “Sojaboonsiektes en –plae” is beskikbaar by:

above 40%, on a moisture free basis, is regarded as excellent.

Seed yield indicates the genetic adaptation and suitability of a cultivar to be planted in a specific area. During the 2008/2009 season 18 cultivars were included in the National Soybean Cultivar Trials, while data of 22 localities were acceptable for statistical analyses.

Yield reliability values of the 18 cultivars for the three production areas (warm, moderate and cool) are presented in Tables 4 & 5, 7, 8 & 9 and 10 & 11. Tables 4, 7 and 10 as well as Tables 5, 8 and 11 contain information regarding cultivars included in the trials for three and two years respectively. Yield of the cultivars at the different localities for the 2008/2009 growing season is presented in Tables 6 and 12. It is also important to use the information provided in Table 2 to determine whether the area to be planted corresponds with the warm, moderate or cool localities. Use the selected yield reliability table (warm, moderate or cool) to select cultivars for the yield potential of the specific farm.

FURTHER INFORMATION

Information on the National Soybean Cultivar Trials and two useful guides, namely “Your Guide to Successful Soybean Production” and “Soybean Diseases and Pests” are available at:

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*** Kultivars wat in die verslag opgeneem is, is die enigste kultivars wat deur die LNR getoets en aanbeveel word.**

ERKENNING

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*** Cultivars that are discussed in this report are the only cultivars evaluated and recommended by the ARC.**

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Tabel 1. Gemiddelde aantal dae tot 50% blom en oesrypheid van kultivars gedurende 2008/09 groeiseisoen vir warm, matig en koue produksiegebiede.

Table 1. Average number of days to 50 % flowering and harvesting of cultivars during 2008/09 growing season for warm, moderate and cool production areas.

Kultivar/ Cultivar	Dae tot 50% blom/Days to 50% flower			Dae tot oesryp/Days to harvest		
	Warm/Warm ¹	Matig/Moderate ²	Koud/Cool ³	Warm/Warm ⁴	Matig/Moderate ⁵	Koel/Cool ⁶
PAN 1454 R	34	47	47	119	128	-
PAN 535 R	40	63	65	119	137	-
LS 6161 R	41	64	65	124	137	-
LS 6164 R	40	61	57	122	145	-
LS 6150 R	41	62	62	126	146	-
PAN 1666 R	43	64	61	123	143	-
LS 6050 R	40	62	61	124	147	-
A 5409 RG	43	63	61	120	142	-
PAN 737 R	43	64	65	126	149	-
Heron	44	65	71	123	149	-
LS 678	45	68	71	126	149	-
Egret	48	68	72	129	152	-
Ibis 2000	51	67	72	132	148	-
PAN 1664 R	37	63	58	123	144	-
Dundee	45	65	65	128	146	-
LS 6162 R	35	44	47	117	126	-
PHB 96 B 01	42	63	54	127	148	-
PHB 95 B 53	43	65	61	122	143	-

¹ - Gemiddeld van 5 lokaliteite / average of 5 localities

³ - Gemiddeld van 1 lokaliteit / average of 1 locality

⁵ - Gemiddeld van 5 lokaliteite / average of 5 localities

² - Gemiddeld van 4 lokaliteite / average of 4 localities

⁴ - Gemiddeld van 5 lokaliteite / average of 5 localities

⁶ - Gemiddeld van 0 lokaliteit / average of 0 locality

Tabel 2. Groepering van lokaliteite volgens warm, matige en koue produksiegebiede gedurende die 2008/09 groeiseisoen.

Table 2. Grouping of localities according to warm, moderate and cool production areas during the 2008/09 growing season.

