

OILSEEDS

focus

Protein Research Foundation • Oil & Protein Seeds Development Trust • Oilseeds Advisory Committee



Canola meal

Conservation agriculture



Weed control

Sunflower cultivar evaluations

Invitation to seminars and workshops

Quest Conference Estate, Vanderbijlpark, South Africa



Centre for Sustainable Livelihoods • Oil & Protein Seeds Development Trust • Oilseeds Advisory Committee

27 – 31 July 2015

Five-day seminar and practical workshop hosted by:

- The Centre of Sustainable Livelihoods (CSL) at the Vaal University of Technology (VUT)
- The Oil and Protein Seed Development Trust (OPDT)
- The Oilseeds Advisory Committee (OAC).

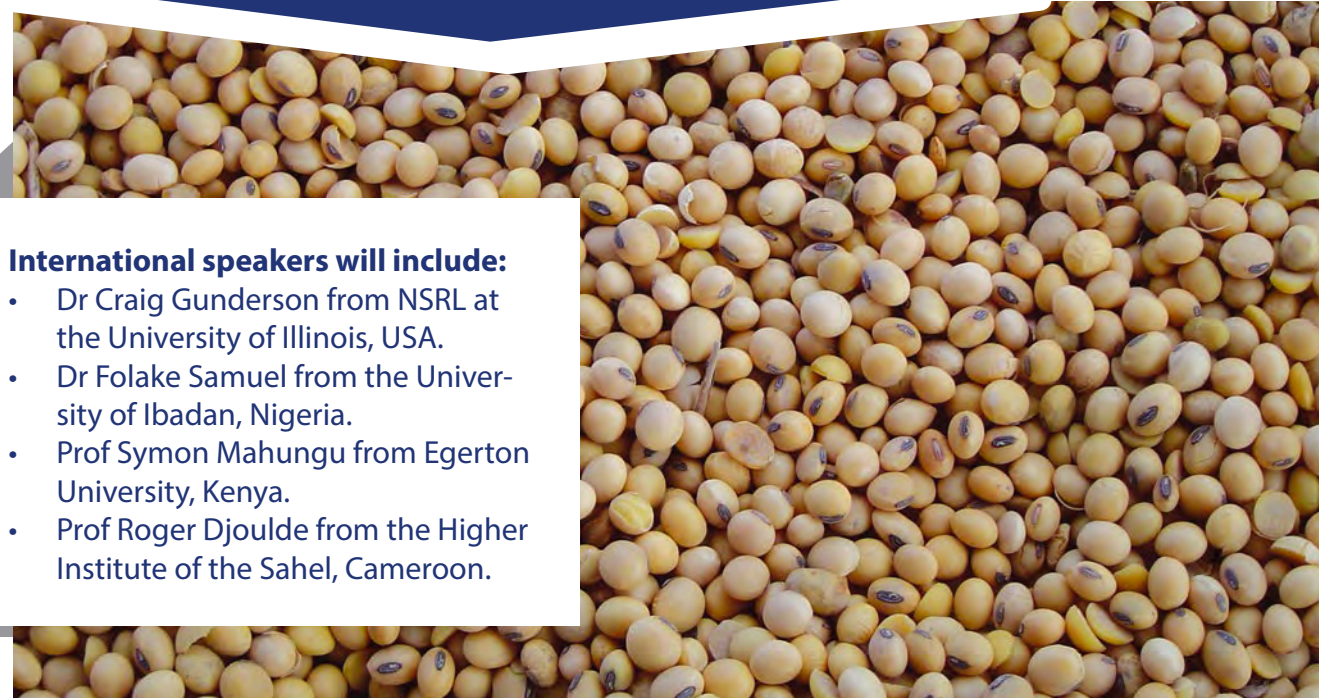
Be there!

- Come listen and exchange views with local and international speakers who will discuss the value of soya in human health and how it can be applied in various human-feeding schemes.
- Network and meet other interested parties.
- Learn about soya ingredients, food-product development.
- Get the opportunity to taste various soya foods.

The goal

To advance human soya consumption in Africa through evidence-based practical information on the role of soya to alleviate food security.

Practical information will be provided on soya production and processing as well as the role of soya in providing nutritious foods to support health. The opportunity will be utilised to showcase the ability of the soya industry in South Africa to lead the technological aspects of the programme.



International speakers will include:

- Dr Craig Gunderson from NSRL at the University of Illinois, USA.
- Dr Folake Samuel from the University of Ibadan, Nigeria.
- Prof Symon Mahungu from Egerton University, Kenya.
- Prof Roger Djoulde from the Higher Institute of the Sahel, Cameroon.

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By De Wet Boshoff,
executive director of Afma

Developments in the protein world are crucial to the feed sector

The Animal Feed Manufacturers Association of South Africa (Afma) wishes to congratulate the Oilseeds and Protein Development Trust (OPDT) and the Protein Research Foundation (PRF) on their initiative to formally establish the *Oilseeds Focus* magazine. This publication addresses the much-needed demand for an official mouthpiece for the South African protein industry.

The magazine will focus mainly on:

- Information transfer regarding news, commodities, markets, policy and events.
- Technology transfer regarding techniques and equipment, agronomic practices, research and successes.
- Marketing and promotion of the oilseeds industry, its commodities and industry issues.

With these focus areas as its core and others opening up as *Oilseeds Focus* grows, the publication will play a pivotal role in the development of the oilseeds industry and its entire value chain. One such example is the current Soya Development Strategy promoted by the Department of Trade and Industry (DTI). This strategy is aimed at growing local production on the primary side, while at the same time developing the offtake and processing capacity on the soya crushing side of the industry.

By implementing the strategy, local soya bean

meal (SBM) production (Table 1 and Figure 1) has increased by almost 500%. Crushing capacity has increased from an estimated 600 000 tons in 2012 to an estimated 2 100 000 tons in 2014, clearly proving that the strategy and policy instruments are able to change and contribute positively to the entire value chain. Market forces indicate that local soya bean meal is becoming available at more competitive prices, thus replacing a large portion of imported SBM.

Looking ahead, the National Development Plan (NDP) was given high priority in the recent State of the Nation Address. As part of the NDP, the Agricultural Policy Action Plan (APAP) of the Department of Agriculture, Forestry and Fisheries (DAFF) was approved by Parliament as the operational implementation plan of the agricultural portion of the NDP.

Drivers of economic growth

The APAP comprises several identified agricultural segments such as the red

meat, poultry, wheat, soya and the fruit industry – which will lead as drivers of economic growth and job creation in the agricultural sector. These agricultural segments will form value chain round tables (VCRTs) to act as the segment's engine room where all planning, coordination, liaison and execution will have to take place.

The South African poultry industry was identified as one of these segments and will include all value chain links feeding into the delivery of the final product at the most competitive price.

Naturally, the major cost component of the poultry producer, namely animal feed and its ingredients (70 to 80%), will receive a great deal of attention. The animal feed industry and ingredient suppliers such as the soya and maize value chains, will have to be innovative in tabling new strategies.

The animal feed and soya value chains anticipate that *Oilseeds Focus* and its sources will play a major role in bringing beneficial information, science, knowledge, research and best practices to the Poultry VCRT. 🌱

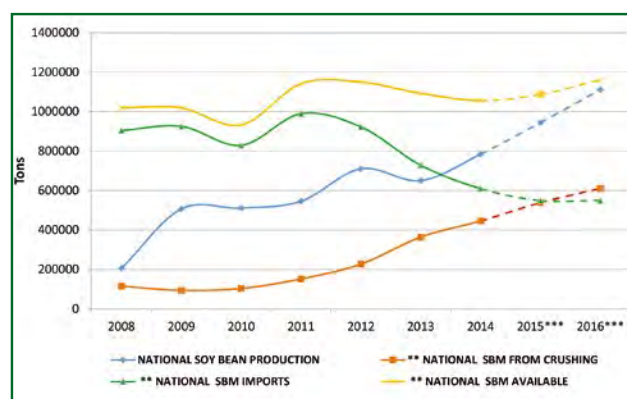
Table 1: National soya situation, 2008 to 2016.
(Source: AFMA Chairman's Reports.)

Tons	National soya bean production	** National SBM from crushing	** National SBM imports	** National SBM available
2008	205,850	115,200	904,214	1,019,414
2009	506,595	93,600	925,270	1,018,870
2010	511,000	103,520	829,000	932,520
2011	546,000	152,000	989,112	1,141,112
2012	710,000	227,200	922,498	1,149,698
2013	650,000	364,000	728,150	1,092,150
2014	784,000	445,600	610,021	1,055,621
2015***	944,340	538,274	549,019	1,087,293
2016***	1,110,550	610,803	550,000	1,160,803

** For the year April to March (AFMA stats year).

*** Estimates.

Figure 1: National soya situation: Comparison of soya bean production, national SBM crushed and SBM imported, 2008 to 2016.



The way forward

April 2015 brought about the first edition of Oilseeds Focus, something which we experienced as well received by the market. Interesting articles were considered and practical content was key for selection. Colourful advertorials not only assist us with the viability of the magazine, but also contribute to the sought-after technology transfer we so often refer to, while at the same time assisting in informing the industry of the latest products that are available.

Without advertisers, the magazine will not be a success and we would like to take this opportunity to thank them for their contributions and request their continuing support.

The launch function of Oilseeds Focus held at the offices of the Protein Research Foundation in Rivonia was well attended. Industry role-players received their brand new, first-edition copies of the magazine at the event.

Magazine content

The magazine aims to cover a broad spectrum of subjects which should result in articles specifically related to each stakeholder in the target market, including numerous others to broaden knowledge in the supply chain.

We will also strive for a balance between the four oilseeds we cover, namely soya beans, sunflower seed, canola seed and groundnuts. The main end-products end up in either the animal feeds market or in the form of products for human consumption – all aspects which we will be addressing in the content.

Our target market

It is imperative that Oilseeds Focus reaches its intended target market, which among others has been identified as the following:

- Producers.
- Processors.
- Traders.
- Agribusiness.
- Government departments.
- Associations.
- Research affiliates.
- International partners.

The oilseeds industry plays a central role in South African agriculture. It will also contribute to addressing the issue of food security in the country and on the continent. Oilseeds Focus magazine will bring together the key role-players and stakeholders to lead the way in this process.

Dr Erhard Briedenhan

Send us your contributions and suggestions to make Oilseeds Focus an enjoyable and valuable publication for the oilseeds industry. For more information, send an email to erhardb@netactive.co.za.

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Printed and bound by: United Litho • 011 402 0571

Oilseeds Focus, Plaas Publishing and its staff and contributors do not necessarily subscribe to the views expressed in this publication.

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Published on behalf of:
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To subscribe

Oilseeds Focus is a magazine aimed at addressing issues that are relevant to the canola, soya bean, sunflower and peanut industries. To subscribe to Oilseeds Focus, please contact Tanasha Moonsamy at 012 664 4793 or email tanasha@veeplaas.co.za. Subscriptions are free.



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Food security in Africa makes progress

A report recently released by the Food and Agriculture Organisation (FAO) shows improvement in the state of food security in Africa. According to the report, Angola, Djibouti, Cameroon, Gabon, Ghana, Mali and Sao Tome and Principe met both the millennium development goal of halving the proportion of the population suffering from undernourishment and the more stringent World Food Summit target of halving the numbers of the hungry.

West Africa in particular made significant strides, reducing the prevalence of undernourishment by 60% from 24,2% in 1990 to 9,6% in 2015. – *All Africa*

Grain producers support NDP

After contradictory and upsetting announcements regarding land reform were once again made, organised agriculture is increasingly taking stand in the media against such statements.

During a press conference at the Grain SA Nampo Harvest Day, Jannie de Villiers, chief executive officer of Grain SA, spoke to the media on Grain SA's official view regarding the current land debate.

De Villiers said grain producers of all provinces, sizes and race, as represented by Grain SA, say yes to the guidelines for land reform in the National Development Plan. "We believe in the necessity of successful land reform and will assist in making the goals set in the NDP become a reality, if it is done according to these guidelines."

However, he said grain producers say no to the 50/50 plan as well as any plans pertaining to land ceilings. Grain SA regards both plans as unconstitutional and not in the best interest of the industry reaching its goals of ensuring food security and creating jobs. – *Press release*

Sansor elects new board



The South African National Seed Organisation (Sansor) elected its new board of directors at its 26th annual congress in Milnerton earlier this month. The board is, in the front from the left, Gert Heyns, chairman, Lukeshni Chetty, general manager, and Willem Engelbrecht, vice-chairman. At the back are David Durandt, David Malan, Susan Allen and Jan Coetzer, all board members. It was also announced that Sansor will host the International Seed Federation congress in South Africa in 2020.



SGS opens new agriculture testing lab in Zambia

In response to increasing demand for farming support in Zambia, the world's leading inspection, verification, testing and certification company, SGS, has opened a new soil, plant and fertiliser testing laboratory in Kalulushi, Zambia.

Farmers are now able to access high standards and quick turn-around-time analyses of soil and plant samples locally. This means that local farmers can access vital services more effectively throughout the growing season, thereby helping them to improve crop yields and quality. These services enable farmers to manage soil fertility more accurately and with a positive impact on profitability. This information is especially important in a sector where inputs are becoming more expensive and farmers need to apply finances optimally on each farm. – *SGS*

Cargill completes Zamanita acquisition

Cargill has completed the acquisition of Zamanita Ltd, the soya bean crushing and oil refining subsidiary of Zambeef. Zamanita now becomes an integral part of Cargill's business in Zambia. As part of the deal, Cargill has acquired all of Zamanita's assets, including the Mama's oil and Zamanita oil brands.

Welcoming Zamanita's 310 employees to Cargill, Lezanne van Zyl, general manager of Cargill in Zambia, said: "Cargill will immediately start an extensive investment programme at the crush and refinery site in Lusaka, where upgrades will be made to machinery, tools and operational processes. Building on Zamanita's existing strengths, we intend to bring this plant up to the high standards of quality, environmental health and safety that are associated with our company around the world. We will optimise the efficiency of the operation that will bring benefits to our customers in the food and feed sectors." – *Cargill*

Sacota establishes member code of ethics

The *South African Cereals and Oilseeds Trade Association* (Sacota) board of directors has approved and released a Code of Ethics for Sacota members and encourages members to abide by it.

The code declares Sacota's belief that a strong competitive market serves in the best interest of the South African agricultural market and the free enterprise system. "Therefore the members of this association dedicate themselves to encouraging and vigorously defending political and economic circumstances, which foster and encourage the viability, health and expansion of free markets. The association further commits itself to the promulgation and implementation of the necessary rules and standards which will foster and sustain public trust and confidence," the code states.

In terms of the code, members are expected to:

- Comply with the laws and regulations relating to the merchandising, inspection, grading, weighing, storing, handling and transporting of grain.
- Maintain and promote the highest ethical and honest procedures in the transaction of business.
- Hold of primary importance the concepts of free enterprise and service to the public, and to continually strive to gain and maintain respect for the industry locally, nationally and internationally.
- Engage in sales and purchasing methods, promotional practices and other transactions, giving consideration to the best interests of the agricultural industry as well as the public.
- Encourage research and development of new methods and practices which would improve the efficiency and future of the grain industry. – *Sacota*

Identification of nematode problems

Nematode symptoms can be easily misleading and are often mistaken for symptoms of over-watering, undernourishment or chemical damage, Dr Sonia Steenkamp from the ARC Grain Crops Institute recently wrote.

Therefore it is important that the cause of detected symptoms is confirmed by an expert. For a nematode analysis, both the soil and roots should be included in the sample, because certain nematode types can slip through the cracks if only the soil is tested.

"The best time to have a nematode analysis done is during the flowering stage of the annual crop when the nematode population reaches its peak. This means that a clear picture can be obtained of what is happening in the fields. The only exception to this rule is regarding peanut samples."

She adds that, depending on the crop, there are very few nematicides that can still be applied at the flowering stage due to the withholding period. "The recommendation made will then apply to the following season. However, should the producer be in an area where nematodes were a real problem in previous seasons, it is advisable to rather use preventative nematicides, even if they are expensive." – *GWK*

Better Life Award winner announced

Prof Terry Aveling from the University of Pretoria was announced as the winner of the 2015 Bayer Science for a Better Life Award award at the recent South African National Seed Organisation (Sanson) congress.

The purpose of the Science for a Better Life Award is to recognise agricultural researchers who show leadership in making a positive contribution to the field of agriculture and specifically the seed industry. Sanson and Bayer invited individuals making a contribution in the field of agriculture to submit essays based on their research projects. The entries were judged in terms of their impact on the seed industry.

Prof Aveling's research outputs are considered relevant to the local and international seed industry. She has established a specialised niche field of research that is relevant and applicable to the seed industry. Prof Aveling explained that the University of Pretoria Seed Science Group will form an integral part of the new Plant Sciences Focus, which was established between the Departments of Plant Science, Plant Production and Plant Pathology. This will allow the group to forge collaboration and work together to solve multidisciplinary seed issues of importance to the seed industry in South Africa and globally. – *Press release*



Decisions to be made on GMO approvals

Proposals by the Sanson GMO committee to expedite the approval process for commodity clearance and general release applications, were discussed at a meeting of the Maize Forum Steering Committee (MFSC). Grain SA indicated that they were not in agreement with the proposals.

Subsequently, Sacota and Afma addressed a letter to Grain SA requesting their official viewpoint on GMO approvals. Grain SA's official position is that commodity clearance for a GMO event should be the exception rather than the rule. They were of the opinion that applications for commodity clearance of GMO events will place South African producers at a disadvantage compared to grain and oilseed producers in other countries where it is allowed to be planted.

It was agreed that Sanson and other directly affected parties should engage with the GMO registrar to discuss the GMO approval process. – *Sacota* 🟡

CONSERVATION AGRICULTURE *and sustainable crop production*

There are increasing concerns about the alarming rate of environmental degradation around the globe. One of earth's finite natural resources, soil, is especially under threat, posing great danger for feeding the world's growing population.

Each year 12 million hectares of land in the world where 20 million tons of grain could have been grown, are lost to land degradation. In the past 40 years, 30% of the planet's arable (food-producing) land has become unproductive due to erosion. Unless this trend is reversed soon, feeding the world's growing population will be impossible.

