



PROTEÏENNAVORSINGSTIGTING
PROTEIN RESEARCH FOUNDATION

OORSIG: CANOLA IN SUID-AFRIKA

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J. DE KOCK EN GA AGENBAG

Canola en raapsaad is die tweede grootste oliesadegewas in die wêreld en lewer tans nagenoeg 14% van die totale wêreldproduksie van oliesade. Die totale produksie van canola/raapsaad is tans (2015/16) nagenoeg 70 miljoen ton graan per jaar.

Die mees belangrike Canola/raapsaadproduserende lande is tans Europa (Frankryk, Engeland en Duitsland), China, Kanada en Indië wat 87,37% van die totaal produseer. Die wêreldproduksie is as volg.

Tabel 1: Wêreldproduksie van Canola/Raapsaad in miljoen tonne graan		
LAND	JAAR	
	2015/16	2014/2015
Europese Unie	22.0	22.1
Kanada	18.4	15.8
China	14.9	12.0
Indië	5.9	7.2
Australië	2.9	3.5
Oekraïne	1.7	2.1
Rusland	1.0	1.4
VSA	1.3	1.2
Suid-Amerika	0.3	0.46
Suid-Afrika*	0.09	0.12
Ander Lande	1.66	2.7
Totaal	70.05	68.59
Bron: Oilworld	*Oesskattingskomitee	

Canola verwys na *Brassica napus* wat 'n geneties verbeterde oliesaadraap is met lae vlakke van erukasuur en glikosinolaat. Die naam “Canola” is die naam wat geregistreer is deur die “Western Canadian Oilseed Crushers Association” en is afgelei as volg:

Can - vanaf “Canada” die registreerder
o - vanaf “oil”
la - vanaf “low acid”

Hierdie naam (Canola) is vanaf 1979 in Kanada gebruik vir Brassica napus met minder as 2% erukasuur in die olie en minder as 30 mikromoles per gram glikosinolate in die oliekoek.

Brassica napus wat aan hierdie vereistes voldoen lewer olie wat uiters geskik is vir menslike gebruik en word ondersteun deur die Hartstigting.

Daar is verskeie Brassica spesies met die belangrikstes; Brassica napus, Brassica rapa ook genoem B campestris, Brassica juncea (Indiese mosterd) en Brassica carinata (Ethiopiese mosterd).

In Suid-Afrika word net canola (Brassica napus) kommersieel verbou. Canola is 'n koelweergewas wat veral in die blom-, peulvorm-, en saadsetstadiums relatief koel, vogtige toestande verlang vir die beste resultate. Canola kan in Suid-Afrika verbou word in alle gebiede waar koring verbou word, maar lewer nie orals dieselfde goeie resultate nie. Tans vind kommersiële verbouing hoofsaaklik in die Wes- en Suid-Kaap plaas.

Klassifikasie van Canola:

Soos in die geval van koring word canolacultivars hoofsaaklik volgens koue behoefte ingedeel. Daar word dus verwys na wintertipes, intermediêretipes en lentetipes. Hierdie benaming het weinig te doen met die tyd van die jaar wat dit geplant word maar veel meer met die kouebehoefte van die cultivars.

Wintertipes:

Hierdie tipe cultivar het 'n sterk kouebehoefte wat eers versadig moet word voor dit verander vanaf vegetatiewe groei na die reprodusktiewe groeifase.

Ten einde seker te maak dat die kouebehoefte bevredig word, word hierdie cultivars so vroeg moontlik in die winter geplant. Daar is beperkings hierop aangesien ekstreme koue die jong saailinge kan beskadig of selfs dood. Die korrekte plantdatum is dus baie belangrik.

Die nadeel van hierdie tipe is dat as die kouebehoefte nie bevredig word nie sal dit slegs in die vegetatiewe stadium bly en dus geen oes lewer nie. Wintertipes word hoofsaaklik in Europa en Asië verbou, maar ook tot 'n mindere mate in die VSA (Pacific North West, Great Plains) en die Ontario provinsie in Kanada.

Lentetipes:

Weer eens verwys die benaming nie soseer na die tyd waarin dit geplant kan word nie. Dit beteken slegs dat hierdie tipe cultivars nie 'n besondere sterk kouebehoefte het nie maar alhoewel dit langdagplante is, blom dit egter onder relatief kort dae van 10 -11 uur. In die Wes-Kaap waar dagliglengtes selfs gedurende die kortste dae in die middel van die winter steeds ongeveer 9.5 uur is, word daglengte vereiste dus vinnig bevredig en reageer die canola plant dus baie sterk teenoor temperatuur (hitte-eenhede). Hoë temperature versnel dus blomvorming.