Warm/Warm	Matig/Moderate	Koud/Cool
Brits (D) Empangeni PD1 (D) Empangeni PD2 (D) Groblersdal (B/I) Koedoeskop (B/I) Rustenburg (D) Vaalharts (B/I)	Cedara (D) Dundee (D) Glen (B/I) Greytown (D) Greytown Kranskop (D) Lichtenburg (D) Newcastle (D) Potchefstroom B90 (B/I) Potchefstroom D90 (D) Vryheid (D)	Delmas (D) Ermelo (D) Ficksburg (D) Kinross (D) Villiers (D)

B – Besproeing / I - Irrigation

D – Droëland / Dry land

Tabel 3. Algemene inligting ten opsigte van geregistreerde sojaboonkultivars wat tydens die 2008/09 groeiseisoen geëvalueer is.
Table 3. General information on registered soybean cultivars that were evaluated during the 2008/09 growing season.

Kultivar/ Cultivar	Volwasse- heidsgroe- pering/Ma- turity Group	Groei- wyse/ Growth habit ¹	Hilum- kleur/ Hilum colour ²	Olieper- sentasie/ Oil per- centage (%)	Proteïenper- sentasie/ Protein percentage (%)	Aalwurmgasheerstatus/ Nematode host status ³		Peul- hoogte/ Pod height ⁴	Oopsporing/ Shatter ⁵	Verskaffer/ Supplier
						<i>M. incognita</i>	<i>M. javanica</i>			
PAN 1454 R	4.5	I	BL	18.70	40.97	S	I	9	3.07	Pannar
PAN 535 R	5.5	D	B	17.93	41.52	I	I	10	1.83	Pannar
LS 6161 R	6.3	I	IB	18.69	41.60	S	S	12	2.97	Link Seed
LS 6164 R	6.0	D	LB	18.52	41.06	S	S	12	2.33	Link Seed
LS 6150 R	6.5	I	LB	18.11	41.06	S	S	11	2.60	Link Seed
PAN 1666 R	5.8	I	BL	19.03	41.48	S	S	12	1.70	Pannar
LS 6050 R	6.4	D	LB	18.47	41.37	S	S	11	2.57	Link Seed
A 5409 RG	5.5	I	G	17.98	41.64	I	S	11	1.60	Pannar
PAN 737 R	7.0	D	IB	18.52	41.28	S	S	13	1.97	Pannar
Heron	7	D	LB	16.97	41.95	S	S	13	1.37	LNR
LS 678	6.8	D	LB	18.30	41.44	I	I	12	1.90	Link Seed
Egret	7	D	KL	15.86	43.51	R	R	13	2.47	LNR
Ibis 2000	7	D	IB	16.87	43.73	S	S	15	1.87	LNR
PAN 1664 R	5.9	D	LB	18.10	41.39	S	S	10	2.63	Pannar
Dundee	6	I	B	17.78	41.41	-	-	16	1.67	LNR
LS 6162 R	4	I	BL	18.80	41.58	I	S	7	3.47	Link Seed
PHB 96 B 01	6	D	LB	18.07	41.59	S	S	12	1.33	Pioneer
PHB 95 B 53	6	D	BL	17.91	42.86	S	S	10	2.37	Pioneer

¹ D - Bepaald/determinate

I - Onbepaald/Indeterminate

² BL - Swart/Black

IB - Onvolledig swart/Imperfect black

B - Bruin/Brown

LB - Ligbruin/Buf

G - Grys/Grey

KL - Kleurloos/Buf

³ R - Weerstandbiedend vir die spesifieke knopwortelaalwurmspesie en/of ras

Resistant to the specific root-knot nematode species and/or race

S - Vatbaar vir die spesifieke knopwortelaalwurmspesie en/of ras

Susceptible to the specific root-knot nematode species and/or race

I - Intermediêr t.o.v knopwortelaalwurmweerstand

Intermediate in terms of root-knot nematode resistance

⁴ Peulhoogte in cm/Pod height in cm

⁵ Geneigdheid tot oopsporing geëvalueer op 'n skaal van 1-9, waar 1 = goed en 9 = swak

Tendency to shatter evaluated on a scale from 1-9, where 1 = good and 9 = poor

Tabel 4. Oessekerheid van kultivars by die verskillende opbrengsmikpunte vir die koeler produksiegebiede gedurende die 2006/07, 2007/08 en 2008/09 groeiseisoene.