Worldwide there is consensus that plough-based farming, still widely practised, is unsustainable. Its continued promotion and application endangers global capacities to respond to food security concerns. Ploughing and removal of crop residue after harvest leave soil vulnerable to wind and rain, resulting in gradual, often unnoticed, erosion of soil. This is like tyre wear on your car — unless given the attention it deserves, catastrophe is only a matter of time. Erosion also puts carbon into the air where it contributes to climate change.

In South Africa, crop production systems based on intensive and continuous soil tillage have led to excessively high soil degradation rates in grain-producing areas. This adds to the growing problems with profitability and poverty in rural areas.

According to a recent study by the Agricultural Research Council (ARC)



No-till planters planting directly into maize residues on Hannes Otto's farm in the North-West Province.

in South Africa, the average soil loss under annual crops (such as grain and cotton) in the country is 13t/ha/yr, which is much higher than the natural soil formation rate. If we have to offer farmers a better chance to survive and if sustainable and economically viable agriculture and food security is to be achieved, then the paradigms of agriculture production and management must be changed.

An ideal vehicle

There is general agreement among key role-players, such as government, research institutions and producer's organisations (such as Grain SA), that these outcomes will be achieved through the adoption and implementation of Conservation Agriculture (CA). CA is seen as an ideal system for sustainable and climate-smart agricultural intensification, through which farmers can attain higher levels of productivity and profitability (i.e. 'green prosperity') while improving soil health and the environment.

Conservation Agriculture (CA) is an approach to managing agro-ecosystems for improved and sustained productivity, increased profits and food security, while preserving and enhancing the resource base and the environment. CA is characterised by three linked principles, namely:

- Continuous minimum mechanical soil disturbance.
- Permanent organic soil cover.
- Diversification of crop species grown in sequences and/or associations.

CA principles are universally applicable to all agricultural landscapes and land uses with locally adapted practices. CA enhances biodiversity and natural biological processes above and below the ground surface. Soil interventions such as mechanical soil disturbance are reduced to an absolute minimum or avoided, and external inputs such as agrochemicals and mineral or organic plant nutrients are applied

optimally and in ways and quantities that do not disrupt biological processes.

CA facilitates good agronomy, such as timely operations, and improves overall land husbandry for rain-fed and irrigated production. Complemented by other known good practices, including the use of quality seeds, and integrated pest, nutrient, weed and water management, CA is a basis for sustainable agricultural production intensification. It paves the way for increased integration of production sectors, such as crop-livestock integration and the integration of trees and pastures into agricultural landscapes.

Ample evidence now exists of the successes of CA under many diverse agro-ecological conditions, justifying a major investment of human and financial resources in catalysing a shift, whenever and wherever conditions permit, towards CA.

More profitable system

Economic analyses indicates that CA is a more profitable cultivation system when compared to conventional tillage (CT). Net farm income increases considerably under CA within a period of ten years, while under CT, it has been shown to decrease. The changes in the returns on capital of CA compared to that of CT are also quite impressive.



The following economic advantages emerge when comparing CT to CA in long-term experiments:

- Investments in machines are 39% lower in CA.
- Power requirements are 75% lower in CA.
- Working time is 60-80% lower in CA.
- Fuel consumption is 60-84% lower in CA.
- Variable costs: wages are 70-84% and repair costs are 60-65% lower in CA.

Increasing crop diversity (rotations) even out marginally. Building soil organic matter content and biotic activity lead to higher natural soil fertility. These can have large financial and environmental impacts. Cover crops (legumes) can contribute up to 250kg of soil nitrogen per hectare annually, amounting to cost savings of above R2 000/ha on N-fertilisers

(2014 prices), reduced weed seed banks and reduced crop losses to pests and diseases when compared to mono-cropped farming systems.

These values will certainly change from one region to the other, but the trend will probably be the same in most parts of the world. When making economic comparisons between CT and CA, we have

to compare the whole system over several years and attach a monetary value to such things as loss/gain of organic matter and soil fertility.

Influence of CA

In general, comparing results over several years (e.g. ten years), farm income decreases under CT in response to declining crop yields, while it increases under CA. Changes in income and variable costs between the first and tenth years under CA reflect increasing crop yields, a higher cropping intensity and savings per crop in fertiliser, herbicide and insecticide.

CA will also reduce carbon emissions, ensure less erosion, increase crop water availability and thus resilience to drought, improve aquifer recharge and reduce the impact of the increased volatility in weather associated with climate change. It will lead to more reliable harvests and reduce risks, especially for smallholders.

The latter point is critical for the household food security of around three million smallholder families in South Africa. It simply means that CA could sustain yields (and household food supply) at acceptably high levels, using minimum external inputs.

Because of the multiple benefits that CA systems generate in terms of yield, land use sustainability, income, cropping practice timeliness, ease of farming and eco-system services, the land under CA systems has been growing exponentially in many countries, largely as a result of the initiative of farmers and their organisations. In South Africa, the total area under CA is still small compared to land farmed using tillage. There is, however, a significant upswing in the number of farmers practising CA, as well as key research and development initiatives, promising significant improvements in promoting it.



For more information and references contact the author at cell 082 331 0456 or email Hendrik.smith@grainsa.co.za.

CHARCOAL ROT DISEASE

in soya beans

Soya bean plants
showing signs
of charcoal
rot disease.
(Photograph: US
Soya bean Research
Information
Initiative)



Charcoal rot is a disease caused by a fungus that is widely present in soil and has been reported to cause yield losses of 30 to 50% in the United States of America. It is also known as summer wilt or dry-weather wilt.

The disease occurs in many fields, sometimes scattered, infecting plants in small patches or parts of rows, and at times in larger patches.

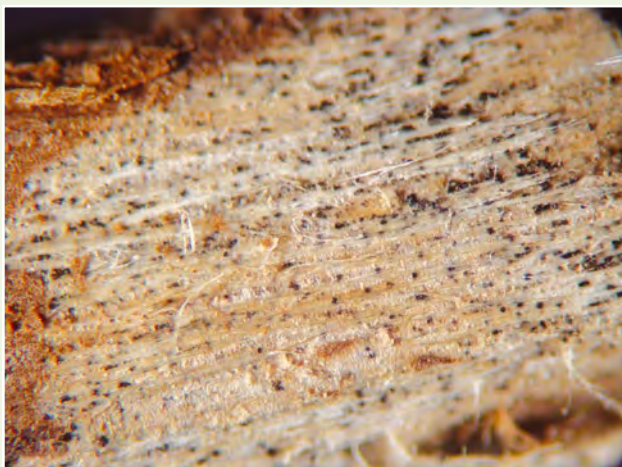
The most seriously affected areas are often in the drier parts of fields. The disease is usually detected after midsummer and is considered as a disease of the mature plant. However, seedlings and young plants are also affected. Under favourable conditions, it causes seedling-wilt disease. Charcoal rot occurs primarily when warm, dry weather causes stress in soya beans.

The fungus

Charcoal rot is caused by *Macrophomina phaseolina*. This pathogen has a host range of more than 500 plant species worldwide. Under hot, dry environmental conditions, many economically significant crops, including soya bean, suffer considerable yield

losses due to this disease. The fungus has been reported to affect soya bean plants throughout the growing season, and causing root and stem rot in soya beans throughout the world. *Macrophomina phaseolina* hibernates in dry soil and in the residue of host tissues, and it can be spread by contaminated seed.

Some reports suggest the fungus to be a weak pathogen and that it can cause only minimal damage when plants are not placed under stress, but that it can severely damage soya beans subjected to stress through factors such as drought. During a recent survey conducted in the major soya bean production areas of South Africa (Bethlehem, Bothaville, Brits, Cedara, Clocolan, Delmas, Dundee, Groblersdal, Kinross, Middelburg, Potchefstroom, Rustenburg and Vaalharts), *Macrophomina phaseolina* was found in all the areas surveyed, with the exception of Cedara.



A close-up view of a soya bean stem infected with charcoal rot, showing minute, black, dusty microsclerotia. (Photograph: www.mississippi-crops.com)



Charcoal rot on a soya bean stem. (Photograph: www.aganytime.com)

Symptoms

Symptoms of charcoal rot are first observed in the driest areas of a field (such as in sandy or compacted areas, or the tops of terraces). Usually the symptoms occur after midseason in dry, warm conditions, but seedlings may also be influenced in hot and dry soil conditions.

- Brown lesions may form on the hypocotyl of emerging seedlings. However, symptoms typically occur during or after flowering in mature plants.
- Infected plants wilt in the midday heat, recovering at night until the permanent wilting point is eventually reached.
- Leaves of severely infected plants turn yellow and brown, then wilt and remain attached to the plant to then drop prematurely, something which is usually mistaken for normal maturity.

A more solid diagnosis of the disease is based on the appearance of the root and lower stem:

- Starting at the flowering stage, a light grey discoloration develops on the epidermal and sub-epidermal tissues of both tap and secondary roots and lower stems. The distinctive characteristic of the disease can be revealed by scraping off the surface layer (epidermis) of the root and lower stem.
- Plants infected with charcoal rot will have minute, black, dusty microsclerotia under the epidermis, giving the stems and roots a charcoal-sprinkled appearance. These microsclerotia are difficult to see without the use of a magnifying glass.
- Cutting the root and lower stem often reveals the distinctive grey-to-black discoloration inside.

root growth and reduces plant populations, in order to diminish competition for water.

Plants infected with charcoal rot will have minute, black, dusty microsclerotia under the epidermis.

- Practise conservation tillage (minimum and no tillage), as decreased infection has been reported with this practice. This could be due to cooler soils and stubble retention, resulting in decreased moisture stress.
- Crop rotation, especially with cereal grains (that are not hosts) or crops that lead to relatively reduced contamination of the soil, is recommended for a period of one to three years.



Soya bean pith with dark-grey central discoloration, due to microsclerotia caused by the charcoal rot fungus. (Photograph: ARC Plant Protection Research Institute)

Management

- Charcoal rot is a difficult disease to manage. No resistant cultivars are available, but some have been reported to be less affected by the disease than others.
- Manage fields in an attempt to avoid drought stress. Implement practices such as early planting, to avoiding the worst drought conditions. Plan an irrigation schedule that promotes good

Contact the ARC Plant Protection Research Institute at Private Bag X5017, Stellenbosch, 7599, for more information.

References available on request. 

SCLEROTINIA

STEM ROT (*Sclerotinia sclerotiorum*)

By Piet Lombard, Western Cape Department of Agriculture, and Jannie Bruwer, Bayer

The occurrence of *Sclerotinia* has shown an increase in Australia and Canada, with an increase in surface area under canola cultivation.

In the Western Cape the surface area under canola has doubled during the past three seasons. Because the climate in the Overberg and Swartland is highly suitable for the development of the disease it occurs very commonly, especially in the Overberg over the past four seasons (2011 to 2014).

Sclerotinia is a disease that infects canola, but also many other broadleaf crops. Lupins are very susceptible to it and in the Swartland it is found on this crop as far up as the Eendekuil area. Weeds such as devil's thorn and wild radish are also disease hosts, but peas and broad beans are, however, less susceptible.

Sclerotinia stem rot (Figure 1) only occurs sporadically when the weather conditions are favourable for the development of the disease. Consequently it varies between years, production regions and even from country to country.

Risk factors

Moisture

Moisture is essential for the development of *Sclerotinia*. High soil moisture content with light rain occurring in the period two weeks prior to bloom and during the flowering stage will greatly increase the risk for *Sclerotinia* infection, while dry weather conditions will limit the development of the disease.

Moisture for the development of *Sclerotinia* can be supplied by rain, dew, foggy weather and even a high relative humidity (>80%) in the air. Since the humidity of plants in a stand of canola is mostly higher than

measured by weather stations, weather station measurements are not a good yardstick. Heavy rain downpours in the flowering stage can reduce the *Sclerotinia* risk, because it can reduce the release of spores as the water covers *Sclerotinia* apothecia and rinses it from the plant petals.

Take note

The risk of infection is low after a few weeks of drought followed by rain, which is followed by a dry climate afterwards with little dew. In case high humidity and dew is experienced in the period after the rain, the spores need two weeks to develop and to be released from the *Sclerotinia* apothecia. In case such conditions occur late in the flowering stage, a fungus spray treatment will not contribute any longer to higher grain yields (<http://www.canolawatch.org/2013/01/09/sclerotinia-stem-rot-management/>).

Temperature

Temperature is less significant than moisture, but still has a big influence. Night and early morning temperatures of approximately 15°C, with heavy dew, are ideal for the development of *Sclerotinia*. Infection does not take place in the heat of the day, but at night.

Warm days will decrease infection, because the infected flower petals dry out and are blown off the plant. In hot, dry conditions the plant weans its lower leaves. In case the leaves fall before the infection spreads from the flower petals, it will limit *Sclerotinia* stem rot.

Leafy canopy

Sclerotinia is highly dependent on the microclimate in the canopy of the



Signs of *Sclerotinia* on the stem of a canola plant.

stand of canola. Key factors that influence microclimate are:

Cultivar: Cultivars that develop bigger leaf surface areas increase the risk. There is more space for flower petals to fall onto, while the leaves trap moisture and can create an ideal (humid) microclimate. Plants that grow high and topple over easily are also more susceptible to *Sclerotinia*.

Fertilisation: Canola plants in soils with a high nutritional status have more and bigger leaves and consequently a denser leafy canopy, which increases humidity and thereby the risk.

Toppling over: Plants that topple over do not dry off as quickly. In case they are infected, the plant-to-plant contact will aid in spreading the disease.

Planting date: The infection levels of canola fields with different sowing dates can differ. The occurrence of *Sclerotinia* stem rot is dependent on the climate and flowering stage of the canola plant. Planting dates that cause canola plants to bloom in moist conditions and favourable temperatures can increase the occurrence of the disease.

High sowing density: A high sowing density results in plants competing better with weeds and ripening more uniformly, but having a denser leafy canopy as a result. Dense stand also results in stems being thin and tending to topple over easily.

Key facts

Lower plant standing is not immune to *Sclerotinia* stem rot. Logic dictates that less plants per square metre have more open spaces with a less dense leafy canopy to capture moisture. This would only be true on fields with less plants and a low yield potential. In a lower plant standing, canola plants have more, as well as bigger, leaves and stems, and a longer flowering period. This can increase the risk of *Sclerotinia* due to flower petals falling over a long period, and with the bigger leaves there is more space for flower petals to fall on.

Wide rows and a lower sowing density can very well lower the risk, but it is dependent on weather conditions. Wind moves more easily between plants when rows are wider, and in so doing, dries off plants and soil. Wider plant rows will hold no benefit in case moist conditions occur during the flowering stage.

Crop rotation

Since the disease can survive for so long in the soil (up to ten years), crop rotation has little influence on the occurrence of *Sclerotinia* stem rot. (See, however, the lifecycle of *Sclerotinia* in canola in Figure 5 and the section on management of the disease below that.)

Risk table

The risk table (Table 1) that was developed in Sweden can be used to determine the risk of *Sclerotinia* occurrence. The list should be completed at the time when 75% of the plants have three flowers (start of flowering). The greater the risk for *Sclerotinia*, the better the chance will be that it is economically justified to apply chemical control. In Sweden, it was found that a count of 40 justifies



Symptoms of *Sclerotinia*.

chemical control, but it is dependent on the canola price and costs of control. It is important to give crop rotation a minimum of five points, since neighbouring crops can pose a risk.

The disease will still occur, even if spray treatment is administered at the correct recommended time. Chemical control will only limit the degree of infestation. Two spray applications will lengthen the protection period, but will still not eradicate the disease, in case the disease incidence is high. Table 2 contains the list of registered fungicides for canola.

When to apply control

Flower petals are the target. Chemical control is ineffective before the flowering stage. Chemical remedies do not combat infection, but prevent the spores from germinating on the flower petals after they have fallen on the leaves.

It is easier to spray flower petals with chemical agents while the plant is still in bloom – it is consequently the most suitable time for chemical control.

The timing of chemical control has to occur within the 20 to 50% flowering stage. (Certain products are registered for only 20 to 30% flowering stage. Read the product label carefully.) At the 20% flowering stage, no flower petals will have fallen yet. Canola can reach the 20% flowering stage within four to five days. Therefore, attempt to detect

Sclerotinia risk timely. A spray application at 20 to 30% flowering stage ensures that many flowers are already open and that they are treated with products before they fall.

A late spray application can only be effective if it was initially dry and was followed by rain during 40 to 50% in bloom, as plants recover after heat or drought that extends the flowering stage. It is, however, seldom more effective than control during 20 to 30% in bloom.

Table 1: *Sclerotinia* stem rot risk list: Start of flowering (75% of the plants have three flowers).

Risk factor	Categories	Risk point
Crop rotation: Years after canola	>6 years	0
	3 to 6 years	5
	1 to 2 years	10
<i>Sclerotinia</i> occurrence in the last host crop (e.g. canola, lupin etc.)	None	0
	Low (1 – 10%)	5
	Moderate (10 – 30%)	10
Sowing density (plant standing)	Heavy (31 – 100%)	15
	Low	0
	Medium	5
Rain in the last two weeks	High	10
	<10mm	0
	10 – 30mm	5
Weather forecast	>30mm	10
	Dry	0
	Erratic	10
Local risk for the development of <i>Sclerotinia</i> apothecia	Good chance of rain	15
	None found	0
	Low numbers	10
	High numbers	15

Source: <http://www.canolawatch.org/2013/01/09/sclerotinia-stem-rot-management/>

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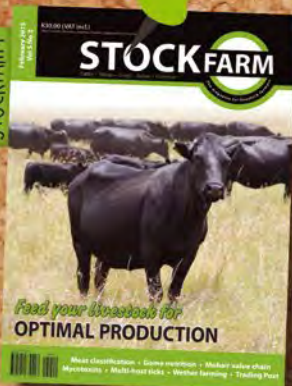
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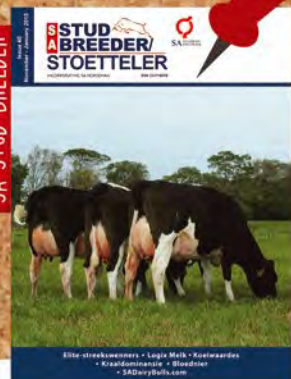
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Table 2: Fungicides for canola.