Lentetipes kan in die winter, lente, of selfs somer geplant word. Dit is egter belangrik om voorsiening te maak dat die tipes 'n lang genoeg groeiperiode het om maksimum opbrengs te lewer.

In Suid-Afrika en Australië word tans lentetipes verbou wat in die herfs aangeplant en vroeë somer geoes word.

Binne elkeen van hierdie tipes kan die volgende groepe gekry word:

- Konvensionele Canola
Dit is Brassica napus met 'n lae inhoud van erukasuur en glikosinolaat. Het relatief hoër opbrengspotensiaal, maar geen spesifieke toleransie teen 'n onkruidodder nie.
- TT-Canola
Dit is canola wat bestandheid het teen triasien onkruidodders en dus geskik is vir verbouing waar onkruidodderweerstand probleme voorkom. Area onder canola kan dus uitgebrei word na waar onkruidodderweerstand 'n probleem is. Opbrengspotensiaal is gewoonlik 10 – 15% laer as dié van Konvensionele Canola. In Wes-Australië is nagenoeg 90% van die oppervlakte onder TT-cultivars.
- CL-Canola (Clearfield canola)
Dit is canola met bestandheid teen Cysure (imasamoks) en kan ook gebruik word waar probleme bestaan met onkruidodderweerstand. Opbrengspotensiaal nagenoeg dieselfde as dié van Konvensionele Canola.
- RR-Canola (RoundupReady canola)
Dit is geneties gemodifiseerde canola met weerstand teen glifosaat (Roundup). Bied 'n alternatief waar onkruidodderweerstand voorkom. Opbrengspotensiaal dieselfde as Konvensionele canola. Nog nie in Suid-Afrika beskikbaar nie. Word algemeen gebruik in die meeste wêrelddele met die uitsondering van Europese lande.
- Hoë-Oleiënsuurcanola (Monola)
Dit is canola met gesonder olie. Die naam Monola word tans gebruik deur die saadmaatskappy, Nu Seed, om te onderskei van gewone canola. Opbrengspotensiaal is tans nog 15% laer as Konvensionele Canola. Nog nie in Suid-Afrika beskikbaar nie.
- Juncea Canola
Dit is Brassica juncea (Indiese mosterd wat verbeter is om dieselfde gunstige olie en meel eienskappe te bevat as canola). Meer tolerant teen hitte en droogtestremming, maar opbrengspotensiaal is tans veel laer as vir Konvensionele canola. Tans nog nie in Suid-Afrika beskikbaar nie.

In al hierdie groepe is daar die wat met gewone teeltprosedures en -metodes ontwikkel is en die wat met basterteling ontwikkel is. Die basterkrag gee aansienlik hoër opbrengspotensiaal en word dus oorwegend verbou in die meeste wêrelddele

Canola in Suid-Afrika:

Canola is 'n relatief nuwe gewas in Suid-Afrika. Krimpemde winsmarges van kleingrane weens lae pryse en vinnig stygende insetkoste gedurende die laat 1980's het die behoefte laat ontstaan vir alternatiewe kontant gewasse wat in die Swartland en Suid-Kaap verbou kan word. Dit het daartoe gelei dat sade van vier gewasse nl canola, lynsaad, sonneblomme en verblom, vir evaluasie ingevoer is. Hierdie gewasse is vir drie jaar gedurende die periode 1990 tot 1992 op verskillende lokaliteite in die Swartland en Suid-Kaap getoets (Tabel 2) voordat daar besluit is dat canola die meeste potensiaal toon en daar op hierdie gewas gekonsentreer sal word. Hoewel Europese en Kanadese cultivars ook aanvanklik getoets is, is die hoogste opbrengste verkry met cultivars vanaf Australië.

Tabel 2: Opbrengs vergelyking van vier oliesaadgewasse in die Wes-Kaap: 1990-1992

GEWAS	1990			1991				1992			
	Lgw	Els	Tgh	Osdam	Lgw	Els	Tgh	Osdam	Lgw	Els	Gem
Canola	2565	2213	1189	2492	2659	2858	1327	2124	2303	2644	2237
Lynsaad	1554	1367	1017	-	1994	1853	1640	1982	1321	1931	1629
Sonneblom	507	995	885	1209	651	1779	-	1891	-	1818	1217
Verblom	1247	1261	1190	1272	935	1342	652	-	-	1290	1148

Lgw = Langgewens; Els = Elsenburg; Tgh = Tygerhoek

Bron: DB Arkoll and P Fouche, 1993. *Research on canola in the Western Cape. Proc. of CCDA Symposium, Darling, Western Cape pp 68-72*

