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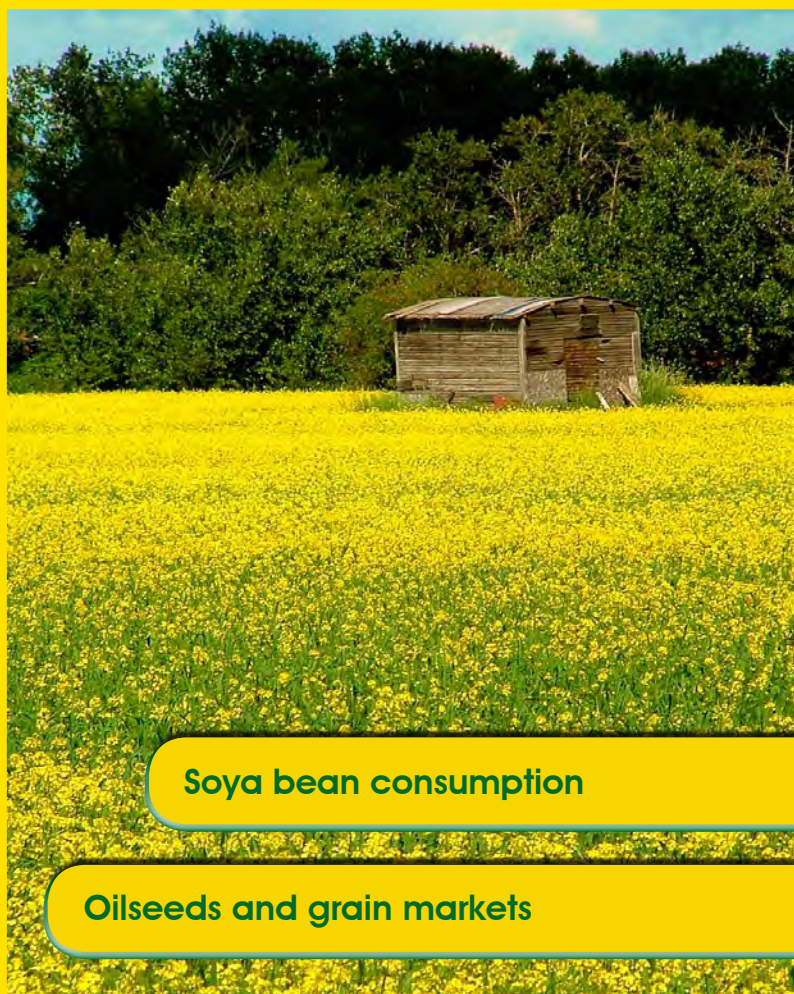


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Blackleg stewardship

Protein requirement forecast



Soya bean consumption

Oilseeds and grain markets

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South African feed industry – threats and opportunities

By Loutjie Dunn, chairman of Afma

The formal feed industry in South Africa, represented by the members of the Animal Feed Manufacturers' Association (Afma), produces approximately 61% of the 11,7 million tons of animal feed used in the country annually.

Afma members produce feed for the entire spectrum of animals in South Africa, and the roughly 3,2 million tons of broiler feed produced by them is calculated to be approximately 99,9% of all the broiler feed produced in the country every year.

Importance of broiler feed

On a volume basis, broiler feed represents approximately 27% of the total animal feed produced in the country, and in monetary terms the estimated annual R17,6 billion of broiler feed represent more than 60% of the total estimated animal feed value of R29 billion per annum.

Afma, as part of the larger value chain, uses roughly 3,5 million tons of maize (including maize

products) and 900 000 tons of soya bean meal (SBM) annually, and the vast majority of these products are used in the production of broiler feed. For the 2015/16 Afma financial year, 71 feed mills – consisting of Afma members – produced 6,9 million tons of animal feed, equating to an annual average of 97 000 tons per feed mill.

We can turn to the opportunities that would arise if we could manage to stop the dumping of bone-in portions.

These figures are a good indication of the size and value of the animal feed industry, and the importance of broiler feed in this value chain is apparent.

Our feed industry has endured hard times in the past, but never before have we experienced a threat as devastating as the possible collapse of the broiler industry.

Afma broiler feed sales indicate a decline of 0,4% from 2014 to 2015, followed by a further decline of 6,2% from 2015 to 2016.

Losses in the value chain

Evaluating this decline in more detail on a monthly basis, shows that the downturn commenced in July 2015 and that the initial slow pace of decline reached about 10 000 ton per month by September 2016.

Without drastic measures to hamper the dumping of low-cost broiler meat into our country, this growing rate of decline will

continue until only the producers of fresh broiler meat remains – a niche market representing approximately 10% of the local broiler meat production. The broiler feed market would then be reduced from 3,2 million to about 300 000 tons per year.