Characteristics Active ingredient	Score Difenoconazole 250g/ℓ	Amistar Xtra Azoxystrobin Cyproconazole 200g/ℓ and 80g/ℓ	Prosaro 250EC Prothioconazole Tebuconazole 125g/ℓ and 125g/ℓ
Volume water			
Air ℓ/ha			30 – 40
Soil ℓ/ha	300	200 – 450	300
Procedure	Systemic	Systemic	Systemic
Registration			
+Dosage/ha			
<i>Alternaria</i> (<i>Alternaria</i> spp)	500mℓ (g)	1 000 – 2 000mℓ (g)	None
Blackleg <i>Leptosphaeria maculans</i>	500mℓ (g)		630 – 760mℓ (g) 630 – 760mℓ (ℓ)
<i>Sclerotinia</i> stem rot		1 000 – 2 000mℓ (g)	630 – 760mℓ (g) 630 – 760mℓ (ℓ)

NB: List possibly not complete. Follow product label. (New registrations may be added in future.)

Identification of *Sclerotinia* stem rot:

- *Sclerotinia* apothecia develops on *Sclerosia* in winter. It resembles small mushrooms with a “golf-tee shape”.
- Fuzzy white (mycelia) grows on the plant stem.
- The plant stops growing above the point of infection. The vascular tissue gets damaged by the fungus and the plant cannot absorb water and nutrients.
- The affected part of the plant is grey-white or brown-white in colour.
- Black-brown *Sclerosia*, resembling mouse droppings, of up to 15mm in length develop inside and on the stem.

Lifecycle of *sclerotinia*

- In favourable conditions, small structures (apothecia) that can resemble mushrooms develop on the *sclerotia* and spores are released from there and spread by the wind (Figure 2). The spores are released 10-14 days after apothecia

are formed. The ideal temperature for apothecia to develop varies between 11 and 15°C.

- The spores germinate on the old flower petals that serve as nutrition.
- Infected flower petals fall on the leaves or against the stem, where the mycelium penetrates and infects the plant.
- Climate during bloom plays a key role in disease development, as it requires moist conditions. The optimum temperature for development is 15°C, but it will even develop in up to 25°C if sufficient moisture is available.
- *Sclerosia* develops in the plant stem and can survive three to four years in the upper 5cm of the soil and up to ten years if worked in deeper. Apothecia develop only on *sclerotia* that occurs in the top few centimetres of the soil when the climate is favourable.

Management of the condition

- Follow a four-year rotation with non-susceptible crops (grains). Lupins are even more susceptible to *Sclerotinia* than canola and *sclerotia* can survive up to ten years in the

soil, in case it occurs deeper (>5cm) in the soil.

- Adjacent fields are significant. Keep history of the field and current crop in mind. If possible, plant 500m away from previously infected field.
- Plant susceptible crops upwind of the contaminated area, according to prevailing winds.
- There is no cultivar available in South Africa with resistance to *Sclerotinia*.
- Clean seed has to be sown. During harvesting, *sclerotia* can end up along with seed.
- Wider plant rows can promote airflow for plants to dry off quickly.
- Observe the season when the plants start blooming. Fill out the *Sclerotinia* stem rot risk list and determine the risk of the particular crop.
- Control broadleaved weeds such as devil's thorn and wild radish, since they are also hosts of the disease.
- After planting, chemical control is the only option to manage the disease. The cost of spray applications must be weighed against the yield increase and price of canola.
- Fungus control has to be applied before infection is visible. (Use the *Sclerotinia* stem rot risk list to determine the risk.)
- The best stage of chemical control is 20 to 30% in bloom. (Follow indications on the product label.)
- A minimum of 100ℓ of water per hectare must be sprayed, preferably along with the chemical agents. Chemical agents only have an effect for a limited period. Determine what this is and consider costs before a follow-up spray treatment is attempted.
- The accepted norm for calculating losses is 0,5% loss in yield for every 1% plant infection. With substantial infections, it is closer to a ratio of 1:1.

Contact Piet Lombard on 021 808 5321/5415 or pietl@elsenburg.com for information and a list of references used. Also visit www.proteinresearch.net for more information. 

Singulation peaks broadacre interest

Broadacre crop establishment, particularly maize and sorghum, using singulation, has been a well-established practice throughout the world for decades. However, it has taken high-cost hybrid canola seed to raise interest in the method in Western Australia.



Direct Seeds director, Darryl Hine, with the Equalizer.

There are also signs that it will not be too long before canola and lupins, along with summer crops, will be sown using singulation, characterised by precision seeders fitted with individual seeding boxes above sowing discs or tines, with the air seeder used only for fertiliser blends.

In any event, it is a subject likely to gain increasing interest from researchers, who are already signalling a programme of trials throughout the Wheatbelt this year to establish canola on wide rows. Trials, associated with the Northern Agri Group, are showing promising results for sowing hybrid canola varieties at lower rates on wide-row spacings between 50cm and 60cm.

What caught Wellstead farmer, Peter Diprose's, attention was a

quick calculation of how much he could save on sowing costly hybrid canola (about Aus\$37 a kilogram) by lowering sowing rates on 50cm spacings. He took the plunge and last year bought a South African made Equalizer vacuum precision planter from Albany-based distributor Direct Seeding. "With the singulation, we shall be growing more hybrid canola varieties in the future as opposed to the triazine-tolerant (TT) lines which are grown on selected paddocks," he says.

Trials with canola

"Hybrid canola varieties are a huge expense and in my first year with the Equalizer, I saved Aus\$20 000 in seed costs. Plus, I reduced fertiliser costs in crop chemical sprays and finished with good yields (average 1,75t/ha), so the gross margin side of the equation is pretty compelling." As a comparison, Peter sowed some TT lines with seed he had kept, with his K-Hart seeding rig and achieved 1,5t/ha sowing at 4,5kg/ha.

"The big difference was the gross

margin story, which was better using the Equalizer," Peter says. Last year, he started sowing his canola with the Equalizer at 1,9kg/ha following 18mm of rain at the end of April. "We were virtually sowing dry, but we got germinations within four days and we could see the crop was way too thick, so we went back to 1,7kg/ha to finish the programme.

"This year we shall start at 1,5kg/ha and do a few trials down to 1,2kg/ha, but I am told we could go lower. But it's not so much about the seeding rate per se, as plants per square metre, which is how the Equalizer is calibrated. It takes a bit to get your mind around it, but it is a matter of calculating seed size per kilogram and relating that back to plant counts."

As far as tow spacings are concerned, Peter says 50cm is enough to incorporate chemicals. "Any wider and you are probably going to have trouble with soil throw (not covering the row)," he says.

Benefits of singulation

While Peter bought the Equalizer as a

purpose machine for sowing canola, it will be employed for other uses such as sowing pastures – Peter runs about 14 000 head of sheep. “We shall trial sowing serradella in April with a view to harvesting the seed and then maybe undersow serradella with oats to establish pasture,” he says.

“This will enable us to do two jobs in one hit. The other aspect of sowing with the Equalizer on wide spacings is that we can get through heavy barley stubbles, so we don’t have to burn. We tend to cross header trials at 90 degrees to establish canola and the Equalizer gives us a smooth finish, which is reflected by even germination.”

Interestingly, swaths are picked up at either 45 or 90 degrees to the swath. The other aspect of singulation that

impressed Peter was the accurate seed depth (10mm) and distribution (35-40cm, 14-16 inches), often described as being like a picket fence. Fertiliser was banded at between 35 and 40mm (sub 2 inches) with rates returning after an initial rate of 110kg/ha.

Ideal machine

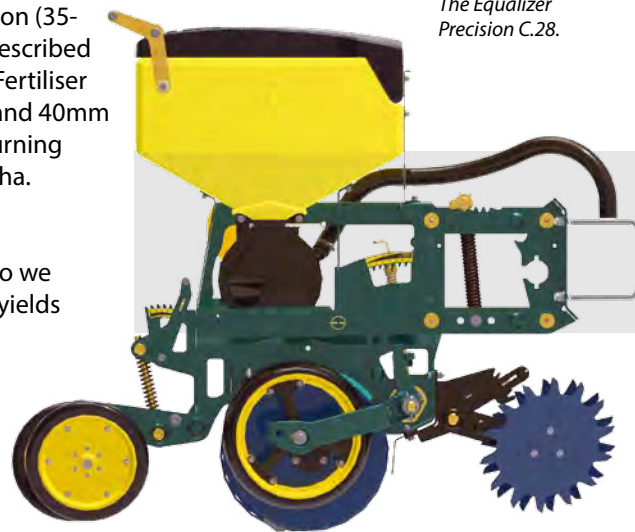
“We went back to 90kg/ha, so we saved on fertiliser costs and yields were not that much different between higher and lower applications,” Peter says. “We got great germination and the crop cabbaged out quickly to outcompete the weeds.”

Peter has no qualms sowing dry with two early applications of glyphosate sprays post-sowing. “Our

rotations see Roundup-Ready canola going every six years in a wheat, barley and oats rotation with TT canola or Clearfield varieties. So we are pushing out the chemical groups as wide as possible.”

According to Direct Seeds director, Darryl Hine, the Equalizer would be an ideal machine in lower rainfall areas, where farmers generally aim for canola yields of about 1t/ha. “With precision sowing, lower costs and wider spacings for potential edge-effect during the growing season, hybrid canola varieties will have a lot of appeal,” he says.

The Equalizer Precision C.28.



It will not be too long before canola and lupins, along with summer crops, will be sown using singulation.



An Equalizer exhibited at Nampo 2014.

Seed depth

According to the South African manufacturer, Theebo Tech, seed depth is controlled by the gauge wheels. A centrally-mounted gearbox is fitted to regulate down the row seed populations, replacing sprockets and chain, while seed metering is a vacuum system which enables seeds to be placed individually in a rotating seed plate for metering down the seed tube.

Each planter hopper holds 70ℓ of seed. The fertiliser hopper holds 6 500ℓ of dry fertiliser. Fertiliser, from the central hopper, is delivered to the tine units via a self-cleaning metering system.

According to Darryl, the productivity of the Equalizer surprises many farmers. “A unit with a working width of 18m (60ft) will have 36 planter units, which is enough for 1 800ha,” he says. “The working speed is between 8 and 10km/h, so you can get through a programme pretty quickly in the right conditions. And you can run a liquid tank behind the Equalizer with plumbing to each unit.” Darryl says the Equalizer is available in working widths ranging from 6m (20ft) to 18m.

Visit www.equalizer.co.za for more information.

SUNFLOWER CULTIVAR EVALUATION:

By Dr André Nel, ARC
Grain Crops Institute

A collaborative effort to ensure efficient seed production

The profitability of sunflower seed production is under constant pressure and making a wrong decision regarding which cultivar to grow, can result in inefficient use of inputs such as fertiliser. An expected profit can easily turn into a loss. Consequently, cultivar evaluation trials are conducted to investigate efficiency.

Environmental influence

Not all sunflower cultivars are similar in their response to the environment. Some will perform well in a particular environment, while others will perform poorly. The opposite might be true in another environment. This phenomenon is well-known in crop science and is referred to as the cultivar-environment interaction.

A second key characteristic of cultivars is yield stability. The yield of an unstable cultivar has a high variation, while that of a stable one has a low variation in similar environmental conditions.

Due to these phenomena, the yield difference between cultivars at a

particular locality often exceeds $0,5\text{t/ha}^{-1}$. This difference has a large impact on the profitability of a sunflower crop, considering that the national mean yield is approximately $1,2\text{t/ha}^{-1}$.

The aim of the cultivar evaluation programme is to enable farmers to select well-adapted cultivars for their particular conditions and to ensure the highest possible efficiency in input utilisation, as well as the soil and climate where the crop is grown.

Seed industry participation

Local evaluation of sunflower cultivars commenced in the 1975/76 season and has continued ever since. Initially, the evaluation was almost exclusively handled by the Department of Agriculture. In the course of time, seed industry participation increased, to the current point where most of the field trials are conducted by five seed companies.

Cultivar evaluation trials are costly, as they require relatively high management and labour inputs. Despite the high cost, a continuous

process of cultivar evaluation is justified. Between 25 and 33% of commercially available cultivars is annually replaced with new entries. The yield performance of some cultivars deteriorates over time, which warrants an annual evaluation process. If a cultivar with a unique quality, such as an extremely high oil content, appears on the market, it will be independently identified and confirmed by the evaluation process.

A typical field trial has about 20 cultivar entries, which are planted in plots consisting of four rows, spaced 0,90m apart and 8 to 10m long. Results from these trials are analysed statistically and the layout adheres to the rules of statistics, such as the requirement for randomisation and replication. About 30 trials are conducted annually in the main production areas, on commercial sunflower and experimental farms. The aim is to conduct field trials on similar soils and environments where commercial sunflower is grown.

Five South African seed companies partake in the trials and the majority



An example of cultivar plots consisting of four rows, in a typical field evaluation trial.

of field trials are conducted by them. For each cultivar entry, at least one trial needs to be conducted by the participating company. The Agricultural Research Council Grain Crops Institute (ARC GCI) plans the trials, packs the seed according to the trial plans and distributes it to the various participants.

Results analysis and presentation

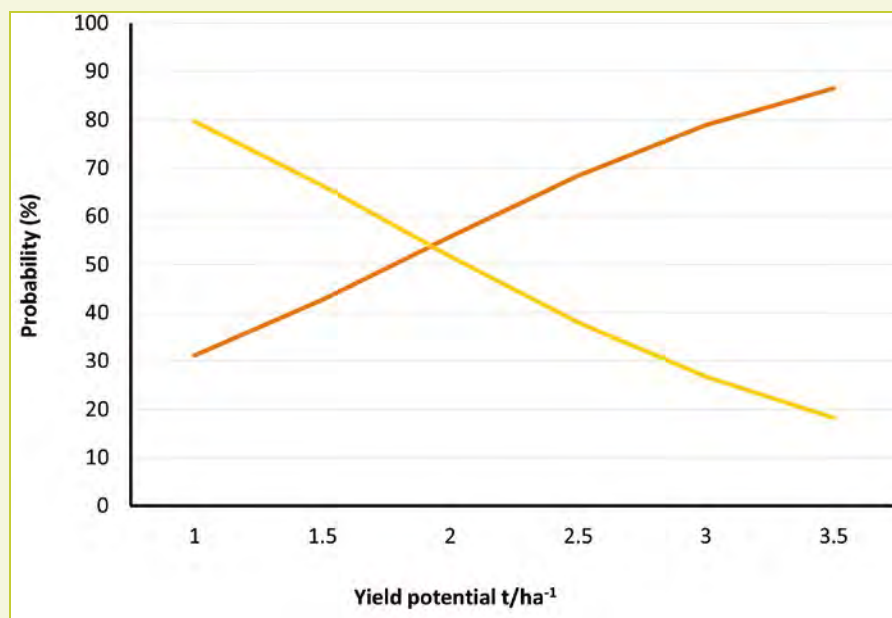
After harvesting the field trials, yield results are sent to the ARC GCI. An analysis of variance is performed for each trial to determine its reliability. Results from reliable trials are pooled and the yield probability for the various cultivars is calculated through regression analysis. The yield probability is simply the probability of a particular cultivar to achieve an above-average yield at a particular yield potential.

The yield potential is reflected by the long-term mean yield of a particular field or environment. Due to their experience, farmers are usually good judges of yield potential. The yield probability accounts for the cultivar-environment interaction as well as yield stability. Yield probabilities are then summarised for a range of yield potentials in a table format. *Table 1* is an excerpt of the 2013/14 results.

The yield probability table, which is published annually, serves the purpose of cultivar recommendation. A farmer can easily select one or more cultivars with high probabilities for sunflower yield potential in his particular environment and place an order with the relevant company.

Table values can also be graphically displayed as presented in *Figure 1*, where the yield probability of only two cultivars over a range of yield potentials is shown. These two cultivars clearly demonstrate the cultivar-environment interaction. The yield potential of a cultivar should be above 50% before it becomes a meaningful option. Occasionally, cultivars with no environmental interaction are discovered. Those with an above-average yield are popular due to their superior performance, despite the seasonal rainfall.

Figure 1: The yield probability of two cultivars, indicating the cultivar-environment interaction.



Note: For a yield potential below 1,9t/ha⁻¹, the yellow cultivar will be the obvious choice of the two, while the opposite is true for potentials above this value.

Table 1: Yield probability (%) of sunflower cultivars evaluated in 2013/14.

Cultivar	Yield potential (t/ha ⁻¹)		
	1	2	3
Agsun 5264	42	33	25
Agsun 5270	31	56	79
Agsun 5271	30	50	70
Agsun 5278	34	47	60
Agsun 5279	38	49	61
Agsun 8251	21	53	84
CAP 4000	47	42	37
PAN 7033	47	46	45
PAN 7049	81	77	71
PAN 7057	64	55	45
PAN 7080	51	73	88
PAN 7098	30	59	84
PAN 7100	87	78	62
PAN 7095CL	44	57	69
PAN 7101CL	27	29	32
PAN 7102CLP	80	52	27
PHB 65A25	43	36	31
PHB 65A70	56	44	34
SY 4200	39	36	33
SY 4045	89	41	8

Trial results are not limited to the yield, but other characteristics are also measured. Growing season length is an important cultivar characteristic as well as the seed oil and protein content, which are measured for most trials. No statistical analyses are completed based on these results and only mean values are reported.

The South African cultivar evaluation programme is probably unique, considering the participation of seed companies, the analysis method and presentation of the results. In the USA, for example, results of individual trials are published without statistical analysis, which accounts for the cultivar-environment interaction and yield stability. In this respect, South Africa's sunflower industry is probably a step ahead of several countries abroad.

For more information, contact
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By Dr Charlie Reinhardt

WEED CONTROL IN SOYA BEANS:

Make-or-break herbicide choices

Soya bean production in South Africa is experiencing a sharp growth curve. According to the Bureau for Food and Agricultural Policy's (BFAP) Agricultural Outlook: 2012-2021, it is possible to achieve a soya yield of more than two million tons on a surface of approximately 900 000ha by 2021. This is estimated to represent about 40% of the land surface that will be planted with maize by 2021.