Gedurende 1992 het 30 produsente begin om canola op kommersiële skaal te verbou en in totaal is ongeveer 500 ton canola geproduseer op 400 hektare. Vanaf hierdie beskeie begin het die canola bedryf veral in die Suid-Kaap baie vinnig gegroei en is daar, gegrond op saadbestellings alreeds in 1996, ongeveer 15 000 hektaar canola in hierdie gebied geplant. Verbouing van canola in die Suid-Kaap is verder bevorder deur die stigting van die maatskappy Southern Oil Bpk in 1996 en oprigting van 'n oliepers te Swellendam. Hoewel produksie in die Swartland nie so vinnig toegeneem het nie, het die oprigting van 'n oliepers op Moorreesburg gedurende 1998/99 ook die produksie van canola in hierdie gebied bevorder.

Gedurende die jare 1998/1999 tot 2003/2004 het die oppervlakte toegeneem vanaf 17 000 hektaar tot meer as 44 000 hektaar, maar daarna weer teruggesak tot tussen 32 000 en 34 000 hektaar vir die jare 2006/2007 tot 2008/2009 (Tabel 3). Hierdie stagnasie en selfs afname in produksie kan waarskynlik aan verskeie faktore toegeskryf word, waarvan lae en wisselvallige opbrengste (Tabel 3) sekerlik een van die belangrikste redes is. Canola produsente in die Suid-Kaap het gedurende hierdie tydperk ook probleme ondervind met slakke en isopoda wat landerye sodanig beskadig het dat dit dikwels hersaai moes word. Omdat die peule van

canola baie maklik oopspring, is die oes van canola ook moeilik. Die beskikbaarstelling van bastercultivars asook groter kundigheid en ervaring by produsente het egter daartoe gelei dat hoër en meer bestendige opbrengste oor tyd behaal is. Tesame met goeie pryse wat produsente vir hul oeste behaal het, het veroorsaak dat canola ekonomies kompetender met graangewasse is. Aantal hektare onder canola verbouing het dus sedert 2011/2012 skerp toegeneem. Omdat canola in wisselbou met ander graan- en weidingsgewasse verbou word, word dit gegewe die wisselboustelsel, nie meer as een keer uit 'n vier jaar siklus op dieselfde land in die Swartland en een tot twee keer uit 'n 10 jaar siklus in die Suid-Kaap verbou nie. Nogtans word daarna gestreef om teen 2020 sowat 150 00 hektaar onder canolaverbouing in die Swartland en Suid-Kaap te hê. Die belangrikste gebied vir oppervlakte uitbreiding is in die Swartland.

Tabel 3: Oppervlaktes geplant in die Wes- en Suid-Kaap, produksies en opbrengste van canola gedurende die periode 1992-2017

	JAAR	HEKTARE	TONNE	OPBRENGS TON/HA
1)	1992/1993	400	400	1.0
2)	1993/1994	1 170	1 000	1.17
3)	1994/1995	5 230	4 500	1.16
4)	1995/1996	14 320	16 000	0.90
5)	1996/1997	10 880	12 600	0.86
6)	1997/1998	15 720	14 800	1.06
7)	1998/1999	17 000	21 000	1,24
8)	1999/2000	25 000	23 000	0,92
9)	2000/2001	21 145	26 549	1,26
10)	2001/2002	27 000	25 750	0,95
11)	2002/2003	33 000	37 975	1,15
12)	2003/2004	44 200	40 770	0,92
13)	2004/2005	44 250	32 000	0,72
14)	2005/2006	40 200	44 200	1,10
15)	2006/2007	32 000	36 500	1,14
16)	2007/2008	33 200	38 150	1,15
17)	2008/2009	34 000	30 800	0,91
18)	2009/2010	34 820	36 900	1,06
19)	2010/2011	43 510	58 800	1.35
20)	2011/2012	44 100	79 000	1.79
21)	2012/2013	72 165	112 000	1.55
22)	2013/2014	95 000	121 000	1.27
23)	2014/2015	78 050	93 000	1.18
24)	2015/2016	68 075	105 400	1.55
25)	2016/2017*	84 000	93 500	1.11

**Skatting deur Oesskattingskomitee op 10 Mei 2018*

In die Swartland en Suid-Kaap onder droëland varieer opbrengste tussen 1.5 tot 2.5 ton per hektaar maar opbrengste van 3.0 ton per hektaar is al deur produsente verkry. Onder besproeiingstoestande is opbrengste van byna 6.0 ton per hektaar al behaal in proewe.