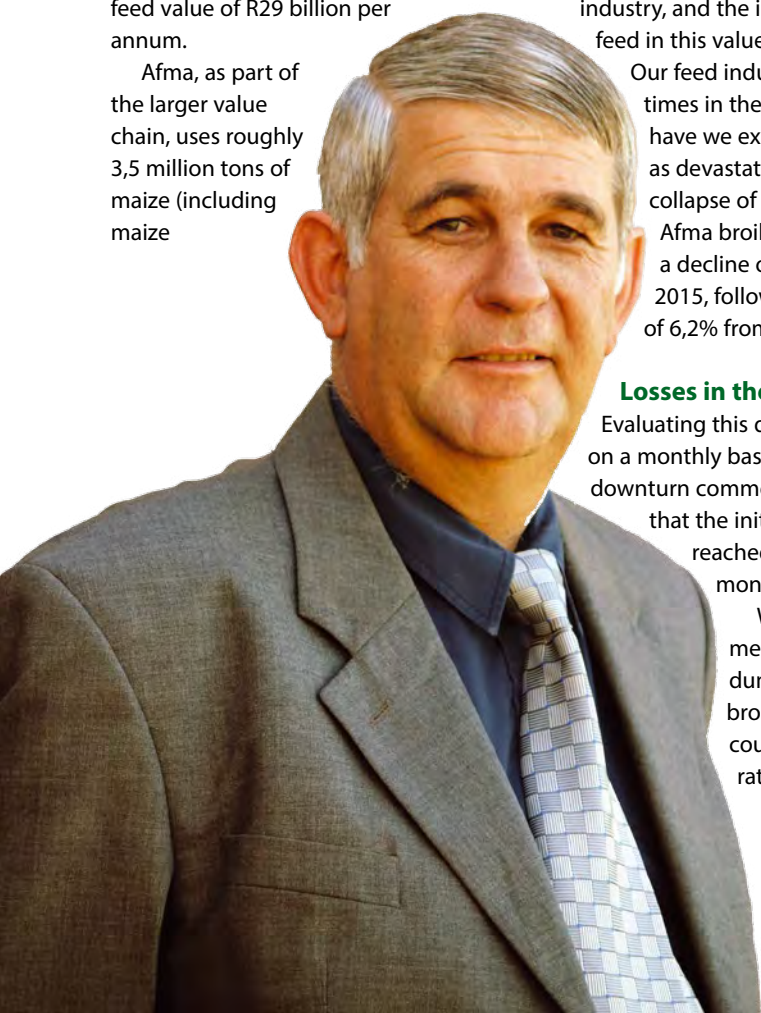
For ease of calculation, the 3 million tons of broiler feed lost to our industry – except for the direct losses in the broiler industry – would include the following losses in the value chain:

- Closure of 31 feed mills.
- A number of 4 500 direct job losses.
- A figure of 1,9 million tons of maize usually used locally which would now have to be exported.
- A figure of 720 000 tons of SBM (900 000 tons of soya beans).
- Other input suppliers in this market.

On a positive note, we can turn to the opportunities that would arise if we could manage to stop the dumping of bone-in portions, which currently makes up approximately 42% of all imported chicken. For 2016, the bone-in imports amounted to 226 800 tons, which translates to 378 million broilers per year.

The possible gains for the value chain, excluding the direct broiler industry gains, would include:

- A figure of 1,3 million tons of broiler feed, increasing the current estimated capacity utilisation of feed mills from 70 to 83%.
- Between 1 700 and 3 400 new jobs created.
- An additional 800 000 tons of maize would be used.
- An additional 300 000 tons of SBM would be used (390 000 tons of soya beans).
- Lower feed prices due to improved capacity utilisation. ●



Army worm wreaks havoc: Is South Africa under threat?

Across Southern Africa we have seen fall army worms (*Spodoptera frugiperda*) from the United States (US) as well as native African army worms (*Spodoptera exempta*) destroying crops. Outbreaks were experienced in Zambia in late 2016 and have spread ever since.

The main target of army worms is cereal crops and pasture grasses. Fall army worms, unlike African army worms, can also host on many other plants, including oilseeds such as soya beans and groundnuts. Chemical pesticides are effective against both army worm species, in which case the devastation of crops can be controlled.

The cost of chemical application will add to the cost of crop production, but is something which will be unavoidable. The fall army worm has been detected in Limpopo, the Free State and some parts of the North West province. It has been confirmed that genetically modified (GM) maize can be less susceptible to fall army worm.

Poultry industry in crisis

The poultry industry is the single largest agricultural sector in South Africa. It employs an estimated more than 110 000 people directly and indirectly. It is also one of the major consumers of grains and oilseeds.

Currently, this industry could be on the verge of collapse, due to the influx of low-cost chicken imports of unwanted portions of chicken being sent to South Africa at far below the cost of production of a whole chicken in the European Union (EU).