Dr Charlie Reinhardt.

The challenge for producers is to double the current average yield of less than 3t/ha in order to meet the global average, and to meet the growing domestic demand for soya bean products such as oilcake and seed oil.

Weed control is one of the most vital practices requiring effective application if we are to achieve significant growth in our soya bean yields. Even in other parts of the world such as Argentina, Brazil and the United States where soil type and climate are generally less restrictive than in South Africa, effective weed control is deemed essential.

Locally registered herbicides

In South Africa 24 herbicides (active ingredients) are registered for use on soya beans. Eleven of the 24 control mainly grass weeds, while five control broadleaved weeds, and eight control both grass and broadleaved weeds. Thirteen of the 24 herbicides are registered for pre-emergence use, nine for post-emergence and two for both pre- and post-emergence use.

At first glance it may seem as though there are more than enough herbicides to effectively manage weeds in soya beans, but it has to be taken into account that not all the herbicides within a particular chemical group or mode-of-action control the same spectrum of weeds, and there are major differences in weed types found in different climate zones, regions, districts, farms, and even between fields on the same farm.

Competitive nature of weeds

Like most other crops, soya beans are most sensitive to weed competition more or less four weeks after sprouting, and also from the onset of the reproductive phase (flower formation,

pollination and seed formation). Between these growth stages the crop is capable of strongly competing with weed, provided that it is able to quickly develop a canopy. Especially grass weeds and nutsedge (*Cyperus esculentus* and *C. rotundus*) compete poorly under low-light conditions that are coupled with overshadowing.

The extent to which weeds compete with soya beans for growth factors such as water, nutrients and light, depends on the type of weed and its numbers, since weed types vary a lot in respect of competitiveness, and because large numbers favour a weed type in the competitive struggle with the crop. In addition to this, weeds will compete best when growth factors become restrictive, such as during drought and low nutritional status of soil or when the crop comes under stress due to weak cultivation practices, diseases, or as a result of under-performance by *Rhizobium* bacteria.

Treatment methods

Herbicides administered prior to planting are ideal for the reduction of weed types and numbers during the early growth stages of the crop. Popular herbicides for pre-plant administering on weeds that have emerged above-ground are



Morning glory is a major problem in soya bean cultivation, as it is tolerant to various herbicides, and sprouts throughout the growing season.



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glyphosate, 2,4-D and paraquat. Precise mixing methods and succession application of these three products are registered for this purpose. (Consult product labels.) All three show little to no activity after coming into contact with soil, but for certain products containing these active ingredients, there are set waiting periods before the crop can be safely planted. (Consult and follow label directions.)

Besides pre-planting administered herbicides, there are various other registered treatments aimed at pre-emergence control (herbicides administered during planting or shortly after planting) in a large variety of weed types. Herbicides used for treatment at this critical stage include certain *acetamides* (e.g. alachlor and metolachlor), *diclosulam*, *dimethenamid-P*, *flumetsulam* and *imazethapyr*. The after-effect (persistence) of a pre-emergence administered herbicide should ideally be long enough to prevent or limit weed competition with the crop for as long as possible.

Development of weed resistance

No-till systems do not offer the option

of mechanical weed control (hoeing), and consequently post-emergence weed control is entirely dependent on herbicides. In glyphosate-tolerant soya beans, glyphosate herbicide are the logical preferred treatment; it controls the broadest spectrum of weeds up to a relatively late growth stage. (See product label for growth stage restrictions.)

CROPS THAT RESIST GLYPHOSATE HERBICIDES, HAVE LED TO A MAJOR TRANSFORMATION IN WEED CONTROL.

Glyphosate use in glyphosate-tolerant soya beans controls weeds that escaped the effect of pre-emergence herbicides, as are weeds that sprout until late in the season or throughout the season, e.g. flaxleaf fleabane (*Conyza bonariensis*), morning glory (*Ipomoea purpurea*) and crabfinger grass (*Digitaria sanguinalis*).

Crops that resist glyphosate herbicides have led to a major

transformation in weed control. This form of biotechnology has greatly simplified weed control in genetically modified (GM) crops such as glyphosate-tolerant soya beans and made it more economical, the result being that many other herbicides lost their market share.

Dependence or excessive use of a single herbicide, specifically if it affects a single plant enzyme, is conducive to the development of weed resistance. Avoiding this colossal problem is relatively simple, provided that the guidelines for weed resistance management is applied scrupulously. These guidelines are freely available from companies that manufacture or sell herbicides.

Be sure to report weed and herbicide-related problems to Dr Reinhardt, and read more about weed resistance research on the website <http://goo.gl/5vh4N7>.

Dr Charlie Reinhardt is extraordinary professor in weed science at the University of Pretoria and dean of the Villa Academy. For more information, contact him at 083 442 3427 or dr.charlie.reinhardt@gmail.com.

Good control of yellow nutsedge with post-sprout administered glyphosate in glyphosate-tolerant soya beans.



LINK SEED

Sojaboon-pakket

Sojabone – die bobaas wisselbougewas

Kort, Vinnige Groeiseisoenklas

Groep 4.4 en Groep 4.0

LS 6444R en LS 6240R

*Wyd aanpasbaar

*Uitstekende

staanvermoë en uifers geskik

vir nou rye *Goed aangepas

vir droëland en besproeiing

*Goeie peulhoogte vir 'n

vinnige groeiklas

*Uitstekende opbrengs
potensiaal



Medium

Groeiseisoenklas

Groep 6.1

LS 6161R en LS 6261R

*Smalblaar kultivars, goed aangepas vir
droëland en besproeiing *Uitstekende

staanvermoë *Wye aanpasbaarheid

* Uitstekende opbrengs *Korter,
regop groeiwyse

Groep 4.6 en Groep 4.8

Groeiseisoenklas

LS 6146R en LS 6248R

*Wye aanpasbaarheid en

goeie opbrengs vermoë

*Goed aangepas in veral die

koel en gematigde dele

*Goeie staanvermoë

en peulhoogte

Medium

Groeiseisoenklas

Groep 6.4

LS 6164R

*Uitstekende agronomiese

eienskappe *Baie goeie

peulhoogte *Verkies

gematigde tot warm

gebiede

Groep 6.6
Groeiseisoenklas

LS 6466R

*Baie goeie peulhoogte

*Goed aangepas in
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By Dr Mian Riaz, director: Food Protein
R&D Centre, Texas A&M University, USA

GETTING MAXIMUM QUALITY from full fat soya

Soya beans prior to oil extraction are referred to as full fat soya beans. Properly processed full fat soya beans are a valuable feed ingredient because of their energy, protein, linoleic acid, vitamin E and lecithin contents.



There are a number of different products on the international market being sold as full fat soya bean meal. These products are produced by a variety of processes, all of which have a different impact on the nutritive value of the product and its quality in terms of anti-nutritional factor levels. The focus of this paper is using extrusion technology to process quality full fat soya beans for animal feeding.

Soya beans are the most important crops in the world and are grown for a variety of agricultural and industrial uses. There are eight major oilseed meals in the world. Soya bean meal represents more than 50% of the total oilseed meal production.

Raw soya beans cannot be used as such for animal feed or human food, because they contain several different anti-nutritional factors such as:

- Trypsin and chymotrypsin inhibitors.
- Phytohaemagglutinins (lectins).
- Urease.
- Allergenic factors.
- Lipases and lipoxygenases.

These factors affect the digestion of soya beans in the stomach. All can

be deactivated, modified or reduced through proper heat treatment to minimise or eliminate their adverse effect. Since all these inhibitors are proteins, caution should be taken to assure that no destruction of the oilseed protein occurs. This can be accomplished only through optimum processing and good quality control measures.

Extrusion cooking

Extrusion cooking has some additional advantages, which other methods do not offer, for example a high temperature and shorter time cooking process will minimise degradation of food nutrients while improving the digestibility of protein by denaturation. In addition, during extrusion cooking most of the cells are ruptured making oil available for the animal.

The critical factor during extrusion cooking is the prevention of over- or under-processing, since either will reduce the nutritional value. A "dry" extrusion process is one in which mechanical energy from the extruder's main drive motor is the only energy used to process the soya beans.

There are objectives that have to be reached for optimally processed

extruded full fat soya beans.

Full fat soya beans are thermally processed to destroy anti-nutritional factors and to increase oil availability while preserving the nutritional quality of the protein. The major anti-nutritional factor of concern in raw soya beans is a trypsin inhibitor.

Trypsin inhibitor is a protease that is harmful to most animals and humans, and nutritionists have documented this effect conclusively. This protease enzyme can be inactivated by heat treatment. A reduction of at least 85% of the trypsin inhibitor units is considered necessary by feed technologists to avoid nutritional problems.

Moisture content

Both moist and dry extrusion are effective in the reduction of the trypsin inhibitor and urease activities. Full fat soya beans can be moist or dry extruded to destroy over 90% of the trypsin inhibitor without damaging lysine. The degree of destruction of trypsin inhibitors is influenced by the moisture content

as well as the processing time and temperature. With dry extruders the highest reduction in trypsin inhibitor activity (TIA) seems to occur at the temperature range of 150 to 160°C and a process moisture content of 9 to 11%.

Better digestion and stability

Release of intra-cellular oil and natural tocopherols (vitamin E) for better digestion and stability and to facilitate the physical extraction of the oil. The cooked full fat soya bean can then immediately enter a mechanical press where the majority of the oil is removed.

This oil can be used for other processing including bio-diesel and the production of oils that are “natural”, since they have not been through a traditional hexane extraction process. The cake can be used as a protein source for animal feeds.

This process must be conducted in a low moisture environment as added water will affect expulsion efficiency and oil stability. It is usually done with a dry extrusion system.

Increase by-pass protein

Heat treatment through extrusion increases the by-pass protein for ruminants. In dry extrusion utilising the inherited moisture in the soya beans (9 to 11%) is sufficient enough to denature the protein without affecting the primary structure or changing the optimum extrusion temperature of 150 to 160°C.

However, some processors may choose to exceed those parameters by increasing the temperature even more to assure a higher by-pass protein. This will, however, be accompanied by minor discoloration or browning of the full fat soya bean meal. The amount of denatured or by-pass protein produced during extrusion may be quantified by determining the Nitrogen Solubility Index (% NSI) of the final product.

Extrusion is a continuous process and has obvious advantages over simple batch cooking processes such as boiling or autoclaving. It is also quicker than boiling, since the beans have to be kept at boiling point for about 30 minutes to achieve reasonable levels of inhibitor destruction. The main variables associated with product quality and process efficiency as far as soya bean processing is concerned are time, temperature, moisture content and the degree of physical damage needed to render the oil content more digestible.



**THERE ARE EIGHT
MAJOR OILSEED
MEALS IN THE
WORLD. SOYA BEAN
MEAL REPRESENTS
MORE THAN 50% OF
THE TOTAL OILSEED
MEAL PRODUCTION.**

Extrusion is a readily controllable process where temperature, time (to some extent), moisture content and the degree of physical damage can all be manipulated. The net result of this is that a very high quality product can be produced when the extrusion process is properly handled.

Dry extruders generate heat and pressure mechanically as a result of the frictional and shear forces produced within the extruder barrel. Provided that adequate operating temperatures are reached (150 to 160°C), this combination of heat and pressure is sufficient to substantially denature the important anti-nutritive factors in soya beans and render the material usable in feeds.

Dry extruders

Dry extruders are single screw extruders with a segmented screw

put together around the shaft. In between the screw a restriction (steam lock, choke plate) of different diameters can be placed to increase the cook and shear. When material moves in the barrel, and comes across these restrictions, it is unable to pass through, and consequently, pressure builds up and a back flow is created.

Usually these restrictions are arranged in such a way that they increase in diameter toward the die end of the screw creating more pressure and shear as they reach the die. This build up of pressure and temperature, together with shear stresses developed, tends to plasticise (gelatinise) the raw materials into viscous paste or puffed shape, depending upon the raw material. In dry extrusion, pressure and temperature should be at a maximum just before leaving the die.

The die design and opening also plays a very important role in pressure build up. Different dies are used for different material and shapes. The cooking range in a dry extruder can be 90 to 160°C with very high pressure. As soon as the material leaves the extruder dies, pressure is instantaneously released from the products, which cause internal moisture to vaporise into steam, making the product expand.

Internal friction

In dry extrusion, whole oilseeds can be used and this type of extruder has the ability to grind the oilseeds during extrusion processing. Dry extruders capitalise their source of heat through internal friction for cooking. Therefore no external steam or heat is injected into an extruder barrel during cooking. The dry extruder can process the soya beans which have a wide range of moisture contents, from 9 to 13%.

Usually, in dry extrusion, we lose moisture in the form of steam at the exit and this moisture loss depends upon the initial start up moisture in the soya bean. The heat and pressure

generated in the extruder barrel typically raises the temperature to 150 to 160°C. This temperature and pressure is sufficient to denature the anti-nutritional factors in the soya beans and rupture the oil cells.

This can be accomplished only through optimum processing and good quality control measures. If too much heat and pressure is applied, significant damage may be done to the protein component of the soya beans, thereby reducing digestibility and availability in non-ruminants. Thus, the process must be carefully controlled to ensure sufficient heat is applied to denature anti-nutritive factors without excessive cooking, which would damage the protein component.

Method varies oil content

Since nothing is added or taken away in the full fat soya process, the gross composition of full fat soya will depend on a constant moisture basis.

The most serious variation is with the level of moisture of the beans and the percentage of impurities such as dust, straw or weed seed among others. Full fat will obviously contain the same level of oil as found in whole soya beans with a similar moisture basis.

IF TOO MUCH HEAT AND PRESSURE IS APPLIED, SIGNIFICANT DAMAGE MAY BE DONE TO THE PROTEIN COMPONENT OF THE SOYA BEANS THEREBY REDUCING DIGESTIBILITY.

The average oil content of full fat soya will be 17 to 18% if determined by the Soxhlet method using

petroleum ether. This figure will be higher if oil is determined by the acid hydrolysis method. The oil in full fat soya which is properly processed by extrusion is very stable and provides a remarkable long shelf life for such a high fat product.

The long shelf life can be explained by the fact that full fat soya contains a high level of tocopherol and lecithin (4%) that inhibits oxidation of the full fat product. At the same time during extrusion, heat will destroy the enzymes lipase and lipoxigenase which cause rancidity. If full fat soya is not processed at the proper temperature, it will show the signs of rancidity, i.e., increased peroxide value and free fatty acid level.

This is no doubt due to the incomplete destruction of lipoxidases. A moisture level above 12% will favour hydrolytic rancidity, which triggers the oxidative rancidity and mould growth. 🌱



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Bearish oilseed outlook due to LARGE GLOBAL STOCK

Since most of the South African oilseed crop has already been harvested, it is crucial to monitor the international market. As of mid-June, international traders expect that the total global production for the ten primary oilseeds will decline for the 2015/16 production season. Oil World (an independent German forecasting service for oilseeds, oils and meals) has presented a tentative forecast of 522 million tons. This represents a decrease of six million tons.

However, it must be kept in mind that the season started with a record high of 104 million tons. Another important factor to keep in mind is the 16 million ton increase in the consumption of all oilseeds. However, the record opening stock will easily offset the expected decline in production and increase in consumption, and production will yet again be greater than consumption. This means that the expected global ending stock of the ten principal oilseeds would increase by three million tons to 107,4 million tons (*Table 1*).

Table 1: World supply and demand – ten oilseeds.

	Forecast	Change
	2015/16	From 2014/15
Opening stocks	104,4	+24,8
Production	522,4	-6,4
Soya beans	314,9	-3,7
Sunflower seed	41,5	+0,4
Rapeseed	67,0	-2,0
Cottonseed	41,0	-3,7
Groundnuts	28,6	+1,6
Total supplies	626,8	+18,4
Ending stocks	107,4	+3,0
Soya beans	95,3	+4,3
Sunflower seed	2,8	+0,1

Source: Oil World

El Niño effect and the global market

In terms of soya beans, the United States (US) has ample stock from the 2014/15 season. According to the World Agricultural Supply and Demand Estimates (WASDE) June report, the stock-to-usage ratio is well above 11%, the highest since the 2006/07 production season. In mid-June, the planting conditions looked promising for the US and more than 80% of the intended hectares were already planted. The expectations are that the Chicago Board of Trade (CBOT) prices will come under pressure in the short to medium term. However, the weather conditions require some monitoring and will have an impact on the prices if there are severe crop failure conditions.

Currently, there are discussions regarding the El Niño effect, which is normally associated with above-average rainfall in the US Midwest and South America, with below-average rainfall conditions in countries such as South Africa and Australia. According to the US Climate Prediction Centre's May report, the chances of El Niño to continuing through the Northern Hemisphere summer is 90%.

In terms of canola, the Canadian prices experienced a rally in early June. This is mainly due to black frost, which destroyed enormous parts of the crop in that country. According to various sources, Canada would need to replant approximately 4-5% of the intended canola fields. This, according to Oil World, is 400 000ha. Placing further pressure on the

situation is that there is insufficient soil moisture and farmers desperately need rain in mid-June to successfully complete replanting. This progress needs to be monitored in the last two weeks of June.

In terms of groundnuts, the Argentine crop is favourable with very high production levels. The expected ending stocks for the 2014/15 production season is at 152 000 tons, which is 17 000 tons more than the previous year.

Thus if one would investigate the international market, it is clear that there are currently favourable production conditions for most of the oilseeds. If the current conditions continue as is expected, the world will once again have a high ending stock level, meaning that the prices will come under pressure. This is the main reason for international traders having a bearish outlook on prices.

South African market

One of the key factors that will have an impact on local prices, is the exchange rate. In the last year, the exchange rate has weakened by 15% and 4% relative to the American dollar and the British pound. This was mostly due to electricity shortages, account deficits, slow economic growth and poor employment rates.

However, the weakening of the rand and the drought conditions in South Africa supported local prices. This is reflected in *Table 2* and *Table 3*. Most of our oilseed crop prices declined with smaller percentages than the international prices did. Brazilian soya bean prices decreased by 30%, against a South African decrease of only 15%.