Wisselbou:

Canola bied groot voordele as wisselbougewas. Veral die onkruidoderweerstandbiedende tipes maak dit moontlik dat canola in groot gebiede in 'n wisselboustelsel met koring ingesluit kan word. In sulke wisselboustelsels het canola meestal 'n verhoging in die opbrengs van daarop-volgende graangewasse tot gevolg. In vergelyking met 'n koringmonokultuurstelsel oor 'n vyfjaarperiode te Langgewensproefplaas het koringopbrengste met 20% toegeneem in die eerste koringjaar na canola. Verdere voordele van canola in 'n wisselboustelsel is:

- Vermindering van siektes
- Meer doeltreffende onkruidbeheer
- Verbeterde wortelstelsels (biologiese ploeg-aksie)
- Planters en oesmasjiene word meer doeltreffend benut
- Verbeterde verspreiding van finansiële risiko

Siektes en Plae:

Weens die informele beleid om nie canola meer as een keer in vier jaar op dieselfde land te verbou nie en afwisseling van cultivars met verskillende weerstandsgene kom gevaarlike siektes soos swartstam (*Leptosphaeria maculans*) tans nie op groot skaal in Suid-Afrika voor nie. Die voorkoms van stamvrot (*Sclerotinia sclerotiorum*) neem egter toe en die gebruik van geregistreerde swamdoders word algemeen aanbeveel. Insekte soos plantluise en ruitrugmot moet egter gereeld gemonitor en beheer word. Slakke en isopoda kan veral in die Suidkaap van tyd tot tyd groot skade aan die stand aanrig, maar skade kan beperk word deur lokaas te gebruik (kyk ook na Canola-Verbouingsriglyne).

Probleme:

Die belangrikste probleme met canola verbouing in Suid-Afrika wat met navorsing opgelos moet word is:

- Korrekte plantdatum
- Onkruidbeheer-program
- Oesmetode en die daarmee gepaardgaande oesverliese

Veevoer:

Canolasaad bevat nagenoeg 36 tot 50% olie en 20 tot 25% proteïen. Canola-oliekoek bevat nagenoeg 37% proteïen. Canola kan in beide die volvet en die oliekoek vorm met groot vrug ingesluit word in voerrantsoene.

Die benutbaarheid van canola as veevoer in Suid-Afrika word weerspieël deur die gemiddelde voedingsamestelling soos aangedui in die volgende tabel.

Tabel 4: Voedingsamestelling van Canola

NUTRIËNTE	CANOLA OLIEKOEK	VOLVET CANOLA
Proteïen	37,1%	24,4%
Vet (olie)	1,0%	36,1%
Kalsium	0,73%	0,46%
Fosfor	1,09%	0,71%
Beskikbare fosfor	0,27%	0,17%
Metaboliseerbare energie (MJ/kg)	7,95	16,65
Verteerbare Energie (MJ/kg)	11,93	18,65
Lisien	2,04%	1,34%
Metionien	0,74%	0,49%
Cystine	0,93%	0,61%
Treonien	1,63%	1,07%
Triptofaan	0,47%	0,31%
Arginien	2,26%	1,49%
Histidien	1,03%	0,68%
Isoleucine	1,44%	0,95%
Leucine	2,58%	1,70%
Phenylalanine	1,52%	1,00%
Valien	1,90%	1,25%

Beide volvetcanola (die ongeprosesseerde saad) en canola-oliekoek (die residu nadat die olie uit die saad verwyder is) is hoëkwaliteit produkte, wat baie goed deur plaasdiere benut word.

Die proteïeninhoud van plaaslik geproduseerde volvetcanola is ongeveer 24% met 'n olie-inhoud van 36%. Canola-oliekoek wat in Suid-Afrika beskikbaar is, het 'n proteïeninhoud van 36% met 'n olie-inhoud van <1.0%. Die sogenoemde verbyvloei proteïenpersentasie van canola-oliekoek is ongeveer 28% en is vergelykbaar met die waarde vir sojaboonoliekoek.

Die relatiewe geldwaarde van volvet canola as veevoer teenoor sojaboonoliekoek (47% proteïen) wissel tussen 58% vir suiwelbeeste, 94% vir pluimvee en 100% vir varke. Canola-oliekoek daarteenoor wissel tussen 53% vir pluimvee, 60% vir suiwelbeeste en 65% vir varke.

Die ideale insluitingsvlak van volvetcanola is ongeveer 12% in die volvoere van lammers en 6% in die volvoere van melkkoeie. Canola-oliekoek kan teen 15% in die volvoere vir skape en 12% in die volvoere van melkbeeste gebruik word.