Table 4. Yield reliability of cultivars at different yield targets for the cooler production areas during the 2006/07, 2007/08 and 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 535 R	0.37	0.85	1.33	1.81	2.29	2.77	3.25	1.83	0.3167
LS 6161 R	0.42	0.92	1.41	1.91	2.40	2.90	3.39	1.61	0.1262
LS 6164 R	0.40	0.91	1.41	1.92	2.43	2.93	3.44	1.66	0.1587
LS 6150 R	0.34	0.89	1.44	2.00*	2.55*	3.10*	3.66*	1.73	0.1992
LS 6050 R	0.49*	1.05*	1.61*	2.17*	2.74*	3.30*	3.86*	1.79	0.1381
A 5409 RG	0.35	0.73	1.11	1.49	1.86	2.24	2.62	1.49	0.1891
PAN 737 R	0.41	0.96*	1.52*	2.07*	2.62*	3.18*	3.73*	1.71	0.1425
LS 678	0.51*	1.00*	1.50*	1.99*	2.49	2.98	3.47	1.72	0.1412
Egret	0.18	0.65	1.13	1.61	2.09	2.57	3.04	1.57	0.2659

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 5. Oessekerheid van kultivars by die verskillende opbrengsmikpunte vir die koeler produksiegebiede gedurende die 2007/08 en 2008/09 groeiseisoene.

Table 5. Yield reliability of cultivars at different yield targets for the cooler production areas during the 2007/08 and 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 1454 R	0.41	0.86	1.30	1.75	2.20	2.65	3.10	2.39	0.1741
PAN 535 R	1.24*	1.45*	1.65*	1.85	2.05	2.25	2.46	2.63	0.2428
LS 6161 R	0.97*	1.33*	1.69*	2.05*	2.42	2.78	3.14	2.60	0.1273
LS 6164 R	0.77*	1.19*	1.60*	2.02*	2.44	2.86	3.27	2.65	0.1689
LS 6150 R	0.00	0.40	1.01	1.63	2.24	2.85	3.47	2.16	0.1270
PAN 1666 R	1.09*	1.43*	1.76*	2.10*	2.44	2.77	3.11	2.61	0.1095
LS 6050 R	0.90*	1.34*	1.78*	2.23*	2.67*	3.11*	3.55	2.63	0.0744
A 5409 RG	0.26	0.83	1.39	1.96	2.52*	3.08*	3.65*	2.55	0.1545
PAN 737 R	0.43	0.96	1.49	2.03*	2.56*	3.09*	3.62*	2.43	0.0736
Heron	0.00	0.49	1.26	2.03*	2.81*	3.58*	4.35*	2.63	0.1652
LS 678	0.21	0.69	1.16	1.63	2.10	2.58	3.05	2.49	0.3124
Egret	0.00	0.08	0.80	1.53	2.25	2.98	3.70*	2.27	0.2449
Ibis 2000	0.00	0.35	0.96	1.57	2.19	2.80	3.41	2.02	0.0938

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 6. Saadopbrengs (kg ha⁻¹) van kultivars gedurende die 2008/2009 groeiseisoen ten opsigte van die verskillende lokaliteite wat in die koel produksiegebiede geleë is.

Table 6. Seed yield (kg ha⁻¹) of cultivars during the 2008/2009 growing season for the various localities situated in the cool production areas.

Kultivar/Cultivar	Delmas	Ermelo	Ficksburg	Kinross	Villiers	Gem/Mean
LS 6164 R	3487	2519	1449	2435	2552	2488
PAN 1454 R	3648	2065	1694	2116	1526	2210
PAN 535 R	3384	2110	2271	2926	1478	2434
LS 6161 R	3355	2329	1514	2634	2244	2415
LS 6150 R	3486	1521	1190	2005	2170	2074
PAN 1666 R	3337	1855	2514	2819	2552	2615
LS 6050 R	3702	2102	2426	2407	2041	2536
A 5409 RG	3926	2137	1306	2912	2233	2503
PAN 737 R	3523	2149	1750	2477	2215	2423
Heron	4263	1548	2396	2986	1919	2622
LS 678	3282	2357	2588	2972	2319	2703
Egret	3847	1672	2324	2412	2237	2498
Ibis 2000	3148	1552	1644	2028	1989	2072
PAN 1664 R	3422	2272	2435	2551	2737	2683
Dundee	4817	1775	2222	2000	1774	2518
LS 6162 R	3580	1579	1463	2148	1722	2098
PHB 96 B 01	2744	1551	2565	2315	1900	2215
PHB 95 B 53	4018	1418	1813	2440	2189	2375
Gem/Mean	3609	1917	1976	2477	2100	2416