Figure 1: Rand exchange rate. (Source: South African Reserve Bank)



Figure 2: Local sunflower and soya bean prices. (Source: Safex)



Table 2: Principal oilseed prices (US\$/ton and R/ton). Table 4: Soya beans and sunflower supply and demand figures – South Africa.

Product	4 June 2015	June 2014	% change
Soya beans (US CIF Rotterdam)	388	516	-25
Soya beans (Brazil)	400	571	-30
Sunflower seed (EU)	415	449	-8
Groundnuts (US 40/50)	1 280	1 128	13
Palm oil (Malaysia)	650	793	-18
Soya oil (US)	805	912	-12
Sunflower oil (Argentina)	850	975	-13
Soya meal (Argentina)	380	553	-31
Fishmeal (Peru)	1 950	1 673	17
Rand/\$	12,35	10,7	15

Sources: South African Reserve Bank and Oil World

Table 3: Local oilseed prices.

Crop	10 June 2015	10 June 2014	% change
Sunflower	5 838	4 560	28
Derived sunflower	5 645	5 583	1
Soya beans	4 819	5 650	-15
Derived sunflower	5 925	6 474	-8
Soil canola	4 300	4 650	-8

Source: Safex and Grain SA

According to the latest Crop Estimates Committee (CEC) report (26 May 2015), the production of soya beans will be 942 850 tons on 687 300ha. This represents a yield decrease from 1,88 to 1,37t/ha year-on-year. According to the National Agricultural Marketing Council (NAMC) supply and demand estimate reports, South Africa will have an ending stock of 89 254 ton for soya beans in the 2015/16 marketing year, 25 550 tons more than the previous marketing season. In terms of sunflower seed, the production projection for 2015/16 is low (612), and this will result in increased imports from countries such as Romania and decreased local processing.

Marketing season	Soya beans	Soya beans	Sunflower seed	Sunflower seed
	Projection for 2014/15	Projection for 2015/16	Projection for 2014/15	Projection for 2015/16
	Tons		Tons	
CEC (Crop estimate)	948 000	942 850	832 000	612 400
Retention	30 000	30 000		
Supply				
Opening stock (1 March)	61 806	63 704	47 116	92 927
Product deliveries	918 000	912 850	833 165	612 400
Imports	110 000	150 000	63 180	70 000
Surplus	0	2 500	5 948	5 000
Total supply	1 089 806	1 129 054	949 409	780 327
Demand				
Processed	1 005 548	1 026 000	847 682	683 500
Withdrawn by producers	1 975	3 000	467	500
Released to end-consumers	2 886	3 000	2 799	3 000
Seed for planting purposes	5 111	5 300	3 804	3 000
Net receipts (-)/disp(+)	1 924	2 000	1 081	1 000
Deficit	2 782	0	0	0
Exports	576	500	48	100
Total demand	1 020 802	1 039 800	862 850	692 800
Closing stock (28 February)	63 704	89 254	92 927	87 527
Processed p/month	83 796	85 500	70 640	56 958
Months' stock	0,8	1,1	1,3	1,5
Days' stock	23	32	40	47

Source: NAMC

In terms of local prices, harvest pressure will start to decrease as some of the stock is being processed. Traditionally, according to standard price seasonality (Figure 2), the price will spike towards the end of the year. However, the magnitude of the price fluctuation is highly dependable on the global market and the exchange rate.

Dr Dirk Strydom is a lecturer in agricultural economics at the Faculty of Natural and Agricultural Sciences at the University of the Free State. For more information, phone him on 051 401 7036 or send an email to dstrydom@ufs.ac.za.

The competitiveness of the SOUTH AFRICAN SUNFLOWER VALUE CHAIN

The South African sunflower industry recently came under the spotlight. Whereas the soya bean and canola industries have posted rapid increases in local production and processing levels in recent years, the sunflower industry has been characterised by volatile production levels with virtually no real growth.

At the same time domestic demand for oilcake and vegetable oil has increased by approximately 40% over the past decade and the imports of seed, oil and cake have gradually been increasing to meet the rising domestic demand levels.

With more than double the amount of crushing capacity available (approximately 1.8 million tons) as the amount of sunflower seed that is produced locally (five-year average equals 650 000 tons), the question arises why the local industry cannot fill the gap of imports and increase the local level of production and processing of sunflower seed.

Competitiveness of the industry

This question automatically raises the issue of competitiveness of the industry. Based on existing crushing capacity as well as the average oilcake imports of roughly 75 000 tons and vegetable oil imports of 80 000 tons, South Africa could expand production by approximately 150 000 hectares, or

increase national yields from 1,3t/ha to 1,67t/ha to make up for this deficit in oilcake requirements.

This study did not follow the typical academic approach of calculating comparative and competitive advantages of an industry, but rather followed a pragmatic market orientated approach where key underlying fundamentals and market realities at the various nodes in the value chain are assessed.

When the competitiveness of an industry is considered, it is important to take a holistic approach since it is not only the competitiveness of sunflowers relative to other cash crops at farm level that counts, but also the competitiveness of the complete value chain relative to the global market. The sunflower seed price is derived from the cake and oil prices.

Import parity prices

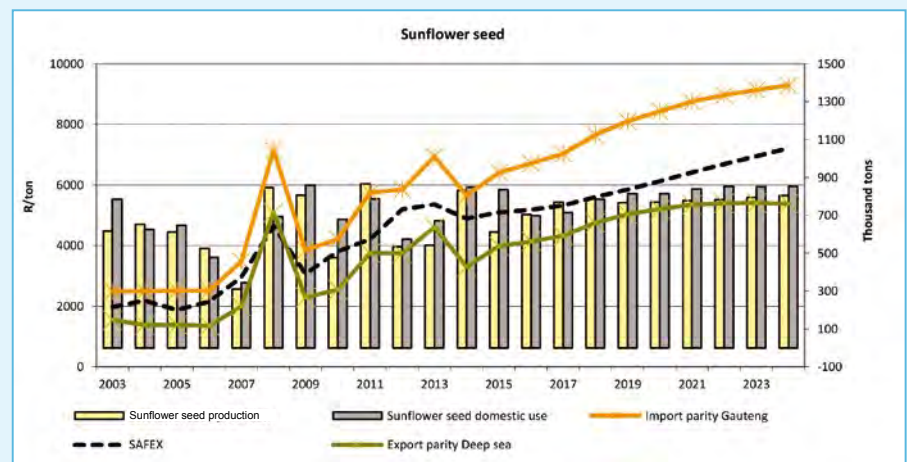
Since South Africa is a net importer of these commodities, their prices are mainly determined by the import parity prices. The competition that the local industry is facing from imported

seed, oil and cake is to some extent softened by the *ad valorem* import tariff (9,4% on seed, 6,6% on cake and 10% on oil) that is charged on the FOB (Free on Board) prices of the imported products.

Figure 1 illustrates how the local sunflower seed price (Safex) on average has traded between import and export parity levels over the past decade, basically driven by the derived price for cake and oil. It is also expected to continue trading in this relationship over the outlook period.

When a closer look is taken at the monthly price cycles, it becomes clear that in most of the years sunflower seed prices traded below the derived price for oil and cake during harvest times. Towards the end of the marketing year, however, seed prices tended to trade more in line with the derived price. Crushing plants typically attempt to secure their feedstock during the harvesting period and thereby seek to increase revenue. Producers could benefit from a more equal pricing strategy throughout the marketing season.

Figure 1: The South African sunflower seed complex.



(Source: BFAP sector model, 2014)

There is a fine balance between the price at which the South African farmer can sustainably produce a ton of sunflower and the price that crushing plants can afford to pay for the seed and still be able to compete with imported oil and cake.

Farmgate prices

To illustrate this point the farmgate prices in Argentina, a major exporter of sunflower products, was compared to the South African farmgate prices. In rand terms the average farmgate price in Argentina for the period 2010 to 2012 equalled R2 153/ton compared to the South African average farmgate price of R3 747/ton over the same period of time.

This does not automatically imply that the South African crushing plants cannot compete due to higher feedstock prices. Local processing plants can sell the oil and cake at higher price levels (import parity prices) than their Argentinian counterparts. It does, however, imply that if the industry wants to achieve real growth, local producers will have to be able to produce a ton of sunflower at lower costs (increase yields and/or reduce production costs) in order to compete with their Argentinian counterparts.

The question of competitiveness actually becomes more complex at the processing level, because the local processors do not only compete against imported sunflower oil *per se*, but rather the total vegetable oil complex, which includes palm, soya and canola oil. Figure 2 illustrates the total value of vegetable oil imports into the country since 2001. The imports of palm oil have increased to such extent, that they now make up the largest share of all vegetable oil imports.

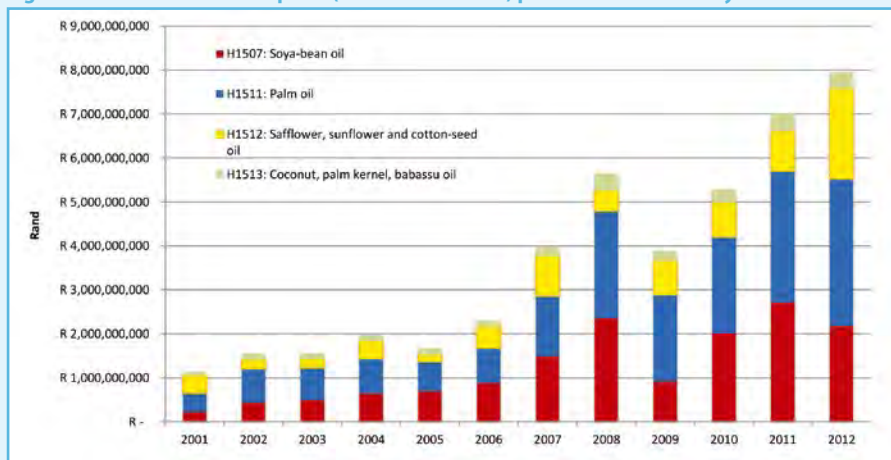
Higher yields per hectare

Palm oil has replaced sunflower and soya oil in the commercial market such as the take-away industry. It does, however, not pose a threat in the household consumption market. The challenge that the sunflower industry (and the other oilseed crops) has with

palm oil is that palm is producing much higher yields per hectare at much lower costs than any other oilseed and can thus be produced sustainably at very low prices.

PALM OIL HAS REPLACED SUNFLOWER AND SOYA OIL IN THE COMMERCIAL MARKET

Figure 2: Total value of oil imports (refined and crude) per oilseed commodity.



(Source: ITC, 2013)

In terms of pricing of sunflower seed, the study did point to the importance of ensuring the correct norm is used for the oil content of the delivered seed. Sunflower hybrids that combine genetics for high oil content and hulling characteristics are generally preferred by processors. In South Africa, premiums are not necessarily realised for a higher oil yield as is the case in countries such as the US where a 2% premium is paid for every 1% of oil content exceeding the US norm of 40%.

South Africa has no formal specification for a "norm" oil content to be delivered. The *Agricultural Products Standards Act, 1990* (Act 119 of 1990) states that FH1 grade sunflower seed delivered should be seed of a "high oil yield", thus not specifying what a high oil yield is. The industry's established norm is generally that all sunflower delivered on Safex should be above a 36% oil yield and preferably at a 38% norm. The 38% norm was also used by ITAC (2006:12) in their anti-dumping investigation of refined sunflower oil from Argentina and Brazil.

Interestingly, the SAGL (2013) reported a national sampled mean of 41,4% moisture free oil content and

17,56% seed protein content across their 121 samples of FH1 graded sunflower. The grading and pricing of sunflowers is a tricky debate since processors argue that the value of the additional oil is already captured in the Safex price. Over the past four years the Safex price traded on average 4% below the derived price calculated on an oil content of 39,5%.

Status of an ideal crop

As mentioned earlier, it is critical for the industry to achieve higher yields. From Figure 1 it is striking to note that over the outlook period only marginal growth is anticipated in the sunflower seed industry. This increase is based on small improvements in average yields over time. Over the years sunflowers have received the status of an ideal crop to grow under conditions of low-input farming and marginal cropping conditions.

Sunflowers' ability to produce relative consistent yields under adverse weather conditions and their overall characteristics of drought tolerance makes it an attractive crop for farmers in dryland production regions. Sunflowers can also produce a crop on marginal soils with very little or no additional fertiliser. In

1999 the sunflower area reached its peak when 828 000ha (Figure 3) were planted and the average yield for the complete crop came to 1,4t/ha.

At that time, South African yields were comfortably on par with the average yields obtained by the four largest sunflower producers and exporters in the world (Ukraine, Russia, EU-28, Argentina). However, as years passed, the area under production declined and South African yields did not follow the same increasing trend as was the case in the rest of the world. In fact, the five-year average yield for the top four producing countries equals 1,6t/ha compared to 1,2t/ha in South Africa.

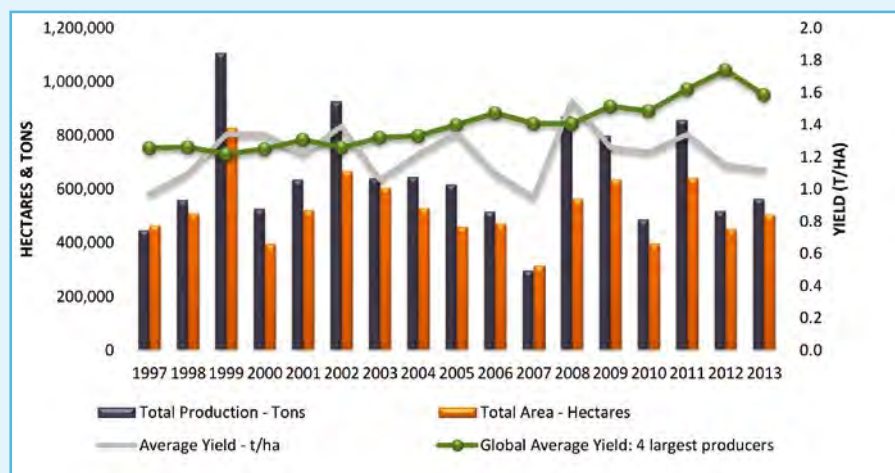
Since its peak in 1999 the area planted has followed a declining trend, with greater reductions in the North West province compared to the other production regions. The reasons for these reductions differed from one region to the next and included the adoption of new bio-tech maize cultivars with better yields, practical producer constraints, e.g. negative sentiments to the crop based on historic incidents such as poor emergence, sclerotinia, lodging, bird damage and the possible exclusion of marginal land under crop cultivation.

A “catch crop”

However, one underlying factor stood out in all production regions why farmers are reluctant to expand the area under sunflower production, namely that under ideal growing conditions or irrigation, sunflowers do not provide the same upward potential as crops such as maize and soya beans. As a consequence, many producers see the crop as a “catch crop” and preference is not given to the timing of production, i.e. optimal planting date and climatic conditions (soils might be too warm/lack of moisture, etc.).

The adverse effects of the wrong planting dates have been trailed and propagated to producers and those who have adapted to guidelines of optimal cropping practises have achieved improvement in yields. It seems as if sunflower hybrids that are

Figure 3: Productivity of the South African sunflower industry.



(Sources: SAGIS, 2014 and Oilworld, 2014)

currently available in the local market do have the genetic potential to produce higher yields that are more in line with the international trends.

UNDER IDEAL GROWING CONDITIONS OR IRRIGATION, SUNFLOWERS DO NOT PROVIDE THE SAME UPWARD POTENTIAL AS CROPS SUCH AS MAIZE AND SOYA BEANS.

This fact is underlined by the average yields obtained in the ARC-GCI yield trials across various provinces. Naturally, yield trial data will always produce higher yields on small plots compared to actual full scale production. It does, however, illustrate the yield gap that exists between the potential of the plant and the actual yields that are obtained in the field. Furthermore, the introduction of advanced Clearfield Plus sunflower breeds offers a major benefit in the management of weeds and opens the opportunity for growing sunflowers in no-till or minimum till farming systems.

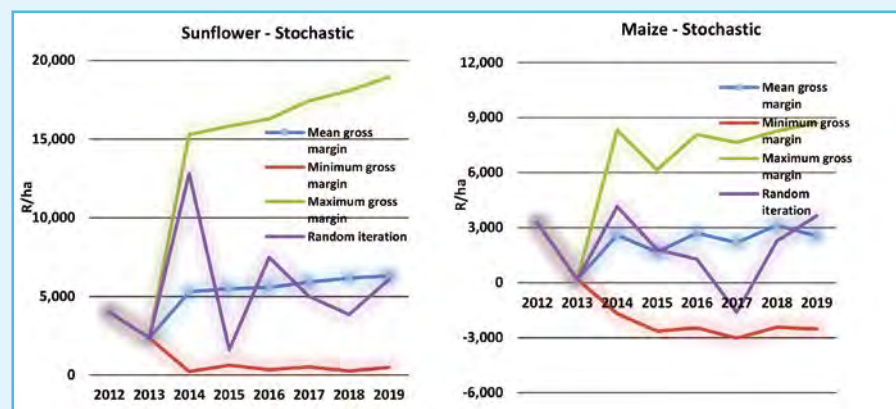
Drawing any final conclusions merely on yields is an over-simplification of a complex production system. Therefore, BFAP applied a financial simulation model (Finsim) to generate a stochastic outlook for the gross margins of a prototype maize and sunflower farm in the North-West province (Figure 4). The outlook was generated by imposing the actual historic variations in yield, costs and prices of a specific farm on to the outlook that was generated by the BFAP sector level model.

Positive gross margin

It has to be mentioned that this 1 200ha crop farm in the North-West cannot be regarded as a typical farm, as actual yields that were recorded over the survey period (2010 to 2013) exceeded the average yields of the region. This, however, stresses the point that if sunflowers are treated as a cash crop in its own right, it becomes a profitable enterprise to consider.

The results indicate that the sunflowers proved to have a higher average gross margin than maize over the long run and more importantly, whereas the potential minimum gross margin for maize turned out to be negative, the potential minimum gross margin for sunflower remained positive throughout the outlook period.

Figure 4: Stochastic evaluation of gross margins on sunflower versus maize production in the North-West.