Wat enkelmaagdiere betref, is die ideale insluitingspeile van volvetcanola en canola-oliekoek in diëte van varke 12 – 18%. Vir volstruise is dit ongeveer 10% en vir hoenders blyk die maksimum insluitingsvlakke tussen 5 en 10% te wees. Met die insluiting van volvetcanola in die diëte van hoenders, varke en melkkoeie, word 'n gesonder vet- en melkvetprofiel verkry, omdat dit 'n hoër konsentrasie onversadigde teenoor versadigde vette bevat.

Vir die beste benutting van volvetcanola moet die canolasaad tydens die maalproses met die graan vermeng word. Canolastoppellande kan vir skape beter weiding verskaf as koringstoppellande. Die canolastoppels word goed deur weidende diere benut en met die korrekte byvoeding kan weidighede van meer as 2 ooie per hektaar vir langer as 3 maande gehandhaaf word.

Ander:

Weens stygende pryse van minerale-olies en kommer oor omgewingsbesoedeling is daar toenemende belangstelling in die gebruik van canola-olie as bron van bio-diesel. Volgens Europese inligting word ongeveer 1050 kg canola-olie benodig om 1000kg bio-diesel en 100kg gliserien te vervaardig. Hoewel canola-olie vir die vervaardiging van bio-diesel reeds op kommersiële skaal in verskeie Europese lande gebruik word, word die winsgewendheid daarvan in die RSA tans nog ondersoek.

Canola-olie is wêreldwyd bekend vir goeie gesondheidseienskappe en word toenemend as kookolie en in die vervaardiging van margarien gebruik. Canola bevat baie lae vlakke van versadigde vetsure en relatiewe hoë vlakke van oleïensuur en linoleensuur. Van al die plantaardige olies wat vir menslike gebruik aangewend word, het canola-olie die hoogste persentasie van omega 3-vetsure wat volgens wetenskaplike bevindinge tot 'n verlaging in LDL-cholesterol-vlakke lei.

Canola is 'n gewas wat met sy gesonde en hoë persentasie olie en hoë waarde oliekoek 'n toenemende waardevolle bydrae kan lewer in die behoeftes van Suid-Afrika en beslis ook kan bydra tot die besparing in buitelandse valuta.



PROTEÏENNAVORSINGSTIGTING
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OVERVIEW: CANOLA IN SOUTH- AFRICA

OVERVIEW: CANOLA IN SOUTH AFRICA

J DE KOCK AND GA AGENBAG

Canola and rapeseed are the second largest oilseed crops in the world and currently contribute close to 14% of the total world production of oilseeds. The total production of canola/rapeseed currently (2015/16) is close to 70 million tons of grain per year.

The most important canola/rapeseed-producing countries at present are France, England and Germany (in Europe), China, Canada and India, which produce 87,37% of the total. Current world production is as follows:

Table 1: World production of canola/rapeseed in million tons of grain		
COUNTRY	YEAR	
	2015/2016	2014/2015
European Union	22.0	22.1
Canada	18.4	15.8
China	14.9	12.0
India	5.9	7.2
Australia	2.9	3.5
Ukraine	1.7	2.1
Russia	1.0	1.4
USA	1.3	1.2
South America	0.3	0.46
South Africa*	0.09	0.12
Other countries	1.66	2.7
Total	70.05	68.59
Source: Oilworld	*Crop Estimates Committee	

Canola refers to *Brassica napus*, which is a genetically improved oilseed rape with low levels of erucic acid and glucosinolate. The name “Canola” is registered by the Western Canadian Oilseed Crushers Association and is derived as follows:

Can - from “Canada”, the registering country
o - from “oil”
la - from “low acid”

The name Canola has been used in Canada since 1979 for *Brassica napus* with less than 2% of erucic acid in the oil and less than 30 micromoles per gram of glucosinolate in the oilcake.

Brassica napus that meets these requirements produces oil that is extremely suitable for human consumption and is supported by the Heart Foundation in RSA.

There are a number of *Brassica* species, with the most important ones being *Brassica napus*, *Brassica rapa*, which is also known as *B. campestris*, *Brassica juncea* (Indian mustard) and *Brassica carinata* (Ethiopian mustard).

In South Africa, only canola (*Brassica napus*) is cultivated commercially. Canola is a temperate crop that requires relatively cool, moist conditions for the best results, particularly in the flowering, pod-development and seed-setting stages. Canola can be cultivated in South Africa in virtually all the areas where wheat is cultivated, but does not produce the same good results everywhere. At present, commercial cultivation takes place mainly in the Western and Southern Cape.