Europe's share in South African bone-in chicken imports has grown from 0,5% in 2012 to over 80% currently. One of the country's largest poultry producers, RCL Foods, recently announced that it will be cutting 1 500 jobs – and still more to come – as a result of having to close operations to prevent further financial losses.

Political intervention required

The temporary imposition of a 13,9% 'safeguard duty' against EU countries, while allegations of dumping are being investigated, will certainly assist the industry. This, however, is not enough to resolve the problem. The reduction in feed raw material costs as a result of returning to normal maize production after a drought, and lower global oilseed prices, will also assist in reducing losses suffered by the industry.

This relief will however take a few months to filter through the system and will not resolve the damage inflicted by imports. Despite numerous talks and investigations, speedy political intervention will be required to save the industry.

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New way to measure crop yields from space

US researchers have come up with a new method of estimating crop yields from small farms in Africa, using high-resolution images from the latest generation of satellites.

Images from new, inexpensive satellites could be used to estimate yields and test interventions in poor regions where data is scarce, scientists from Stanford University said in a paper published in the *Proceedings of the National Academy of Sciences*.

David Lobell, an associate professor at the school, said that satellites which were once the size of school buses, were now the size of fridges or even shoeboxes. "You can get lots of them up there, all capturing very small parts of the land surface at very high resolution.

"Any one satellite doesn't give you very much information, but the constellation of them actually means that you're covering most of the world at very high resolution and at very low cost. That's something we never really had even a few years ago."

The researchers focused on Western Kenya, where smallholders farm maize on small half-acre or one-acre plots, to test if images from the new satellites were detailed enough to provide reliable estimates of crop yields.

"Just combining the imagery with computer-based crop models allows us to make surprisingly accurate predictions," Burke said.

The researchers plan to scale up their project across Sub-Saharan Africa. – *Bizcommunity*

Global Canola Oil Market Research Report 2017

A report titled Global Canola Oil Market Research Report 2017 was released on 21 February. The report studies canola oil in the global market, focusing especially on North America, Europe, China, Japan, Southeast Asia and India.

Aspects such as capacity, production, price, revenue and market share is discussed for each manufacturer covered in the report. Companies covered include Louis Dreyfus, ADM, Cargill, Bunge, Richardson Oilseed, Viterra, Al Ghurair and many more.

Markets covered in the report are segmented by several key regions, with production, consumption, revenue, market share and growth rate from 2011 to 2021 (forecast) covered.

Canola oil is split by product type, with production, revenue, price, market share and growth rate of each type covered.

Visit the following website for more information and insight into the report: <https://www.bharatbook.com/food-market-research-reports-812118/global-canola-oil2.html>

Syngenta launches annual Grain Academy

Syngenta recently launched its 5th annual Grain Academy, a business leadership development programme for young commercial farmers.

In partnership with the University of the Free State Business School and supported by Grain SA, the focus for the 2017 programme sees a stronger emphasis on leading for higher performance in the world of agriculture.

Antonie Delport, MD of Syngenta SA, says: "This year we chose to focus more on the art of leading, but also on personal wholeness, and the positive impact this has on a farming business. Successful farming is not just about knowledge of the land and applying approved methods to farming. Focusing on that human element is just as important, especially as growers get in touch with nature every day."

Each year the Grain Academy Programme targets a small group of influential growers, with the aim for them to spearhead the concept of smart farming – a concept that challenges the status quo. This year, the programme proudly boasts six female growers among the 24 participants, a remarkable upward trend seen in the business of agriculture. – *Press release*

What's in the Monsanto R&D pipeline?

The Monsanto Company announced updates on progress made across its research and development (R&D) pipeline over the past year and highlights into 2017. The company once again emphasises the crucial role of R&D in the agricultural industry. "Science is helping us identify new solutions to help farmers, and this marks a record year for our R&D pipeline – with 14 projects advancing to launch and the first unveiling of more than 35 projects in the climate pipeline," said Robert Fraley PhD, Monsanto's chief technology officer.

Monsanto's R&D platforms span five areas of agricultural technology: data science, plant breeding, plant biotechnology, crop protection and ag biologicals. These platforms support sustainable agriculture practices by delivering solutions that reduce the footprint of global production through better harvests, protect harvests from increasing threats and deliver continuous improvement to production.

The company also highlighted that the Monsanto-Bayer merger will offer new opportunities to expand innovation and insights for farmers. The message is that this group will create a leading global agriculture company that would accelerate innovation for farmers around the world, deliver new, optimised integrated solutions to support the future of agriculture and expand offerings to benefit farmers globally. – *Press release*



Lower tariff will not affect producers

The recent wheat import tariff trigger will decrease wheat import prices towards the reference price. This trigger is due to increases in world wheat prices for three consecutive weeks. This is according to Dr Dirk Strydom, manager of the Grain Economy and Marketing Department at Grain SA.