(Source: BFAP, 2013)

To conclude, the South African sunflower industry seems to be delicately balanced. Without a structural break in the average yields that are achieved by producers, it is unlikely that producers will be incentivised to expand production in order for the local industry to fill the gap in the market that is currently

taken up by imported products.

As it stands, it is not in the interest of the local crushing plants to produce a surplus of cake or oil, since prices of these products will decline by approximately 25% if a surplus is produced. Prices will move from import parity to export parity levels. Under this scenario, crushers will pass

on the drop in prices to producers and if yields do not rise sharply to make up for the loss in income due to lower prices, producers will simply have to reduce the area under production of sunflowers in order to push prices higher.

Lastly, there are niche options that can be developed like the high-oleic markets that have been expanding in Europe, but it will take a concerted effort to develop these markets. It is important to note that a number of issues related to the competitiveness of the sunflower value chain were not discussed in this article. For example, the nature of the value chain between the processors and the retailers where probably the toughest price negotiations are taking place.

The article shows highlights of a study by the Bureau for Food and Agricultural Policy (BFAP), funded by the Oilseed Advisory Committee (OAC). 🌱



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Symposium

Theme:

Weed control

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21 July 2015 –

Delmas showgrounds

23 July 2015 –

Nampo Park, Bothaville

Programme:

Opening by master of ceremonies	Mr Gerhard Scholtemeijer – Chairman PRF	09:00 – 09:20
Keynote speakers	Prof Stevan Knezevic University of Nebraska, USA <i>The effect of weed competition on soya bean yield</i>	09:20 – 10:20
	Prof Charlie Reinhardt Dean: Villa Academy at the University of Pretoria <i>Soya bean herbicides, their mode of action and the control of resistance plants</i>	10:20 – 11:10
	Break	11:10 – 11:40
	Dr Brian de Villiers Villa Crop Protection <i>Water quality, additives and general practices for better weed control</i>	11:40 – 12:20
	Mr Cobus van Collier Farmer from Viljoenskroon Practical aspects of weed control in soya beans	12:20 – 13:00
	Panel discussion and closing	13:00 – 14:00
	Lunch	14:00 – 15:00

Dr Brian de Villiers – Villa Crop Protection

Over many years Dr De Villiers has conducted ground-breaking research on water quality and its influence on the efficiency of herbicides. He has also become a specialist on the efficiency of additives.

From a producer and adviser's viewpoint, it is necessary that everything possible is done to make weed control more effective, not only to reduce costs but also to protect the environment.

The basic aspects of effective weed control, such as nozzles, spray speed and the role of wind, will be discussed. Water volume also plays a large role in the effective application of herbicides. This aspect will be discussed in more detail.

Symposium attendees will have a clear picture of why the choice of a herbicide represents only part of the solution for effective weed control.

Prof Stevan Z Knezevic – University of Nebraska

Prof Knezevic is a global expert on weed control. At the symposium he will especially focus on the yield-reducing influence that weeds have on soya bean production. In his extensive research he has studied the yield that is forfeited as weed control is delayed. Similar quantitative work has not yet been undertaken on soya bean production in South Africa.

Although US research results may differ from what is applicable to South Africa due to a difference in weed composition, the principles of weed control will remain relevant. There are thus many lessons to be learnt from the American experience.

Soya bean producers and advisors will gain decidedly new perspectives on the influence of weed control and the timing of weed control in soya bean production.

Dr Charlie Reinhardt, honorary professor in weed control and dean of Villa Academy, University of Pretoria

Professor Reinhardt is a well-known expert in the field of weed science in South Africa. His wide knowledge of the field puts him into regular contact with the private sector and farmers. In addition to his academic research, he regularly consults role-players in the field.

At the symposium he will discuss the spectrum of herbicides that is available for soya beans, as well as resistance that may develop in weeds and how it can be dealt with. He will share with the audience some insights gained from his extensive knowledge of harmful weed excretions (allelopathy).

After this lecture, symposium attendees will have a better picture of what is available in terms of weed control and how obstacles can be avoided.

Kobus van Collier – farmer from Viljoenskroon

Weed control affects all soya bean producers. It is thus necessary to gain perspective on how a producer can handle weed control in practice. What are the challenges to effectively apply weed control in real farming conditions?

Mr Van Collier has had to overcome many challenges in effective weed control, with soya bean being a relatively new crop on the sandy soils of the Viljoenskroon district.

More information

Yvette Papadimitropoulos
011 803 2579 or email admin@proteinresearch.net

Dispensation for a new method of SOYA BEAN GRADING

By Mariana Purnell, Agbiz Grain

A new dispensation on the grading of soya beans for the 2015 season has been granted by the Directorate of Food Safety and Quality Assurance of the Department of Agriculture, Forestry and Fisheries (DAFF), following a request by Agbiz Grain members.

The dispensation approves a new method of grading that allows for a more objective and scientific manner to grade soya beans which is relevant to the new regulations for grading soya beans on a clean basis, as published by DAFF in June 2014. It is also faster, more accurate and less tedious for the grain grader, without compromising the position of either producers or agribusiness role-players in the value chain.

The method involves the use of two sieves during grading instead of just the usual 4,74mm round-hole sieve. Agbiz Grain members and other role-players in the soya bean industry may start using the new double sieve grading method immediately and for the duration of the 2015 season.

Preliminary tests were done by Agbiz Grain and industry specialists to evaluate the effectiveness of this method prior to requesting the dispensation. More work will be done later in the year before a request is made to DAFF to change the soya bean grading regulation.

Inspection methods

- A 1,8mm slotted sieve should be used in combination with the 4,75mm round-hole sieve for the determination of foreign matter in soya beans.
- The number of sieve strokes must be increased from 20 to 30 and



the prescribed 30 strokes must be completed within 30 to 35 seconds.

- All matter other than soya beans, loose seed coats and pods of soya beans as well as glass, coal, manure, sclerotinia and metal that pass through the 1,8mm slotted sieve during the sieving process is considered foreign matter.

The grading table

- The maximum percentage foreign matter is increased from 4 to 5%.
- The combination of foreign matter and sclerotinia is increased from 6 to 7%.

Definitions

The 1,8mm slotted sieve, which has also been used for the grading of wheat, sunflower seed and sorghum, will also be used in combination with the 4,75mm round-hole sieve for the detection of foreign matter.

A 1,8mm slotted sieve is a sieve:

- With a flat bottom of metal sheet of 1mm thickness with apertures 12,7mm long and 1,8mm wide with rounded ends. The spacing between the slots in the same row must be 2,43mm wide and the spacing between the rows of slots must be 2mm wide. The slots must

be alternately orientated with a slot always opposite the solid inter segment of the next row of slots.

- Of which the upper surface of the sieve is smooth;
- With a round frame of suitable material with an inner diameter of between 300 and 310mm maximum and at least 50mm high;
- That fits onto a tray with a solid bottom and must be at least 20mm above the bottom of the tray.

Foreign matter

The definition of foreign matter must also be amended to include the material that passes through the 1,8mm slotted sieve. Foreign matter means:

- All matter that pass through the 1,8mm slotted sieve during the sieving process.
- All matter that do not pass through the 1,8mm slotted sieve other than soya beans, glass, coal, manure, sclerotinia or metal and loose seed coats of soya beans as well as pods.

Inspection methods

An amendment of inspection methods is necessary to reflect the amendments in the detection of foreign matter and soya beans and

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pieces of soya beans that pass through the 4,75mm round-hole sieve. The number of strokes must be increased from 20 to 30 to be certain that all matter smaller than 1,8mm has the opportunity to pass through the sieve.

The percentage of other grain, sunflower seed, stones, sclerotinia and foreign matter in a consignment of soya beans shall be determined as follows:

- Obtain working samples of at least 200g from a representative sample of the consignment.
- Place the 1,8mm slotted sieve in the pan and the 4,75mm round-hole sieve on top of the 1,8mm slotted sieve. Place the sample on the 4,75mm round-hole sieve and screen the sample by moving the sieve 30 strokes to and fro, alternately away from and towards the operator of the sieve, in the same direction as the long axis of the slots of the 1,8mm sieve. Move the sieve, which rests on a table or other suitable smooth surface, 250 to 460mm away from and towards the operator with each stroke. The prescribed 30 strokes must be completed within 30 to 35 seconds, provided that the screening process may also be performed in some or other container or an automatic sieving apparatus.
- Remove the foreign matter from both sieves by hand and add it to the foreign matter below the 1,8mm sieve in the pan and determine the mass of the foreign matter. Remove all other grain, sunflower seed, stones and sclerotinia by hand from the working samples and determine the mass of the other grain, sunflower, seed, stones and sclerotinia separately.
- Express the respective masses thus determined as a percentage of the mass of the working sample concerned.
- Such percentage represents different percentages of other grain, sunflower seed, stones, sclerotinia and foreign matter in the consignment concerned.

The percentage of soya beans and pieces of soya beans which pass through the 4,75mm round-hole sieve shall be determined as follows:

- Determine the mass of the soya beans and pieces of soya beans that pass through the 4,75mm round-hole sieve and remain on top of the 1,8mm slotted sieve. The mass of other grain, sunflower seed, stones, sclerotinia and foreign matter that have been removed, is expressed as a percentage of the mass of the working sample.
- Such percentage represents the percentage soya beans and pieces of soya beans in the consignment which passes through the 4,75mm round-hole sieve and not through a 1,8mm slotted sieve.

Defective soya beans

The percentage of defective soya beans shall be determined as follows:

- Obtain a working sample of at least 100g soya beans that remained on top of the 4,75mm round-hole sieve after the sieving action, which is free of other grain, sunflower seed, stones, sclerotinia and foreign matter, from the representative sample of the consignment.
- Sort the soya beans on the 4,75mm round-hole sieve so that the defective soya beans are

retained.

- Determine the mass of the defective soya beans on the 4,75mm round-hole sieve and express it as a percentage of the mass of the working sample concerned.
- Such percentage represents the percentage of defective soya beans in the consignment.

Percentage of soiled beans

The percentage of soiled soya beans in a consignment of soya beans shall be determined as follows:

- Remove all soiled soya beans from the working sample by hand and determine the mass thereof.
- Express the mass thus determined as a percentage of the mass of the working sample obtained.
- Such percentage represents the percentage of soiled soya beans in the consignment concerned.

Grading table

Amendments to the grading table (Table 1) must also be done in the light of the additional material that passes through the 1,8mm slotted sieve that has become part of the foreign matter. The maximum percentage foreign matter is increased from 4 to 5%. As a result, the combination of foreign matter and sclerotinia is increased from 6 to 7%. 🌱

Table 1: Standards for grades of soya beans according to the new dispensation.

Nature of deviation	Maximum percentage permissible deviation (m/m)
	Grade SB1
1	2
Wet pods	0,2
Foreign matter, including stones, other grain, sunflower seed and stones, provided that such deviations are individually within the limits specified	5
Other grain	0,5
Sunflower seed	0,1
Stones	1
Sclerotinia	4
Soya beans and parts of soya beans above the 1,8mm slotted screen which pass through the 4,75mm round hole screen	10
Defective soya beans on the 4,75mm round hole screen	10
Soiled soya beans	10
Deviations in foreign matter and sclerotinia collectively, provided that such deviations are individually within the limits of said items	7

Unclear transport regulations can cause headaches

(Press release issued by Santam Agriculture)

The Department of Transport recently introduced amendments to the National Road Traffic Regulations for goods-in-transit, which could have far-reaching consequences for the agricultural transport industry – including a requirement that goods-in-transit be “fully insured”.

In terms of the amendments which became effective on 31 January this year, transport operators now need to provide written evidence that both vehicles and goods to be transported on a public road are insured “for damages that can occur as the result of an incident”. The insurance must be taken out either by the “consignor” (the person dispatching more than 500 tons of goods per month by road) or the “consignee” (the person receiving such goods).

“If a transport operator cannot produce the required evidence of insurance, the consignor and consignee are obliged not to transport or accept goods respectively. However, it is not very clear what ‘fully insured’ means, since there are various risks involved with the transportation of goods,” says Gerhard Diedericks, head of Santam Agriculture.

Expert advice

“For example, a road accident can cause damage to the carrying vehicle, goods, road infrastructure, vehicles driven by other road users, or pedestrians. An accident can give rise to indirect damages, such as economic losses caused by the delivery delay of the cargo. The list is endless and not every possible loss can be insured.

“It is advisable to consult with insurance providers on what their standard policies cover, for instance Santam’s transport policy provides standard environmental impairment liability cover for goods-in-transit. This includes costs incurred by the policyholder for the clean-up and remedial procedures to remove or repair the effects of spillage or leakage of any substance carried on or by the insured vehicle, in the custody and control of the insured,” adds Diedericks.

The largest insurance claim processed by Santam’s heavy commercial division was in 2014 for a hefty sum of over R1 million – for goods only. Santam paid out a total of 1 504 goods-in-transit related claims to the value of more than R54 million from January to December 2014. The type of goods that are typically insured by Santam in this category, include any commodity type of goods, including household stock, perishables, livestock, hazardous goods, agricultural goods and equipment, vehicles, earth moving equipment, information technology products and industrial machinery.

Diedericks says the regulations do not stipulate who is responsible for which insurance, what the consignee is responsible for and what insurance must be taken out by the consignor. “We recommend that the carrier and the consignor should procure the cover reasonably required by the circumstances. A cargo owner should have goods-in-transit insurance, while the carrier should take out carrier’s liability and motor vehicle insurance.”



Gerhard Diedericks, head of Santam Agriculture.

Entering into a contract

Other amendments to the regulations require the transport operator to be in possession of a written declaration, outlining the nature and quantity of the goods to be transported. It should also include a written agreement between the consignor and the operator, stipulating loading instructions and the parties’ responsibilities.

Furthermore, the regulations now prohibit a consignee or consignor from concluding a contract with an operator if the vehicle is overloaded in terms of the *National Roads Traffic Act*. The consignor is obliged to keep record of the mass of every load transported from his premises, which must be made available to a traffic officer if requested.

“Complying with all these new amendments may be challenging to road hauliers and consignors, especially when it is unclear who is responsible for what. Current agreements and policies may need to be revised to take into account their effects, and we recommend consulting a professional adviser to ensure that the appropriate cover is in place and to ensure compliance,” Diedericks concludes.

For more information, contact Margot Gutteridge on 021 469 1572 or 084 296 2689, or email margot@atmosphere.co.za. 

Factors influencing the PROTEIN AND OIL CONTENT of soya beans

By Prof Rob Gous



Soya bean, *Glycine max* (L.) Merr., contains about 200g of oil and 400g protein/kg seed dry matter. It is the major oilseed and protein crop in many regions of the world, providing approximately 60% of the world supply of vegetable protein. For both animal feed and human food utilisation, a high and stable seed protein content is desirable.

In South Africa, the soya bean industry is growing rapidly, with many first-time producers realising the benefits of this crop. However, in order to ensure that the local crop is acceptable to animal feed producers, it is essential that the protein and oil contents of the seeds produced are close to the quantities expected. A number of factors are known to influence the content of protein and oil in soya bean seeds, and these are described below.

The factors can be divided into those associated with the plant, the soil, the climate/environment and with the rhizobia involved in nitrogen fixation.

Plant factors

There are no differences in protein content among seeds within the

same pod, but seed protein content has been shown to increase linearly from the lowest to the highest fruiting node of both normal and high-protein strains of soya bean (Escalante and Wilcox, 1993). The increase is from 344 to 432g/kg for normal and 420 to 509g/kg for high-protein genotypes. This increase in protein content is observed in both determinate and indeterminate varieties. The greatest range in protein within plants has been reported to be from 349 to 510g/kg for indeterminate and from 340 to 487g/kg for determinate plants.

The oil content of soya beans is somewhat different. It also varies with pod position on the plant and on the raceme (flower-bearing branches), but in this case the position of the seed in the pod also causes variation in oil content. Seeds from the lower half of plants are on average 5g/kg higher in oil than those from the upper half; beans near the tip of long, terminal racemes have less oil than those further down; and seeds in the tip of the pod have the highest oil content (Collins and Carter, 1956).

If an accurate determination is to be made of the oil and protein content of individual plants, the analysis of seed samples, representative of the

entire plant, is essential.

Genetic variation in seed protein content is considerable, thus plant geneticists have the potential to increase protein content by selection. However, there is an inverse relationship between seed yield and seed protein content, especially in indeterminate types. This is true even though the seed protein and oil contents from determinate and indeterminate plant types are similar. Determinate varieties, therefore, appear to have a better potential to combine high seed yield with high seed protein than indeterminate varieties (Wilcox and Guodong, 1997).

Soil/fertilisation factors

Soya beans obtain nitrogen (N) from the soil and from symbiotic fixation, when nodulated with effective strains of rhizobia. These two sources of N may need to be supplemented with fertiliser N for maximum seed yield.

In an analysis of 637 data sets published between 1966 and 2006, Salvagiotti *et al* (2008) demonstrated that, on average, 50 to 60% of the soya bean N demand was met by biological N₂ fixation. In most instances, the amount of fixed N was not sufficient to replace the N removed from the

field in harvested seed. Soya bean yield was more likely to respond to N fertilisation in high-yield (>4,5tons/ha) environments.

A negative exponential relationship was observed between N fertiliser rate and N₂ fixation, when N was applied on the surface or incorporated in the topmost soil layers. Deep placement of slow-release fertiliser below the nodulation zone, or late N applications during reproductive stages, may be promising alternatives for achieving a yield response to N fertilisation in high-yielding environments.

Sugimoto *et al* (2001) reported a positive correlation between the contents of protein and oil in seeds from nodulated soya bean plants. Seeds from nodulated plants grown on urea-treated soil exhibited higher protein and lower oil contents than those from plants grown on soil treated with coated slow-release N fertiliser (LP-100). The contents of

these compounds, in seeds from nodulated plants grown on LP-100 soil, were almost the same as those from non-nodulated plants on the same soil. These observations indicate that N economy in roots during seed maturation affects the contents of storage compounds.

Mineral N absorption

Yield has been shown to be directly related to mineral N absorption in the first stages of the reproductive growth period (R2) and to high N₂ fixation rates at stage R6, whereas seed protein content was related to N₂ fixation efficiency during the reproductive growth period until late stages (R2 – R6 + 10d). N is therefore utilised independently for yield and for seed protein content (Fabre and Planchon, 2001).