Tabel 7. Oesekerheid van kultivars by die verskillende opbrengsmikpunte vir die matige produksiegebiede gedurende die 2006/07, 2007/08 en 2008/09 groeiseisoene.

Table 7. Yield reliability of cultivars at different yield targets for the moderate production areas during the 2006/07, 2007/08 and 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 535 R	0.23	0.77	1.30	1.83	2.36	2.89	3.42	2.30	0.3276
LS 6161 R	0.42*	0.94*	1.46*	1.98*	2.50*	3.02*	3.54*	2.19	0.1358
LS 6164 R	0.10	0.63	1.15	1.68	2.20	2.73	3.25	2.25	0.4086
LS 6150 R	0.39*	0.87*	1.36	1.84	2.33	2.81	3.30	2.17	0.1987
LS 6050 R	0.42*	0.96*	1.50*	2.03*	2.57*	3.11*	3.65*	2.18	0.1092
A 5409 RG	0.29	0.86*	1.42*	1.99*	2.55*	3.11*	3.68*	2.21	0.1608
PAN 737 R	0.31	0.80	1.29	1.78	2.28	2.77	3.26	2.23	0.2812
LS 678	0.22	0.64	1.06	1.48	1.90	2.32	2.74	2.24	0.5369
Egret	0.18	0.60	1.03	1.45	1.88	2.30	2.72	2.17	0.5018

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 8. Oesekerheid van kultivars by die verskillende opbrengsmikpunte vir die matige produksiegebiede gedurende die 2007/08 en 2008/09 groeiseisoene.

Table 8. Yield reliability of cultivars of different yield targets for the moderate production areas during the 2007/08 and 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 1454 R	0.33	0.79	1.25	1.72	2.18	2.64	3.10	2.51	0.3124
PAN 535 R	0.47	1.02	1.56	2.11	2.66	3.20	3.75*	2.49	0.0675
LS 6161 R	0.67*	1.18*	1.69*	2.20*	2.70*	3.21*	3.72	2.52	0.0495
LS 6164 R	0.75*	1.25*	1.75*	2.24*	2.74*	3.24*	3.74*	2.69	0.0945
LS 6150 R	0.64	1.14	1.65	2.15	2.65	3.15	3.65	2.54	0.0744
PAN 1666 R	0.51	1.07	1.64	2.20*	2.77*	3.34*	3.90*	2.50	0.0406
LS 6050 R	0.81*	1.29*	1.76*	2.23*	2.71*	3.18	3.66	2.60	0.0651
A 5409 RG	0.73*	1.15	1.58	2.00	2.43	2.85	3.28	2.33	0.0507
PAN 737 R	0.35	0.91	1.46	2.02	2.57	3.12	3.68	2.56	0.1411
Heron	0.49	0.99	1.48	1.98	2.48	2.97	3.47	2.46	0.1093
LS 678	0.72*	1.29*	1.86*	2.43*	3.01*	3.58*	4.15*	2.81	0.0682
Egret	0.34	0.83	1.32	1.81	2.30	2.78	3.27	2.34	0.1353
Ibis 2000	0.69*	1.09	1.49	1.90	2.30	2.71	3.11	2.31	0.0827

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 9. Oessekerheid van kultivars by die verskillende opbrengsmikpunte vir die matige produksiegebiede, gedurende die 2008/09 groeiseisoen.