Strydom said the new import tariff of R1 190,19 per ton, which is 25% lower than the current level of R1 591,40 per ton, will not be active until it is published in the *Government Gazette*. He also indicated that local prices already trade below these levels.

Strydom made it clear that this has nothing to do with the court case regarding the publication and revision of the wheat import tariff that Grain SA was involved in. The normal variable rate formula is still in place. Grain SA is still waiting for the government to either revise the reference price of wheat or to introduce a new formula which will determine the wheat import tariff.

The wheat import tariff naturally fluctuates and is influenced by international wheat prices. This occurrence is nothing new or out of the ordinary, and is still determined by the same formula.

Wandile Sihlobo, head of economic and agribusiness intelligence at Agbiz, recently explained: "The wheat import tariff has triggered six times over the past 29 months. Over the same period, the tariff has only been revised down once – in August 2015." – *Ursula Human, FarmBiz*

Final commercial summer crop production figures

The final crop sizes for various commercial summer crops for the 2016-season were released and accepted. At a meeting held on 10 February 2017, the Crop Estimates Liaison Committee (CELC) oversaw the process for the finalisation of the crop production figures of commercial white and yellow maize, sunflower seed, soya beans, groundnuts and sorghum for 2016.

The estimated total production figures as released by the national Crop Estimates Committee (CEC) were revised, using the published figures of the South Africa Grain Information Services (SAGIS) of actual deliveries as the basis for the calculations.

The figures from the maize utilisation survey to determine on-farm usage and retentions, which was conducted by the Department of Agriculture, Forestry and Fisheries (DAFF) and the telephonic survey conducted by the National Crop Statistics Consortium (NCSC), were added to the SAGIS delivery figures to calculate the final crop production figures.

Comparing the final calculated crop figures with the numbers set by the CEC during September 2016, the size of the commercial maize crop is now 7,778 million tons, which is 3,21% or 241 625 tons more than the final crop estimate figure of 7,537 million tons. For white maize, the recalculated crop size is 3,408 million tons, which is 4,76% or 154 725 tons higher than the final crop estimate figure, and for yellow maize the recalculated crop size is 4,370 million tons, which is 2,03% or 86 900 tons more than the final crop estimate figure.

In the case of commercial sunflower seed, the final calculated crop figure remained unchanged at 755 000 tons. Sorghum and groundnuts were adjusted downward by 4,92% (or 3 650 tons) and 6,21% (or 1 170 tons), respectively. The soya beans crop was slightly adjusted upward, from 741 550 tons to 742 000 tons, which is 0,06% or 450 tons.

– CEC press release

Yara opens R30 million fertiliser plant

In an action that is said to demonstrate Yara's long-term commitment to South Africa's agricultural development, a brand-new liquid fertiliser plant was just opened in Malmesbury. The ribbon was cut during a ceremony hosted by Yara Cape as Yara International ASA launched the R30 million plant.

This facility will enable Yara to serve farmers in a radius of more than 300km from Malmesbury in several markets including dryland cereals, vegetables, fruit and grapes. "With the latest investment we affirm our belief in the agricultural potential of South Africa and our aspiration to be the leading crop nutrition company in the country, with the farmer at the centre of everything we do," said Terje Knutsen, executive vice-president of crop nutrition at Yara International.

"We are grateful and proud to announce the completion of this construction without injuries.



Cutting the ribbon at the opening are, from the left: Luis Alfredo Perez, chief executive officer of Yara Africa, Herman Saayman, production manager of Yara Cape, Terje Knutsen, executive vice president of crop nutrition at Yara International and Ig Ferreira, general manager of Yara Cape.

Safety is our licence to operate," said Ig Ferreira, general manager of Yara Cape. "With the increased capacity of this investment, we once again illustrate our commitment to the Western and Southern Cape farmers and their needs." – Press release

Blackleg stewardship

– taking a proactive and integrated approach

Canola growers and advisers are being encouraged to take action early and be proactive in developing an integrated approach to managing blackleg in canola.

Promoting these key messages makes good sense and encourages responsible stewardship in managing the risks of blackleg infection and resistance. However, a recent article in issue 116 of the Australian Grains Research and Development Corporation (GRDC) publication *Ground Cover* – in which plant pathologists recommended giving a higher priority to major resistance genes in selecting a canola variety and outlined an identified suspected tolerance to the seed dressing fungicide, fluquinconazole (Jockey Stayer®) – needs to be put into perspective in order to make informed decisions.

We must all recognise that resistance is a reality. Successful producers will manage herbicide resistance, and likewise blackleg resistance. Growers and advisers do not

need bad news or scare tactics. We all have a choice to add diversity to weed and disease management as resistance is identified and/or evolves. These measures aim to reduce the yield and quality losses associated with the disease, but are not likely to eliminate the pathogen or prevent herbicide resistance.