Ham *et al* (1975) measured the responses to three readily available fertilisers (ammonium nitrate, urea, and urea plus sulphur) and two slow-release fertilisers (S-coated urea and urea formaldehyde), which were mixed into the top 20cm of soil before planting. One non-nodulating and two nodulating soya bean lines were used.

The response to N fertiliser was greater with the non-nodulating line than with the other two lines. Nitrogen fertilisation increased seed yield, weight per seed, seed protein percentage and kilogram of protein per hectare. Plant height and lodging were either increased or unaffected, depending upon locations and/or year. Seed oil percentage

decreased following N fertilisation. However, the total oil production usually increased due to larger yields.

All sources of fertiliser decreased N₂ fixation, plant nodule weight, nodule number and weight per nodule. Increases in seed yield and/or seed protein percentage, in the nodulating lines, suggest that N₂ fixation failed to supply the amounts of N essential for maximum seed yield and/or protein percentage.

Inoculated seed

In the experiment above, sulphur (S) fertiliser increased seed yield in one case and decreased it in two other cases, depending on location and year. The total S percentage and S-containing amino acids of the seed were not increased with S additions.

In a pot experiment and with seeds inoculated with *Bradyrhizobium* inoculum before sowing, Morshed *et al* (2008) found that N application progressively and significantly increased the yield of soya bean up to the N rate of 26,5kg/ha, where the highest seed yield of 6,85g per plant was obtained. Nutrient uptake and protein content in seeds also increased with increasing levels of N (up to the same rate of 26,5kg N/ha).

A trial conducted in Canada, in which the effects of N fertilisation on yield and protein content were measured, demonstrated that the benefits of N fertilisation depend critically on whether the soya bean seeds have been effectively inoculated prior to planting. The use of an inoculant promoted root nodule formation, enabling the soya bean crop to fix its own N throughout the growing season, leading to high yield and quality at harvest.

However, in non-inoculated treatments it was apparent that 112kg N/ha as fertiliser or manure was insufficient to meet soya bean needs, since crops ripened prematurely and produced lower yield and seed protein. Where seeds were inoculated,



The oil content of soya beans vary with pod position on the plant and on the flower-bearing branches. (Photograph: news.uga.edu)

high soil N may have inhibited nodulation by the root, leaving the crop dependent on soil N supply to meet needs throughout the growing season.

These results suggest that high levels of soil N reduce soya bean yield and quality, and that high soil N from fertilisation tends to cause increased vegetative growth, increased lodging and lower yield and protein content. The effects are likely due to reduced root nodulation, which is required for full season N supply to the crop. This has implications for nutrient management, suggesting that the application of N fertiliser or manure – on soya bean fields where the seeds have been effectively inoculated – is an inefficient use of this fertiliser and may adversely affect the crop.

Nitrogen fixation

Nitrogen fixation by soya beans provides N nutrition in a highly sustainable and economically competitive way and, most importantly, increases the seeds' protein content. N fixation by soya beans may be limited by various environmental conditions. Thus, there exists the need to optimise symbiotic fixation through agronomic and plant-breeding research.

In two experiments conducted in Australia by Pritchard and Cesari (1996), N fertiliser had no significant effect on protein content at one of the sites, indicating that nodules alone were able to maintain both protein content and seed yield, at this site where the previous soya bean crop had been inoculated. At the second site, where soya beans had not been grown previously, mean protein content (39,0%) under flood irrigation was somewhat lower (41,7%) than at the other site, indicating a possible



Soya bean producers have only a limited capacity to influence the oil and protein contents of seeds.

benefit of higher rhizobia populations in soils with a soya bean history.

Apparently poor nodulation is not uncommon on fields where soya beans have been planted for the first time. Some of the reasons for this include a lack of viable bacteria having been placed on the seed, possibly due to improper storage of the product; the inoculant might not have stuck to the seed or was added unevenly; or there was a problem with plant infection. Excess nitrate, present in the soil at planting time, will also inhibit infection. If there is excess N in the soil, the plant will first use this nitrogen before allowing proper nodules to form.

In fields with a history of soya beans, the nodules can form later, but in first-time fields the opportunity may be missed. The roots may have grown past the point where the inoculant was placed, or the bacteria may have died due to dry conditions. This may be the reason why old forage fields sometimes have nodulation failures when first seeded with beans.

Delayed root infection

The initial high N level in the field may cause delayed root infection. For fields with a history of soya beans, the bacteria will survive for many years in most soils, once introduced. However, poor nodulation can occur even in an established field if the soil has a low pH or is sandy, if there is excess nitrate in the soil or if it is very dry.

Rhizobial inoculants can only

improve yields when the legume crops do not have enough N. Inoculants will not solve additional problems, such as a lack of other soil nutrients (see below). N already present in the soil or left over from earlier fertiliser applications may reduce the

N fixation and inoculation benefit. When there are already many rhizobia present in the soil that can stimulate effective N fixation, inoculation may not provide much further benefit.

For proper nodulation to occur, a relatively high number of rhizobia must be present in the soil. Soya bean plants secrete chemical signals (flavonoids) into the soil from the roots. These signals are detected by the bacteria, which in turn send a chemical signal back to the root to then elicit nodulation in the plant.

Factors that influence nodulation, nodular growth and nitrogen fixation include excessive or insufficient moisture, soil temperature, soil pH, diseases, organic matter and soil nitrate availability, as well as the rhizobial quality and bacterial strain in the soil. N fixation in soya beans is highly susceptible to soil drying, being more susceptible to water-deficit stress than any other physiological processes in the plant. This may partially explain why soya beans do poorly in dry years, when compared to other crops.

Soya beans generally do not respond to pre-plant N fertilisation, but there are a few exceptions, including poorly drained soils, low organic matter, low residual N, acidic soils and dry conditions.

Soil trace minerals

The efficiency of the process of N fixation in soya beans can be limited by micronutrient deficiencies,

especially of molybdenum (Mo). Soya beans generally respond positively to fertilisation with Mo in soils of low fertility and in fertile soils, depleted of Mo due to long-term cropping. Seeds enriched with Mo could be a viable alternative to exterior seed treatment, because certain forms of Mo have been shown to be toxic to rhizobium when applied to seed at the time of inoculation.

Severe manganese (Mn) deficiency (less than 15ppm Mn in the leaves) has been shown to increase seed protein percentage and decrease seed oil percentage. Interestingly enough, seed from plants with extremely low leaf Mn levels contains higher percentages of linoleic, palmitic, linolenic and stearic acids, and a lower percentage of oleic acid. The percentages of seed protein, seed oil, and fatty acids changed markedly at low leaf Mn levels, but remained relatively constant above leaf Mn concentrations of 15 to 20ppm. Amino acid content in seed protein is relatively unaffected by Mn.

Locality and climate

Vollmann *et al* (2000) reports that the protein content of soya beans grown in the northern regions of the world is reduced, owing to climatic conditions such as low temperatures and high volumes of precipitation. In the United States, seed protein content in the Western and Eastern Corn Belt has been lower than in southern production regions over a number of seasons.

Similarly, protein content is reported to be low in the northern locations of Northeast China and in the northern sites of Europe, where large seasonal variations are observed in protein content. Apart from other findings, it was recently discovered that low root-zone temperatures reduce nitrogen fixation, which might explain the low protein content commonly found in northern areas of soya bean cultivation.

In their investigation, seed protein

content was the highest for soya bean crops grown under moderately dry conditions and a high temperature during the seed-filling period. In experiments on stress during the seed-filling period, both drought and high-air temperature conditions enhanced the protein content by approximately 30 to 50g/kg, whereas oil content and grain yield were reduced.

At constant water-supply levels, both protein and oil contents were increased at a high temperature and fatty acid composition was most affected by temperature, whereas amino acid composition was stable. In other investigations dealing with water stress and irrigation of early maturing soya beans, the importance of timing the irrigation was emphasised. The protein content was highest with irrigation after the flowering stage, whereas it was lower with continuous water supply. This might be due to higher yield levels or higher oil content at optimum levels of water supply, which would dilute a given amount of protein.

Environmental conditions

After observing the variation in seed protein content of early

maturing soya beans grown in Central Europe, their conclusion was that environmental conditions, i.e. both seasonal and location effects, can modify seed protein content considerably. Low protein content may be due to insufficient nitrogen fixation in cool seasons or to high levels of precipitation and a low temperature during the seed-filling period.

Karr-Lilienthal *et al* (2004) obtained soya beans from five leading soya bean-producing countries (Argentina, Brazil, China, India and the United States), which had been imported to the United States and processed into soya bean meal (SBM) under uniform conditions. Soya beans from China had the highest crude protein content, while soya beans – and the resultant soya bean meal – from Argentina had the lowest.

In *Table 1* the chemical composition of the soya bean samples is given (two from India, a low- and a high-protein sample) and then again after processing under standard conditions. It is interesting to note the very low protein content of the Argentinian soya beans (32,6%).

Table 1: Chemical composition of an individual sample of soya beans from five geographic locations, and of soya bean meals prepared from those produced in different regions, but processed under uniform conditions in the United States (from Karr-Lilienthal *et al*, 2004).

Soya bean source						
	Argentina	Brazil	China	India		USA
				Low	High	
Soya bean composition						
DM (%)	91,0	90,5	90,6	93,2	91,9	90,1
Crude protein*	32,6	39,3	44,9	37,5	39,6	37,1
Fat*	14,1	13,6	12,9	13,1	12,8	15,1
Soya bean oilcake composition						
Crude protein*	47,4	57,0	58,5	54,6	57,8	53,2
Fat*	4,4	4,4	4,6	5,6	2,9	4,1

* On a dry-matter basis.

Maestri *et al* (1999), while working in Argentina, identified a trend towards lower protein content as latitude increased and a negative correlation between latitude and oil content. Also, altitude above mean sea level correlated positively with protein and oil contents and oleic acid percentage, while a negative correlation between altitude and linoleic acid was found.

Fatty acid composition has been shown to be strongly affected by temperature. Linolenic and linoleic acids decreased markedly, whereas oleic acid increased as temperature increased; palmitic and stearic acids, however, remained unchanged (Wolf *et al*, 1982). Oil content was positively correlated with temperature and protein content increased at the highest temperature.

Piper and Boote (1999) summarised a large data set, in which the temperature effects on protein and oil content of soya beans were measured. Oil content increased along with increasing temperature, with an optimum at 25 to 28°C above which the oil concentration declined. The protein concentration was either constant or only slightly increased with decreasing mean temperature below 28°C.

At temperatures greater than 28°C, protein concentration increased linearly with temperature. In addition to temperature, shortening day length may enhance the protein concentration by increasing the rate of nitrogen translocation to the seed and seed growth rate.

Water as a contributing factor

Sionit and Kramer (1977) studied the effects of controlled water stress on yield, applied at various stages of development and on two varieties of soya bean. Plants stressed during flower induction and flowering produced fewer flowers, pods and seeds than controls, because of a shortened flowering period and abortion of some flowers.

Stress during early pod formation caused the greatest reduction in the number of pods and seeds at harvest. However, yield – as measured by seed weight – was reduced most by

stress during early formation and pod filling. However, water stress did not materially affect the oil or protein content of the seeds at any stage of growth.

Dornbos and Mullen (1992) studied the effect of environmental stress during soya bean seed fill on the chemical composition of the seed, which is known to reduce yield, viability and vigour. Across experiments, severe drought increased the protein content by 4,4%, while the oil content decreased by 2,9%. As drought stress increased, the protein content increased and the oil content decreased linearly at each ambient temperature.

FATTY ACID COMPOSITION HAS BEEN SHOWN TO BE STRONGLY AFFECTED BY TEMPERATURE.

Drought stress

Seeds from plants exposed to 35°C during seed fill, contained 4% more protein and 2,6% less oil than those exposed to 29°C, when averaged across drought stress levels. Drought had little effect on the fatty acid composition of the oil, but high ambient temperatures reduced the proportion of the polyunsaturated components.

A meta-analysis of published data reported by Rotundo and Westgate (2009) showed that water stress reduces the content (mg per seed) of protein, oil and residual seed fractions. Protein accumulation, however, was less affected than oil and residual accumulation, resulting in an increase in final protein concentration (percentage dry weight). Growth at a high temperature also increased protein concentration in a manner similar to that observed with water stress. However, in neither case was the increase in protein concentration due to an increase in protein synthesis.

It is important to note that although

the seed protein concentration increased during drought, the actual yield of protein was less. It is of key importance to the industry to maximise the yield of soya bean oil and protein per hectare, not necessarily the percentage of these components in the seed.

Agronomic practices

Delaying the planting date: The protein content of soya bean seeds can be increased by delaying the planting date. Helms *et al* (1990) conducted a study to determine if the gross value per hectare was increased sufficiently – due to the increased protein content, resulting from a delay in sowing date – to offset the decreased oil content and seed yield economically. By delaying sowing by five weeks, the seed protein content increased from 34,1 to 34,9%, but the oil content and seed yield decreased from 18,9 to 17,9% and 2,95 to 2,17tons/ha, respectively. The increased value due to a higher protein content did not compensate economically for the decreased oil content and yield from late sowing.

Plant density: Boroomandan *et al* (2009) applied three levels of plant density (15, 30 and 45 plants/m²). Yield increased significantly (with 528kg/ha) as density increased from 30 to 45 plants/m², but seed protein was unaffected.

Since factors such as longitude, altitude, environmental temperature (heat units) and rainfall play major roles in determining the quality of seeds produced, it is apparent that soya bean producers have only a limited capacity to influence the oil and protein contents of seeds. Nevertheless, seed inoculation prior to planting, the judicious application of N and micro-elements such as Mo and Mg, and the choice of variety and planting time are managed by the farmer. These factors can make a difference and contribute to the quality and yield of soya beans, as indicated above.

More information and references are available from Prof Gous at gous@ukzn.ac.za. 📧

Canola meal in DAIRY CATTLE DIETS

This article contains extracts from the Canola Council of Canada's website, www.canolacouncil.org, edited by Rex Newkirk of the Canadian International Grain Institute.

Canola meal is widely used in beef and dairy cattle feed and is considered to be a premium ingredient due to its high palatability and high-quality protein for milk production.

Canola meal is a highly palatable source of protein for ruminant animals. Spomdy and Asberg (2006) examined the relative palatability of common protein sources by comparing eating rate and preference in heifers. When fed a mash diet, heifers consumed 221g of canola meal in the first three minutes, while those fed soya bean meal only consumed 96g, demonstrating the highly palatable nature of canola meal. The reasons for the high degree of palatability are unknown, but may be related to the high sucrose content.

When feeding canola meal, it is important to ensure the meal is derived from modern, low-glucosinolate varieties. Some regions such as China and India still produce rapeseed and mustard with relatively high levels of glucosinolates, which can reduce feed intake. Ravichandiran *et al* (2008) examined the impact of feeding rapeseed or mustard meals with varying levels of residual glucosinolates to five-month-old calves.

Calves receiving a concentrate containing low-glucosinolate canola meal (<20µmol/g) consumed the same quantity as the control group without canola meal (1,10 vs 1,08kg, respectively). However, calves fed a concentrate containing high-glucosinolate mustard meal (>100µmol/g) only consumed 0,76kg).

Table 1: Summary of the effective rumen degradability of canola meal dry matter and protein fractions (rumen outflow rate of 5%/h).

	Effective rumen degradability (%)	
	Dry matter	Crude protein
Ha and Kennelly (1984)		
Trial 1	57,1	68,5
Trial 2	57,1	65,5
Kirkpatrick and Kennelly (1987)		
Trial 1	63,0	63,2
Trial 2	64,2	72,0
Kendall <i>et al</i> (1991)	53,5	51,5
Cheng <i>et al</i> (1993)		
Trial 1 (Hay diet)	-	74,9
Trial 2 (Straw diet)	-	72,3
Trial 3 (Grain diet)	-	62,5
Piepenbrink and Schingoethe (1998)	65,1	53,1
Woods <i>et al</i> (2003)	60,5	66,7
Sadeghi and Shawrang (2006)		
2%/hr passage rate	78,1	79,3
5%/hr passage rate	66,5	65,2
10%/hr passage rate	59,5	56,9

Rumen degradability

The rumen degradability of canola meal protein has been studied extensively. *Table 1* provides a summary of the effective degradability of the dry matter and crude protein fractions of canola meal, assuming a rumen turnover rate of 5%/h. Ha and Kennelly (1984) reported that the effective degradability of canola meal protein was 65,8%. Effective

degradability of soya bean meal and dehydrated alfalfa were 53,6% and 41,4% respectively.

Kendall *et al* (1991) found that the effective degradability of canola meal averaged 51,5%, compared to 59,1% for soya bean meal. Woods *et al* (2003) reported that the effective degradability of canola meal protein was 66,8%, while cottonseed meal was 73,7%, soya bean meal 73,8% and

cotton gluten 73,4%. Piepenbrink and Schingoethe (1998) reported a rumen degradability of canola meal of 53,1%. Cheng *et al* (1993) reported that the effective degradability of canola meal was 62,5% with concentrate diets and 72 to 74% with hay or straw diets.

Increasing the ruminal turnover rate from 2 to 5 and 10%/h reduced effective degradability from 79,3 to 65,2 and 56,9% (Sadeghi and Shawrang, 2006). Therefore, it is important when evaluating such results for ration-formulation purposes to consider the type of diet into which the protein supplement is to be incorporated.

Research at the University of Manitoba in Canada has focused on the digestibility of the amino acids present in canola meal. Kendall *et al* (1991) noted that following twelve hours of rumen incubation, total tract digestibility of amino acids present in canola meal approached 85% or greater. Considerable variation was noted among samples and amino acids in the proportion degraded ruminally or absorbed post-ruminally.

Boila and Ingalls (1992) reported that the amino acid profile of canola meal protein that bypasses the rumen was superior in valine, isoleucine, threonine, phenylalanine, serine, aspartate and alanine, relative to unincubated meal. The magnitude of the enrichment in the bypass fraction ranged from 14 to 33%.