Classification of canola:

As in the case of wheat, canola cultivars are divided primarily in terms of chilling requirement. Reference is thus made to winter types, intermediate types and spring types. These names have little to do with the time of year in which it is planted, but rather with the chilling requirement of the cultivars.

Winter types:

This type of cultivar has a high chilling requirement that first needs to be satisfied before it changes from vegetative growth to the reproductive growth phase.

In order to ensure that the chilling requirement is satisfied, these cultivars are planted as early as possible in the winter. There are limitations to this, however, since extreme cold can damage or even kill the young seedlings. The correct planting date therefore first needs to be determined.

The disadvantage of this type of cultivar is that, if the chilling requirement is not satisfied, it will remain in the vegetative stage and not produce any seed yield. Winter types are cultivated primarily in Europe and Asia, and to a lesser degree in the USA (Pacific North West, Great Plains) and the Ontario Province in Canada.

Spring types:

Once again the name does not necessarily refer to the time when it can be planted. It simply means that these types of cultivars do not have a very high chilling requirement, but change from vegetative to reproductive growth on the basis of day length. Although canola is a long-day length plant, it flowers under conditions of relatively short days length of 10 to 11 hours. In the Western Cape, where day lengths are as long as 9.5 hours, even during the shortest days in the middle of the winter, the day length requirement is satisfied quite rapidly and the

canola plant therefore reacts very strongly to temperature (heat units). High temperatures therefore accelerate flower formation.

Spring types can be planted in the winter, spring or even in the summer. However, it is important to make provision for these types to have a long enough growth period to produce a maximum yield.

In South Africa and Australia, spring types that are currently being cultivated can be planted in autumn and harvested in early summer.

The following groups can be distinguished in each of these types:

- Conventional canola
This is *Brassica napus* with a low content of erucic acid and glucosinolate and it has a relatively higher yield potential, but without any specific tolerance to a herbicide .
- TT Canola
This is canola that is resistant to triazine herbicides and therefore is suitable for cultivation where problems are experienced with herbicide resistance. The area under canola therefore can be expanded to where herbicide resistance is a problem. Yield potential usually is 10 to 15% lower than that of conventional canola. In West Australia, close to 90% of the land area used for the cultivation of canola is already planted with TT cultivars.
- CL Canola (Clearfield canola)
This is canola with resistance to Cysure (imazamox) and it can also be used where there are problems with herbicide resistance. Yield potential is similar to that of conventional canola.
- RR Canola (RoundupReady canola)
This is genetically modified canola with resistance to glyphosate (Roundup) and offers an alternative where there is herbicide resistance. Yield potential is the same as that of conventional canola. It is not yet available in South Africa. It is commonly used in all countries with the exception of Europe.
- High oleic acid canola (Monola)
This is canola that contains healthier oil. The name Monola is currently used by the breeding company, Nu Seed, to distinguish it from conventional canola. The yield potential currently is still 15% lower than that of conventional canola. It is not yet available in South Africa.
- Juncea Canola
This is *Brassica juncea* (Indian mustard that has been improved to contain the same favourable oil and meal properties as canola). More tolerant to heat and water stress, but yield potential are much lower compared to conventional canola It is not yet available in South Africa.

Of all these groups there are those that were developed using ordinary breeding techniques and methods, and those that were developed through hybrid breeding. The hybrid vigour

gives rise to a considerably higher yield potential and for this reason hybrid cultivars are predominantly grown in most countries.

Canola in South Africa:

Canola is a relatively new crop in South Africa. Shrinking profit margins from cereal crops as a result of low prices and rapidly increasing input costs during the late 1980s gave rise to the need for alternative cash crops that could be cultivated in the Swartland and Southern Cape. This led to the seeds of four crops being imported for evaluation purposes, namely canola, linseed, sunflower and safflower. These crops were tested in various locations in the Swartland and Southern Cape for three years from 1990 to 1992 (Table 2) before it was decided that canola showed the most potential and that the emphasis would fall on this crop. Although European and Canadian cultivars were also tested initially, the highest yields were obtained with cultivars from Australia.