Herbicides alone are not the answer

Relying on herbicides alone to manage weeds is not the answer, as research and experience on-farm have clearly shown in Australia and globally. Regional disease monitoring over the past 15 years across Australia has demonstrated that field populations of *L. maculans* (blackleg) have high evolutionary potential and rapidly adapt to selection pressure from sowing cultivars with major gene resistance, which can lead to resistance 'breakdown' within a few years of cultivar release.

Major gene resistance is a gene-for-gene interaction, with the pathogen having avirulence genes corresponding to the resistance gene in the host canola plant.

Changes in the frequency of *L. maculans* isolates virulent on cultivars, dependent on major gene resistance, have led to a 'boom and bust' type cycle and resulted in severe yield losses in Australian-grown canola. Two breakdowns of blackleg resistance relying on major gene resistance have been reported from commercial field situations – for instance,

experienced on the lower Eyre Peninsula in South Australia in 2003 and 2012.

An integrated approach

All Pioneer® brand Y series canola hybrids strategically deploy a combination of quantitative (polygenic) and qualitative (major genes) blackleg resistance. Research and experience have proven that quantitative resistance used in an integrated approach with cultural practices and fungicides (seed/foliar) is effective in protecting yield potential, while contributing significantly to durable resistance over more years in the field.

Rotation of cultivars every three years can influence shifts in avirulent allele frequencies of *L. maculans*, but validation of the success from rotation of cultivar resistance groups (based on presence of a major gene) if known and in the longer term is inconclusive.

Cultural practices and fungicide use should be recommended to help preserve the effectiveness of genetic resistance where risk has been assessed, giving resistance conferred by major genes a fighting chance of durability in the long term.



Responsible stewardship

Responsible stewardship programmes for blackleg should include:

- Know your risks by monitoring the incidence and trends in severity of stem canker at windrowing the preceding canola crop and scouting early in the season for leaf lesions in newly sown canola.
- Cultural practices, particularly less intensive rotation of canola, isolation from last year's canola stubble and agronomic practices such as early sowing in April can help to escape high risk of blackleg infection in field

situations, in addition to managing other risk factors (e.g. pest damage, losses from heat/soil moisture deficit/late frosts in spring) that may limit yield potential.

- A higher priority is to separate canola from last year's stubble, particularly in high-risk conditions using a farm rotational planner and communicating to neighbours.
- Always use the latest variety blackleg ratings, as the virulence of local blackleg populations may change through crop rotation cycles.
- Avoid blanket recommendations from advisers to plant only one canola variety in a district or rely on the same variety over more than two years.
- Using fungicides on seed (Jockey Stayer®) and applied to fertiliser (Flutriafol) when planting canola, particularly in tight rotations, is a 'critical' best management practice that will reduce fungal infections up to the three to five leaf stage.
- Strategic deployment of foliar fungicides (Prosaro®, Aviator Xpro®)



Blackleg fungus seen up close.
(Photograph: www.aginnovators.org.au)

complements other stewardship measures to reduce the severity of stem cankers that in turn helps to protect yield potential.

- Avoid relying on one tactic only to manage resistance (herbicide, disease), and follow-up with another tactic in an integrated double/multiple-knock approach.

Development of new cultivars

In conclusion, the use of race-specific major gene resistance to manage blackleg has been beneficial to improve a variety

of blackleg ratings of new canola cultivars. Ongoing high priority has been given to the development of new cultivars with novel sources of resistance by all proprietary breeders and through the GRDC National Brassica Germplasm Improvement Programme (NBGIP).

This industry initiative is showing good promise. However, this is not the 'silver bullet' solution and should not replace industry stewardship programmes. Being proactive in recommending a more integrated strategy to manage blackleg and increase yield potential in Australian-grown canola crops, is vital.

For more information, contact your local DuPont Pioneer territory manager or promoter agent, visit the Pioneer Hi-Bred Australia website, www.pioneer.com/web/site/australia/stewardship/ or visit www.australianoilseeds.com for the autumn blackleg management guide fact sheet of the agronomy centre of the GRDC Australian Oilseeds Federation. 🌱

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Science For A Better Life

02/2017

Innovations in the control of Sclerotinia

Over the last few years, the incidence of Sclerotinia has increased in oilseed crops, including soya beans, sunflowers and canola, causing significant yield losses. Fortunately, the past season was a dry one, resulting in lower incidence of the disease.

This disease, which is caused by *Sclerotinia minor* and *S. sclerotiorum*, has been a challenge to control due to its wide host range, robust survival structures in soil and its efficient way of spreading to its target host.

It is important to bear in mind that the sclerotia resting structure can survive for approximately five to ten years in soil. The sclerotia germinate after a rain event and create spores producing structures (apothecia) in the top 3 to 5cm of soil (Figure 1).

These structures produce ascospores that are released in the air ten to twelve days after rainfall. The spores infect petals and leaves within two days of their release. Sclerotia can also germinate in the soil and infect the roots (Figure 2).