Table 9. Yield reliability of cultivars at different yield targets for the moderate production areas, during the 2008/09 growing season.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 1454 R	0.46	0.87	1.28	1.68	2.09	2.50	2.90	2.52	0.1527
PAN 535 R	0.56	1.11	1.66*	2.21*	2.76*	3.31*	3.86*	2.85	0.0424
LS 6161 R	0.44	1.00	1.56	2.12	2.69*	3.25*	3.81*	2.85	0.0657
LS 6164 R	0.96*	1.45*	1.94*	2.42*	2.91*	3.39*	3.88*	3.05	0.0501
LS 6150 R	0.87*	1.36*	1.84*	2.33*	2.82*	3.31*	3.79*	2.95	0.0475
PAN 1666 R	0.43	1.01	1.58	2.16*	2.74*	3.31*	3.89*	2.92	0.0769
LS 6050 R	0.92*	1.37*	1.82*	2.28*	2.73*	3.18*	3.63	2.96	0.0763
A 5409 RG	0.70*	1.14*	1.59	2.03	2.47	2.92	3.36	2.59	0.0380
PAN 737 R	0.25	0.79	1.34	1.88	2.42	2.97	3.51	3.01	0.2788
Heron	0.30	0.78	1.27	1.75	2.23	2.71	3.19	2.72	0.2007
LS 678	0.61	1.22*	1.84*	2.46*	3.07*	3.69*	4.30*	3.15	0.0489
Egret	0.00	0.48	1.02	1.56	2.10	2.65	3.19	2.42	0.1250
Ibis 2000	0.37	0.82	1.27	1.71	2.16	2.61	3.05	2.52	0.1269
PAN 1664 R	0.71*	1.18*	1.66*	2.13*	2.61	3.08	3.56	2.97	0.1324
Dundee	0.50	0.98	1.47	1.95	2.44	2.93	3.41	2.78	0.1247
LS 6162 R	0.08	0.49	0.91	1.32	1.73	2.14	2.55	2.48	0.3613
PHB 96 B 01	0.00	0.50	1.10	1.70	2.31	2.91	3.51	2.85	0.2678
PHB 95 B 53	0.33	0.76	1.18	1.61	2.04	2.47	2.90	2.65	0.2580

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 10. Oessekerheid van kultivars by die verskillende opbrengsmikpunte vir die warmer produksiegebiede, gedurende die 2006/07, 2007/08 en 2008/09 groeiseisoene.

Table 10. Yield reliability of cultivars at different yield targets for the warmer production areas, during the 2006/07, 2007/08 and 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 535 R	0.11	0.53	0.95	1.37	1.79	2.21	2.63	2.93	0.7233
LS 6161 R	0.00	0.43	1.00	1.58	2.15	2.72	3.29*	2.81	0.2855
LS 6164 R	0.34*	0.82*	1.30*	1.79*	2.27*	2.75*	3.23	2.95	0.2910
LS 6150 R	0.55*	1.01*	1.46*	1.92*	2.38*	2.83*	3.29*	2.98	0.2306
LS 6050 R	0.00	0.49	1.10	1.70	2.30*	2.90*	3.50*	2.91	0.2516
A 5409 RG	0.00	0.44	1.02	1.61	2.19	2.78*	3.36*	3.00	0.4081
PAN 737 R	0.60*	1.01*	1.41*	1.82*	2.23*	2.64	3.05	2.89	0.2654
LS 678	0.00	0.01	0.58	1.15	1.71	2.28	2.85	3.01	0.9522
Egret	0.22	0.62	1.03	1.43	1.83	2.24	2.64	2.69	0.4190

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 11. Oessekerheid van kultivars by die verskillende opbrengsmikpunte vir die warmer produksiegebiede, gedurende die 2007/08, en 2008/09 groeiseisoene.

Table 11. Yield reliability of cultivars at different yield targets for the warmer production areas, during the 2007/08 en 2008/09 growing seasons.