Table 2: Comparison of yields of four oilseed crops in the Western Cape: 1990-1992

CROP	1990			1991				1992			
	Lgw	Els	Tgh	Osdam	Lgw	Els	Tgh	Osdam	Lgw	Els	Gem
Canola	2565	2213	1189	2492	2659	2858	1327	2124	2303	2644	2237
Lynseed	1554	1367	1017	-	1994	1853	1640	1982	1321	1931	1629
Sunflower	507	995	885	1209	651	1779	-	1891	-	1818	1217
Safflower	1247	1261	1190	1272	935	1342	652	-	-	1290	1148

Lgw = Langgewens; Els = Elsenburg; Tgh = Tygerhoek

Source: DB Arkoll and P Fouche, 1993. Research on canola in the Western Cape. Proc. of CCDA Symposium, Darling, Western Cape pp 68-72

During 1992, 30 producers started growing canola on a commercial scale and a total of approximately 500 tons of canola was produced on 400 hectares. From these humble beginnings the canola industry has grown rapidly, particularly in the Southern Cape, and on the basis of seed orders in 1996 it was evident that approximately 15 000 hectares had been planted under canola in this region. Cultivation of canola in the Southern Cape was promoted further through the founding of the company Southern Oil Ltd in 1996, and the establishment of an oil press at Swellendam. Although production did not increase rapidly in the Swartland, the construction of an oil press at Moorreesburg during 1998/99 also promoted the production of canola in this region.

During the years 1998/1999 to 2003/2004, the hectares under canola cultivation increased from 21 000 hectares to more than 44 000 hectares, although it decreased to between 32 000 and 34 000 hectares for the years 2006/2007 to 2008/2009 (Table 3). This stagnation, and even decrease in production, can most likely be ascribed to a number of factors, with the main one probably being low and fluctuating yields (Table 3). During this period, some canola producers in the Southern Cape experienced considerable problems with slugs and isopods, which damaged fields to such an extent that they had to be re-planted. In addition, the canola pods can dehisce (shatter) very easily, it also is not easy to harvest canola. The

introduction of hybrid cultivars together with a better understanding and producers being more experienced in the production of canola, resulted in higher and less variable yields in recent years. These higher yields and favourable canola prices made canola competitive with cereal crops and for this reason the area planted with canola showed a sharp increase since 2011/2012 . Since canola is cultivated in crop rotation with other cereal and pasture crops, it cannot, due to the crop rotation system, be planted more than once on the same land in the Swartland in every four-year cycle, and once or twice on the same land in the Southern Cape in every 10-year cycle. Nevertheless, it is the aim to have an area of about 150 000 hectares planted with canola in the Swartland and Southern Cape in 2020. The most important region where the area under canola can be expanded is in the Swartland.

Table 3: Area planted in the Western and Southern Cape, production and yields of canola during the period 1992-2017

	YEAR	HECTARES	TONS	YIELD TON/HA
1)	1992/1993	400	400	1.0
2)	1993/1994	1 170	1 000	1.17
3)	1994/1995	5 230	4 500	1.16
4)	1995/1996	14 320	16 000	0.90
5)	1996/1997	10 880	12 600	0.86
6)	1997/1998	15 720	14 800	1.06
7)	1998/1999	17 000	21 000	1,24
8)	1999/2000	25 000	23 000	0,92
9)	2000/2001	21 145	26 549	1,26
10)	2001/2002	27 000	25 750	0,95
11)	2002/2003	33 000	37 975	1,15
12)	2003/2004	44 200	40 770	0,92
13)	2004/2005	44 250	32 000	0,72
14)	2005/2006	40 200	44 200	1,10
15)	2006/2007	32 000	36 500	1,14
16)	2007/2008	33 200	38 150	1,15
17)	2008/2009	34 000	30 800	0,91
18)	2009/2010	34 820	36 900	1,06
19)	2010/2011	43 510	58 800	1,35
20)	2011/2012	44 100	79 000	1,79
21)	2012/2013	72 165	112 000	1,55
22)	2013/2014	95 000	121 000	1,27
23)	2014/2015	78 050	93 000	1,18
24)	2015/2016	68 070	105 400	1.55
25)	2016/2017*	84 000	93 500	1.11

*** Crop Estimates Committee 10 May 2018**

Under dryland conditions in the Swartland and Southern Cape, yields on average vary from 1.5 to 2.5 tons per hectare, but yields of up to 3.0 tons per hectare have already been achieved by producers. Under irrigation, yields of nearly 6.0 tons per hectare have been obtained in trials.

Crop rotation:

Canola offers great benefits as a rotation crop. It is particularly the herbicide resistant cultivars that make it possible for canola to be included in crop rotation systems with wheat in many regions. In such crop rotation systems, canola usually causes an increase in the yields of the subsequent cereal crops. In comparison to a wheat monoculture system that was monitored over a five-year period on the Langgewens experimental farm, wheat yields increased by 20% in the first wheat year after canola. Further benefits of a crop rotation system are:

- Reduction in diseases
- More effective weed control
- Improved root system (biological ploughing action)
- Planters and harvesters that are used more effectively
- Better distribution of the financial risk

Diseases and pests:

As a result of the informal policy that canola is not cultivated more than once every four years on the same land and using cultivars with different resistance genes, the most dangerous diseases, such as blackleg disease (*Leptosphaeria maculans*) does not occur on a large scale in South Africa at present, but the incidence of stem rot (*Sclerotinia sclerotiorum*) has increase in recent years and spraying with registered fungicides is generally recommended. However, insects such as aphids and diamond back moth should be monitored and controlled regularly. Slugs and isopods can cause extensive damage to the crop during the seedling stage from time to time. Slugs and isopods can be limited by using bait (also see the canola cultivation guidelines).