Figure 1a: An example of the spore producing apothecia often hidden between organic matter.



Figure 1b: Sclerotia on a canola stem.

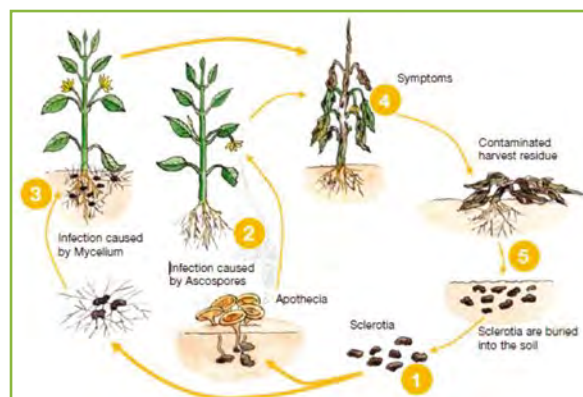
Environmental triggers

For Sclerotinia to develop, the following is required:

- Wet conditions on the soil surface with a temperature of 11 to 15°C trigger sclerotia germination and result in spore release from the apothecia after 10 to 14 days.
- Extended dampness, particularly during flowering (>25mm rain).
- High humidity and leaf dampness during petal drop and lodging will result in stem infection. This is linked to temperatures of 20 to 25°C.
- Infection is halted when dry conditions occur.

Sclerotinia remains a challenging disease to control. This is attributed to the fact that both the soil and aerial infection phases exist, requiring different control strategies. The basis of a control strategy is breaking the life cycle (Figure 2).

Figure 2: Sclerotinia life cycle.

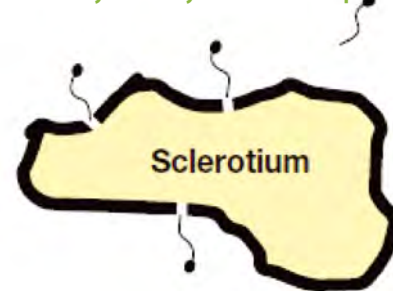


The life-cycle consists of the following:

1. Sclerotia can survive in soil for many years. This phase can be controlled with the new biological fungicide, Contans®.
2. Sclerotia produce apothecia that release spores which infect the susceptible host. On canola, this can be controlled by Prosaro®.
3. Sclerotia can also germinate and infest the roots of host plants.
4. Mycelia colonise the plant, causing it to die.
5. New sclerotia are produced, surviving for many years in the soil.

Bayer has introduced a biological compound which contains a pathogen for *Sclerotinia minor* and *S. sclerotiorum*. This organism contains *Coniothyrium minitans* which attacks the sclerotia stages as shown in Figure 3. It prevents the sclerotia from developing, which reduces root infection and the production of spores.

Figure 3: An illustration of a sclerotium being attacked by *Coniothyrium minitans* spores.



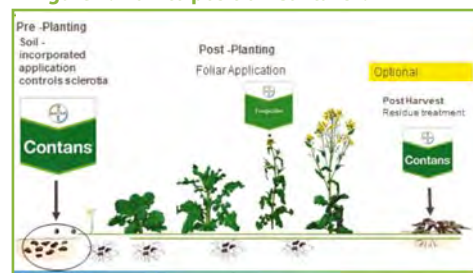
It is, however, also important to apply a fungicide during the early flowering stage. This is particularly critical when favourable conditions exist for the development of

the disease. Such conditions include prolonged dampness during flowering.

To ensure effective control, it is key to integrate strategies which include the control of sclerotia with Contans®, a foliar application with a registered fungicide and adapting cropping practices by means of crop rotation and cultivar choice. Figure 4 illustrates the method for

the application of Contans®.

Figure 4: How to position Contans®.



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Article and photographs by Dr Charlie Reinhardt, dean of the Villa Academy

Sheep for weed control:

New approach to herbicide resistance management

Weeds is the term used to describe plants that interfere with human aspirations and activities – also called unwanted or problem plants. This viewpoint is from a human perspective, however. From nature's viewpoint, weeds fulfil key functions – for instance stabilisation of soil, pioneering species in areas denuded of vegetation, food, medicine and shelter for animals and humans, serving as energy resource (firewood) and more.

Utilisation of weeds by browsers and grazers is determined by several factors, including the type of animal, weed type, alternative food plants and the environment. Although the nutritive value of a weed may be high, it may be toxic or unpalatable due to chemicals produced by the plant.

Livestock and game might not feed on a particular weed, even though it is not toxic, because the animal has not 'learned' to ingest it and prefers other vegetation. Animals are forced to ingest plants that would normally be avoided or rarely utilised when drought and overgrazing cause significant reduction in plant biomass and species diversity.