Kultivar/ Cultivar	Opbrengsmikpunte/Yield Targets ton/ha ⁻¹							Gem/ Mean	D ²
	1.0	1.5	2.0	2.5	3.0	3.5	4.0		
PAN 1454 R	0.00	0.00	0.00	0.09	0.46	0.83	1.20	2.30	1.1950
PAN 535 R	0.00	0.25	0.92	1.59	2.26	2.93	3.61	3.41	0.3000
LS 6161 R	0.55	1.08	1.61*	2.13*	2.66*	3.19*	3.72*	3.35	0.0847
LS 6164 R	0.10	0.64	1.18	1.71	2.25	2.79	3.33	3.59	0.5097
LS 6150 R	0.00	0.53	1.07	1.61	2.15	2.69	3.23	3.16	0.2517
PAN 1666 R	0.33	0.79	1.26	1.72	2.18	2.64	3.10	2.84	0.0870
LS 6050 R	0.94*	1.35*	1.75*	2.16*	2.57	2.97	3.38	3.42	0.1910
A 5409 RG	0.60	1.12*	1.63*	2.15*	2.67*	3.19*	3.71*	3.43	0.1187
PAN 737 R	0.73*	1.23*	1.72*	2.22*	2.72*	3.22*	3.72*	3.34	0.0660
Heron	0.72*	1.22*	1.71*	2.21*	2.71*	3.20*	3.70*	3.33	0.0675
LS 678	1.40*	1.78*	2.16*	2.54*	2.92*	3.30*	3.68*	3.59	0.1066
Egret	0.35	0.93	1.50	2.08	2.66*	3.23*	3.81*	3.47	0.1296
Ibis 2000	0.00	0.00	0.10	0.61	1.13	1.64	2.16	2.67	0.7335

* Waardes in dieselfde kolom is betekenisvol beter/Values in the same column are significantly higher
D² waarde dui stabiliteit van 'n kultivar aan. Hoe kleiner die D² waarde, hoe meer stabiel is die kultivar
D² value indicates the stability of a cultivar. A smaller D² value indicates a more stable cultivar

Tabel 12. Saadopbrengs (kg ha⁻¹) van kultivars gedurende die 2008/2009 groeiseisoen ten opsigte van die verskillende lokaliteite wat in die warmer produksiegebiede geleë is.

Table 12. Seed yield (kg ha⁻¹) of cultivars during the 2008/2009 growing season for the various localities situated in the warmer production areas.

Kultivar/Cultivar	Brits	Empangeni PD1	Empangeni PD2	Groblersdal	Koedoeskop	Rustenburg	Vaalharts	Gem/Mean
PAN 1454 R	1718	1955	3089	3083		3644	3633	2854
PAN 535 R	2324	4832	2084	3042	2833	3116	4541	3253
LS 6161 R	2438	3959	2091	3097	3313	3727	4350	3282
LS 6164 R	2181	5416	2538	4116	3021	3579	5046	3699
LS 6150 R	2458	2567	1763	3375	2257	3495	4052	2853
PAN 1666 R	1778	2529	2147	2968	2333	3463	3776	2713
LS 6050 R	2102	3896	2275	3806	3639	3931	4387	3434
A 5409 RG	2657	4348	2643	3398	2535	3472	4656	3387
PAN 737 R	2204	3907	2132	3176	3139	3611	4123	3185
Heron	2593	3981	1784	3528	2917	3917	4204	3275
LS 678	3250	3882	2907	2931	3319	3898	4351	3506
Egret	2528	3656	1587	3514	3118	4102	4139	3235
Ibis 2000	1968	1458	718	2009	2854	3843	3903	2393
PAN 1664 R	2356	2721	2639	3458	2917	3741	4109	3134
Dundee	2243	3478	1795	3065	3306	3935	3910	3104
LS 6162 R	1264	3094	3369	3398	3084	3037	4563	3116
PHB 96 B 01	2403	3361	1922	3375	3090	2787	4665	3086
PHB 95 B 53	2370	4127	1592	2764	3472	3569	3984	3125
Gem/Mean	2269	3509	2171	3228	3009	3604	4244	3124