The results, in combination with the data presented in *Table 1*, suggest that a sizeable, but variable, fraction of the protein of canola meal bypasses the rumen. In light of the enriched amino acid content of the bypass fraction, it would appear that canola meal provides a significant contribution to both rumen microbial protein needs and to the digestible amino acids required for animal growth and lactation.

Table 2: Milk production of cows fed canola meal compared to soya bean meal or cottonseed meal.

	Milk yield (kg/day)	
	Control	Canola
Ingalls and Sharma (1975)	23,0	23,7
Fisher and Walsh (1976)	24,4	23,0
Laarveld and Christensen (1976)	24,9	26,4
Sharma <i>et al</i> (1977)	20,7	20,9
Sharma <i>et al</i> (1977)	21,5	21,8
Papas <i>et al</i> (1978)	24,3	25,2
Papas <i>et al</i> (1978)	23,9	24,6
Papas <i>et al</i> (1979)	21,8	22,2
Laarveld <i>et al</i> (1981)	26,4	27,7
Sanchez and Claypool (1983)	33,4	37,7
DePeters and Bath (1986)	39,8	41,4
Vincent and Hill (1988)	28,5	28,6
Vincent <i>et al</i> (1990)	25,1	26,7
McLean and Laarveld (1991)	17,2	30,7
MacLeod (1991)	17,2	16,9
Emmanuelson <i>et al</i> (1993)	21,0	21,9
Dewhurst <i>et al</i> (1999)	24,0	24,5
Dewhurst <i>et al</i> (1999)	23,7	25,5
Whales <i>et al</i> (2000)	21,8	22,3
White <i>et al</i> (2004)*	21,7	22,7
Maesoomi <i>et al</i> (2006)	27,0	28,0
Johansson and Nadeau (2006)**	35,4	38,4
Brito and Broderick (2007)	40,0	41,1
Mulrooney <i>et al</i> (2008)***	34,3	35,2
Average milk yield	26,4^a	27,4^b

*Ruminal-protected canola meals vs lupin

**Canola expeller meal vs commercial concentrate

***Canola meal vs DDGS

Canola meal in dairy rations

Canola meal is an excellent protein supplement for lactating dairy cows. In a summary of 24 research trials with canola meal (*Table 2*), the mean milk-production response was +1,0kg/d when compared to diets containing cottonseed meal or soya bean meal. Recent research with cows producing >40kg/d (Brito and Broderick, 2007)

clearly indicates that, even at high levels of production, canola meal is still a superior protein supplement when compared to soya bean meal or cottonseed meal.

Amino acid profile

The amino acid content of rumen microbes, canola meal, soya bean meal, corn gluten meal, cottonseed meal and sunflower meal, expressed as a percentage of the amino acid composition of milk protein, are shown in *Table 3*. Canola meal is an excellent source of histidine, methionine, cystine and threonine.

The abundance of these amino acids and the extent to which they supplement amino acids from other protein sources may, in part, explain the consistent milk-yield response found when canola meal is included in dairy cow rations. Of all the protein sources listed in *Table 3*, canola meal has the best amino acid balance, as indicated by the relatively high level of its first limiting amino acid.

Another commonly used measure of protein quality for dairy cattle is 'milk protein score', which relates the amino acid composition

of protein sources compared to the amino acid composition of milk protein. The milk protein score of common ingredients – as calculated by Schingoethe (1991) for a maize-, maize silage- and alfalfa-based diet – is shown in *Figure 1*. Canola meal exhibits the highest score of all the supplemental protein sources (except for fish meal).



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Table 3: Ingredient and rumen microbe amino acid composition, compared to milk protein.* (The first limiting amino acid in each protein source is highlighted.)

Amino acid as percentage of milk protein								
	Milk % EAA	Rumen microbe	Canola meal	Soya bean meal	Maize gluten meal	Cottonseed meal	Sunflower meal	Corn DDGS
Arg	7,2	139	197	225	99	361	288	149
His	5,5	73	138	111	85	120	113	120
Ile	11,4	107	83	89	80	64	87	86
Leu	19,5	81	82	88	190	71	133	130
Lys	16,0	119	84	87	23	61	50	37
Met	5,5	84	95	58	95	67	102	87
Phe	10,0	104	103	116	141	125	110	34
Thr	10,0	121	113	98	84	85	98	102
Trp	3,0	90	115	93	40	93	97	77
Valine	13,0	85	88	78	79	77	90	96

*NRC, 2001

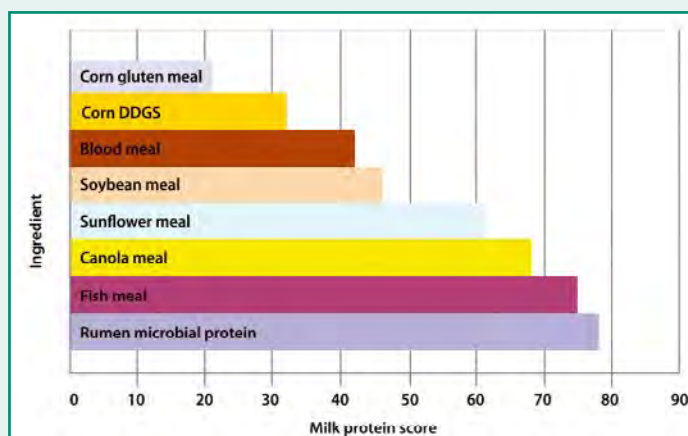
Microbial protein production

Canola meal optimises the amount of absorbable amino acids for lactating dairy cows, by providing adequate amounts of rumen-degradable protein (RDP) that stimulate microbial protein production in the rumen. Microbial protein is a high-quality protein that accounts for as much as 60% of a dairy cow's metabolisable protein requirements for milk synthesis.

ANOTHER COMMONLY USED MEASURE OF PROTEIN QUALITY FOR DAIRY CATTLE IS 'MILK PROTEIN SCORE'

The high rumen protein degradability of canola meal efficiently provides ammonia, amino acids and peptides, which are essential growth factors for rumen bacteria that can be readily incorporated into microbial protein. A comparative study investigating canola meal, cottonseed meal and soya bean meal as protein supplements for high-producing dairy cows, demonstrated a numerically higher post-rumen flow of microbial protein in cows fed canola meal, compared to those fed cottonseed meal and soya bean meal (Brito *et al*, 2007).

Figure 1: Milk protein score of common feed ingredients for dairy cattle (Schingoethe, 1991).



Rumen undegradable protein

The rumen undegradable protein (RUP, bypass protein) fraction in canola meal contains a profile of essential amino acids that closely matches that of milk protein. Recent trials with lactating dairy cows demonstrated that cottonseed meal > canola meal > soya bean meal in post-rumen flow of RUP and total protein and canola meal > soya bean meal > cottonseed meal in milk and milk protein yields (Brito and Broderick, 2007; Brito *et al*, 2007).

Higher milk production that is observed with canola meal, is attributed to the amino acid profile in the bypass fraction of canola meal being complementary to microbial

protein (Brito *et al*, 2007). The post-rumen supply of total amino acids, essential amino acids, branched-chain amino acids and limiting amino acids (methionine, lysine, histidine and threonine) when canola meal is used as a protein supplement, is numerically higher or at least comparable to that when diets are supplemented with soya bean meal or cottonseed meal (Brito *et al*, 2007).

Unequivocal research data indicates that when it is used to supplement dairy cow diets, canola meal can meet the rumen-degradable protein (RDP) and RUP requirements of dairy cows, which is reflected by the increase in milk production. 🟡

AFMA SYMPOSIUM 2015

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PROGRAMME

08:15 - 09:00		Registration and Refreshments
09:00 - 09:10		Welcome, Opening and Technical Committee feedback Dr Christel Coetzee, Director, ADVIT Animal Nutrition (Pty) Ltd, South Africa; Chairperson of the AFMA Technical Committee
Session 1 – Chairperson: Mr Kenneth Botha, Director in Barnlab, NutriGenics & Feed First (Pty) Ltd, South Africa		
09:10 - 09:40		Amino acids for dairy cows: Precision feeding towards improved profitability Dr Pieter Henning, Technical Executive: Ruminants, Meadow Feeds, South Africa
09:40 - 10:10		The role of short chain fatty acid (SCFA) absorption in the regulation of ruminal pH Dr Greg Penner, Associate Professor and Centennial Enhancement Chair in Ruminant Nutritional Physiology, Department of Animal and Poultry Science, University of Saskatchewan, Canada (Sponsored by Celtic Sea Minerals and Allied Nutrition (Pty) Ltd)
10:10 - 10:40		Live yeast as rumen modifier and potential for optimizing diet formulation Mr Laurent Dussert, Category Manager, Ruminant Feed Additives, Lallemand Animal Nutrition, France (Sponsored by Vitam International (Pty) Ltd)
10:40 - 10:50		Questions & Discussions
10:50 - 11:00		Renewal of professional registration through CPD for an Animal Scientist Mr Johan van Schalkwyk, Director, CPDonDemand (Pty) Ltd, South Africa
11:00 - 11:30		Refreshments
Session 2 – Chairperson: Dr Neil Dominy, General Manager, Central Analytical Laboratories – A Division of Astral Operations Ltd, South Africa		
11:30 - 12:00		NIR Technology: Past, present and what to expect from the future Mr Steven Tayfield, Business Operations Manager, AuNIR (A division of AB AGRI Ltd), United Kingdom (Sponsored by AuNIR (A division of AB AGRI Ltd))
12:00 - 12:30		A critical review of methods used to do proximate analysis on raw materials and animal feed and the financial implications thereof Mrs Evelyn Botha, Nutritionist: NIR and Laboratory, AFGRI Animal Feeds (A division of AFGRI Operations Limited), South Africa
12:30 - 12:40		Questions & Discussions
12:40 - 12:50		AFMA Forum 2016 update Mr De Wet Boshoff, Executive Director, AFMA, South Africa
12:50 - 13:00		Presentation of the Koos van der Merwe/AFMA Student of the Year Award Recipient
13:00 - 14:00		Lunch



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PROGRAMME (continued)

**Session 3 – Chairperson: Mr Johan du Plessis, Technical Manager, Quantum Foods (Pty) Ltd
t/a NOVA Feeds; Vice-chairperson of the AFMA Technical Committee, South Africa**

14:00 - 14:30		Metabolomics – opening a new window on nutrient metabolism Dr Behnam Saremi, Manager Animal Physiology Research, Evonik Industries AG, Germany (Sponsored by Evonik Africa (Pty) Ltd)
14:30 - 15:00		Advances in understanding enzyme substrates in feed and available solutions Dr Luis Romero, Animal Nutrition, Global Innovation Lead, DuPont Industrial Biosciences, United Kingdom (Sponsored by Chemuniqué (Pty) Ltd)
15:00 - 15:10		Questions & Discussions
15:10 - 15:30		Refreshments

**Session 4 – Chairperson: Mr Franscois Crots, Technical Executive Monogastric Nutrition, AFGRI Animal Feeds (Pty) Ltd,
South Africa; AFMA Symposium Programme Convener**

15:30 - 16:00		The use of enzymes to improve amino acid digestibility of under processed soya oilcake Dr Nasser Odettallah, Executive Manager, Global Technical Services, NOVUS International, Inc, United States of America (Sponsored by NOVUS Nutrition Products Africa)
16:00 - 16:30		Improved profitability in poultry production with combination of genetics, nutrition and natural feed additives Mr Robert Pottgueter, Dipl. Ing. Agrar – Nutritionist, Lohmann Tierzucht GmbH, Germany (Sponsored by EW Nutrition South Africa (Pty) Ltd)
16:30 - 16:40		Questions & Discussions
16:40 - 16:45		Closing Mr Loutjie Dunn, National Technical Manager, Nutri Feeds (Pty) Ltd, South Africa; AFMA Chairperson
17:30		AFMA & WPSA Pre-function drinks
18:00		AFMA & WPSA Cocktail Function Amber Banquet Room, CSIR International Convention Centre
18:15		AFMA & WPSA Presentation of Awards

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Why soy? How soy? Wow soy!

By Eden Social Development Foundation

The development of a sustainable soya-in-food market, with further progression to the soya-preneurs level among consumers, is the main objective of the mobile soya-in-food awareness programme. It is known as the Why soy? How soy? Wow soy! Programme.

This mobile soya-in-food awareness programme, managed by the Eden Social Development Foundation (ESDF), is financially supported by the Oil & Protein Seed Development Trust (OPDT) and was officially launched on 22 January 2011.

We successfully engage in creating soya awareness through on-site planting, harvesting, domestic utilisation and eventual or optional establishment of small and medium enterprise (SME) soya-processing businesses. The uniqueness of this programme is in providing access to information on soya, including all aspects from planting to processing of soya beans.

Rural development

The project is mostly implemented in deep rural areas. An average of 98% of project participants has never had any experience or contact with soya before their involvement with the mobile soya-in-food awareness programme.

On average, 95% of household project participants who are provided with seed packets engage in successful planting of soya, despite adverse climate conditions. Approximately 4 500 people have been made aware of the benefits of soya over the past five years through our awareness programme.

Household soya garden participants have very limited logistics available with which to engage in these unfamiliar projects. Notwithstanding these challenges, they participate enthusiastically in the 'soylution' based on the immediate nutritional benefits derived from soya.

SME opportunities

Agri-processing is recognised by local and national government as one of the most important and viable ways to create economic stability within communities. If a group has proven themselves proficient in achieving small-scale success, ESDF, in association with the OPDT, will consider possible expansion of the project to SME opportunities, by making available a SoyCow food processing unit to them. These units are utilised in SME soya food entrepreneurial businesses within communities. A number of these units have already been installed in South Africa with the aid and support of the OPDT.

In instances where the need should arise, ESDF assists small-scale farmers in expanding their soya crops beyond subsistence farming. The foundation arranges for harvested soya to be procured by local processors, thereby establishing an offset opportunity for these farmers.

On completion of on-site training and planting of soya within household gardens, the project management will return to the participating groups to

demonstrate the utilisation of their own soya beans in domestic kitchens. Soya foods that can be produced in both domestic kitchens and by using the SoyCow soya food processing system include: soya milk, soya yoghurt, okara (used in baking soya biscuits and soya bread) and soya nuts.

Workshops and collaboration

Based on findings from countless workshops and interaction among different government departments and academic institutions, we recently hosted a two-day workshop with the Mangosotho University of Technology.

A total of 85 third-year students from both the Department of Agriculture and Department of Social Project Development, attended this workshop held at Bergville, KwaZulu-Natal. This dual participation by these relevant departments is a major step towards involving the key future role-players in expanding future soya utilisation in South Africa.

Sustainability is a crucial element when projects are considered for a mobile soya-in-food awareness programme. Preferred time allocated to a project is over a three-year period. This is conducive to securing successful and productive soya planting, increased household soya consumption and the ultimate establishment of microbusinesses.



Kids enjoying
flavoured soya milk.

IMPORTANT EVENTS: 2015 TO 2016

2015

2

DATE	EVENT	VENUE	ENQUIRIES
15-16 July	<i>FarmBiz</i> AgriBusiness Africa Conference	Gallagher Conference Centre, Midrand	Marianna du Plessis Tel: +27 82 337 6127 Email: africa@farmlinkafrica.co.za www.farmbiz.co.za
21 & 23 July	PRF Soya Symposium on Weed Control	Delmas Showgrounds Nampo Park, Bothaville	Yvette Papadimitropoulos Tel: +27 11 803 2579 Email: admin@proteinresearch.net
27-31 July	VUT Soya Seminar and Workshop	Quest Conference Estate, Vanderbijlpark	Zelda Kotze, email: zelda@vut.ac.za Luzanne Dippenaar, email luzannevt@vut.ac.za
6-9 September	21 st SAAFoST Biennial International Congress	Tsogo Sun Elangeni Maharani Complex, Durban	Leanne Armoogam Tel: +27 31 368 8000 Email: leannea@turnergroup.co.za www.saafofst2015.org.za
16-19 September	Agri Mega Week	Mega Park, Bredasdorp	Reinette Basson Tel: +27 21 863 0397 Email: reinette@agrimega.co.za www.agrimegaweek.co.za
21-23 September	48 th Sasas Conference	Umfolozi Hotel Casino Convention Resort, Empangeni	Trevor Dugmore Tel: +27 33 355 9262 Email: Trevor.Dugmore@kzndard.gov.za www.sasas.co.za
22 September	Sacota AGM	To be confirmed	Teresa Struwig Tel: +27 12 663 9097 Email: sacotaadmin@afma.co.za www.sacota.co.za
29 September	AMT SA Agricultural Outlook Conference	CSIR International Convention Centre, Pretoria	Minda Reinert Bornman Tel: +27 12 361 2748 Email: minda@amtrends.co.za www.agrimark.co.za
30 September to 1 October	Potatoes SA Congress	Lagoon Beach Hotel, Cape Town	Hanrie Greebe Tel: +27 12 349 1906 Email: hanrie@potatoes.co.za www.potatoes.co.za
10-14 October	Anuga	Koelnmesse GmbH Cologne, Germany	Natascha Schneider Tel: +49 221 821 2058 Email: n.schneider@koelnmesse.de www.anuga.com
14 October	Afma Symposium	CSIR International Convention Centre, Pretoria	Teresa Struwig Tel: +27 12 663 9097 Email: admin@afma.co.za www.afmasymposium.co.za
15 October	World Poultry Science Association Day	CSIR International Convention Centre, Pretoria	Alet Botha Tel: +27 33 260 6825 Email: Bothaa@ukzn.ac.za www.wpsa.com
15-16 October	Agri SA Congress	St George's Hotel, Pretoria	Thea Liebenberg Tel: +27 12 643 3400 Email: thea@agrisa.co.za www.agrisa.co.za
23-25 October	PMA Fresh Summit	Georgia World Congress Centre, Atlanta, United States	Jamie Romano Hillegas Tel: +1 607 2123 Email: jhillegas@pma.com www.pma.com/events/freshsummit
2016			
29 February to 4 March	Afma Forum	Sun City	Teresa Struwig Tel: +27 12 663 9097 Email: admin@afma.co.za www.afmaforum.co.za

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5503 TWD OOS	54	R4 000	R49 300
5503 MFWD OOS	54	R4 750	R58 400

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