Hairy fleabane (*Conyza bonariensis*) is a commonly occurring weed in many parts of the world, where it causes serious yield loss in annual and perennial crop systems. In South Africa, this weed poses a serious threat in both the summer and winter rainfall regions. In countries bordering on the Mediterranean, hairy fleabane is considered as one of the most prevalent weeds (Omar, 2010).

Sheep utilising hairy fleabane

Hairy fleabane is classified as a summer weed as it flowers in summertime, but seeds can germinate in any season, provided that sufficient soil moisture is available. Seedlings and mature plants can withstand dry conditions and seedlings can survive long dry periods in the rosette growth stage.

In regions with a Mediterranean climate, such as the Western Cape, summers are dry and scarcity of plants for grazing as well as increased fodder prices are common. This is what prompted the research conducted by Omar (2010) in Palestine. He investigated the value of the most common weed in the country, hairy fleabane, in the production of lambs.

The study was motivated by the following:

- Natural pasture in Palestine is only available periodically, and at times not at all.
- The use of grain crops, such as maize, sorghum, wheat and soya bean, and their seed as sources of fodder conflicts with food for human consumption.
- Crops used for fodder are expensive.
- Hairy fleabane is widespread, occurring in large numbers in Palestine and in many other countries where prolonged dry spells are the norm and rainy periods the exception.

Omar's research indicates that hairy fleabane in Palestine contains 20% crude protein (CP) and 27% crude fibre, as well as other nutritional properties at levels which are significantly higher than maize, soya bean, wheat, barley and sorghum. It was found that 10 to 15% content of hairy fleabane in fodder for lambs resulted in significantly increased daily weight gain (DWG) compared to the same percentage content of other fodder types.

A maize field near Vredefort where zero tillage has been practised for at least a decade, with high dependence on glyphosate herbicide. Virtually all the green weed plants pictured here are hairy fleabane that were treated with glyphosate herbicide three weeks earlier.

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Hairy fleabane flowering.



Transformation into multi-stemmed hairy fleabane plants due to regrowth from buds below the part of the stem (apical growth point) grazed off by sheep.



Three weeks after treatment with glyphosate, the hairy fleabane plants had not been killed by the herbicide treatment, and sheep selectively removed those parts showing symptoms (yellowing of youngest leaves) of glyphosate damage.



Control of resistant weeds

In South Africa, hairy fleabane is absent or occurs rarely on farms where sheep are present and allowed to graze on crop fields in areas otherwise heavily infested with the weed. An example of such a situation is a farm in the Moorreensburg district, where for the past 20 years sheep production has been integrated with a wheat-medic crop rotation.

The farmer is convinced that sheep are the only effective tool for keeping hairy fleabane in check in summer and that the role of sheep in controlling rye grass (*Lolium*) weeds in winter is underestimated.

It is a well-known fact that herbicide resistance is widespread in both hairy fleabane and rye grass populations across the Western Cape. Recently (2015/16), the herbicide resistance research team of the University of Pretoria (UP) has identified high glyphosate tolerance leaning toward glyphosate resistance in hairy fleabane populations in the north-western Free State.

Resistance to glyphosate herbicide in South Africa has to date been proven in three prominent weed species, namely hairy fleabane, rye grass and common plantain (*Plantago lanceolata*).

The nutritional value of all three these weeds has been determined as high (Botanical Society of South Africa, 1994; Omar, 2010; Dickinson, 2010). In the case of common plantain, the following is stated: "Animals prefer the weed and farmers at one stage considered growing it as a pasture." (*Field Flower Guide No. 6*, Botanical Society of South Africa, 1994).

Case study in Vredefort

Observations made in 2015 on maize fields in the Vredefort district

confirmed that sheep feed on hairy fleabane, and that this phenomenon has significant implications for the successful management of this weed – in particular with regard to the weed's high tolerance (leaning toward resistance) to the popular herbicide, glyphosate.

In August 2015, the maize fields in question were being prepared for planting, by applying a herbicide product containing glyphosate to a weed spectrum consisting virtually exclusively of hairy fleabane (*Photograph 1*). Three weeks later, the herbicide's effect was limited to yellowing (chlorosis) of leaves at the apical growth point. This was considered ineffective weed control, since the particular herbicide and dosage employed ought to have killed the plants.

It soon became clear that sheep grazed the hairy fleabane plants in a highly selective way – only leaves that turned chlorotic (yellow) due to the sub-lethal glyphosate effect were ingested and green leaves were not grazed at all (*Photograph 2*). Over the next three weeks, the plants of which the apical growth point and chlorotic leaves were grazed off showed vigorous regrowth from buds lower down the compressed stem (*Photograph 3*).

The alarming consequence of intervention by sheep was that hairy fleabane plants carried more than ten stems that would bear flowers, instead of just one which develops under normal circumstances. Moreover, the sheep removed most of the glyphosate present in the plants, allowing regrowth unimpeded by the herbicide. Intensive grazing by sheep from the time hairy fleabane emerges, would probably be a better solution for effective control of this weed.