Problems:

The most important problems that need to be solved by research on canola cultivation in South Africa are:

- Correct planting date
- Weed-control programme
- Harvesting methods and the associated harvest losses

Animal feed:

Oil content of canola varies from 36 to 50% oil and 20 to 25% protein. Canola oilcake contains nearly 37% protein. Canola can be included in complete diets of live stock with

great benefit in both the full-fat (the unprocessed seed) and oilcake (the residue that is left once the oil has been removed from the seed) form.

The usefulness of canola as animal feed in South Africa is reflected in its average nutritional composition, as indicated in the table below.

Table 4: Nutritional composition of canola		
NUTRIENTS	CANOLA OILCAKE	FULL-FAT CANOLA
Protein	37,1%	24,4%
Fat (oil)	1,0%	36,1%
Calcium	0,73%	0,46%
Phosphorus	1,09%	0,71%
Available phosphorus	0,27%	0,17%
Metabolisable energy (MJ/kg)	7,95	16,65
Digestible energy (MJ/kg)	11,93	18,65
Lysine	2,04%	1,34%
Methionine	0,74%	0,49%
Cystine	0,93%	0,61%
Threonine	1,63%	1,07%
Tryptophane	0,47%	0,31%
Arginine	2,26%	1,49%
Histidine	1,03%	0,68%
Isoleucine	1,44%	0,95%
Leucine	2,58%	1,70%
Phenylalanine	1,52%	1,00%
Valine	1,90%	1,25%

Both full-fat canola and canola oilcake are high-quality products that are utilised very well by live stock.

The protein content of locally produced full-fat canola is approximately 24%, with an oil content of 36%. The canola oilcake that is available in South Africa has a protein content of $\pm$ 36%, with an oil content of $< 1.0\%$. The percentage of the so-called bypass protein in canola oilcake is approximately 28% and is comparable to that of soybean oilcake.

The relative monetary value of full-fat canola as cattle feed compared to soybean oilcake (47% protein) varies from 58% for dairy cattle, 94% for poultry and 100% for pigs. Canola oilcake, in contrast, varies from 53% for poultry and 60% for dairy cattle to 65% for pigs.

The optimum inclusion level of full-fat canola is approximately 12% in the complete diets of lambs and 6% in the complete diets of dairy cows. Canola oilcake can be included at 15% in the complete diets of sheep and at 12% in the complete diets of dairy cattle.

Regarding monogastric animals, the ideal inclusion level of full-fat canola and canola oilcake in the diet of pigs is 12 to 18%. For ostriches it is approximately 10% and for chickens it appears that the maximum inclusion levels are between 5 and 10%. When full-fat canola is included in the diets of chickens, pigs and dairy cows, a healthier fat and milk-fat profile is obtained because canola contains a higher concentration of unsaturated fats versus saturated fats.

For the best utilisation of full-fat canola, the canola seed should be mixed with the grain during the milling process. Canola stubble fields can provide better grazing for sheep than wheat stubble fields. The canola residue is utilised well by the grazing animals and, with the correct supplementary feeding, grazing capacities of more than two ewes per hectare can be maintained for longer than three months.

Other:

Due to the rising prices of mineral oils and concern about environmental pollution, there is increasing interest in the use of canola oil as a source of bio-diesel. According to European information, approximately 1 050 kg of canola oil is required to produce 1 000 kg of bio-diesel and 100 kg of glycerine. Although canola oil is already being used for the manufacture of bio-diesel on a commercial scale in a number of European countries, the profitability thereof in the RSA is still being investigated.

Canola oil is well known all over the world for its good health properties and is being used increasingly as a cooking oil and in the manufacture of margarine. Canola contains very low levels of saturated fatty acids and relatively high levels of oleic acid and linolenic acid. Of all the vegetable oils that are being used for human consumption, canola oil has the highest percentage of omega-3 fatty acids, which have been scientifically proven to lead to a reduction in LDL cholesterol levels.

Canola is a crop that, because of its healthy and high percentage of oil and its high-value oilcake, can make an increasingly valuable contribution to the needs of South Africa and can definitely also contribute to a saving in foreign exchange.