Stimulation of plant growth

It is known that sub-lethal levels of glyphosate occurring in plants can, in fact, stimulate plant growth – a phenomenon called 'hormesis' (Duke and Belz, 2011). Glyphosate can be used as a ripening agent for sugarcane. A relatively low dosage has a sub-lethal effect, causing the inhibition of vegetative growth and an increase in sucrose concentration.

The sub-lethal effect which glyphosate had on hairy fleabane in the Vredefort district possibly made it more palatable to sheep, and clarifies why they favoured that part of the plant where the herbicide had the greatest effect – i.e. the apical growth point and youngest leaves.

Follow-up research conducted in a greenhouse at UP confirmed that the Vredefort hairy fleabane population exhibited high tolerance, leaning toward resistance to glyphosate herbicide. There is a high risk that this population could become glyphosate-resistant, unless urgent steps are taken to mitigate the evolution of herbicide resistance.

Herbicide resistance management strategies are well documented and frequently communicated on the South African Herbicide Resistance Initiative (SAHRI) website: www.up.ac.za/sahri. Prof Reinhardt is project leader of the SAHRI, which is based in the Department of Plant and Soil Sciences at UP. For more information and references, contact Prof Reinhardt, dean of the Villa Academy, extraordinary professor of weed science at UP and extraordinary professor at the Department of Agronomy at Stellenbosch University (SU), on 083 442 3427 or email dr.charlie.reinhardt@gmail.com. 🌱

Forecast estimates of animal protein requirements



With increasing feed requirements, South Africa will need to produce 1,6 million tons of soya beans to achieve 79% of soya oilcake requirement self-sufficiency by 2020. To achieve 76% by 2025, the country will need to produce 2,1 million tons of soya beans.

These are projections of oilcake requirements for use in animal feed in South Africa from 2015 to 2025, a project for the Protein Research Foundation (PRF) conducted by the Unit in Livestock Economics of the University of the Free State (UFS).

The PRF has as its main objective the replacement of imported protein with domestically produced protein. After many years of investigating numerous alternatives, the focus has shifted mainly to where the largest impact could be made, namely soya beans and canola.

Domestic availability

The growth in the domestic availability of oilcake is a good measure by which the PRF could ascertain whether it is achieving its objectives, by way of supporting the industry with research, new technology and technology transfer.

The targets that will need to be met in the future for the PRF to continue to emulate the great progress that has been made, thus requires projections of future oilcake demands and what will be required to obtain self-sufficiency, as well as when this goal is likely to be met.

To accurately measure this progress, various models were developed and used over the years. However, a new model has now been developed.

The new model methodology

Collaboration between the UFS Department of Agricultural Economics, PRF's existing agricultural products requirement (APR) model and the Bureau for Food and Agricultural Policy (BFAP) has created a new successful model that can accurately calculate current protein requirements and project future requirements under various scenarios.

There are several animals not producing meat, milk and eggs that consume a substantial amount of animal feed, including protein.

The model considers changes in per capita consumption of meat, milk and eggs as projected by BFAP as well as population growth. The quantity of meat, milk and eggs that are predicted to be imported and exported are also considered. Projected future prices of

major raw materials are incorporated as well as the availability of raw materials, mainly those that are derived as by-products from various agricultural processing industries.

The genetic improvement of animals has a substantial impact on productivity. Therefore, changes in animal performance is an important factor that the model incorporates. The model calculates the quantity of feed required as well as raw material breakdown for these feeds.

There are several animals not producing meat, milk and eggs that consume a substantial amount of animal feed, including protein. The feed consumption of these animals, including the protein materials, also needs to be accounted for.

By making use of least-cost linear programming and considering transport costs of raw materials across various regions of the country, the model has the ability to formulate the actual feeds required by all animals in South Africa, given the constraints by which quantity of raw materials will be domestically available.

The result is an accurate prediction and projection of protein requirements, both domestically and imported.

Current scenario

Based on the current per capita consumption of animal products, it is estimated by using the APR model that the requirement for animal feed in South Africa is as follows:

Table 1: National animal feed production 2015/16.

Feed type	National feed consumption (ton)
Dairy	2 136 384
Beef and sheep	3 512 035
Pigs	905 977
Layers	1 276 342
Broilers	3 323 278
Pet foods	325 789
Horses	135 670
Ostriches	116 063
Aquaculture	5 200
Total	11 736 738

Table 3: Historical consumption of oilcake (local and imported soya beans processed in South Africa).

Year	Local soya (ton)	Total oilcake (ton)	Local %
2008/09	565 181	1 664 916	33,9
2009/10	701 030	1 743 137	40,2
2010/11	624 912	1 857 391	41,3
2011/12	766 927	1 856 360	41,3
2012/13	760 321	1 877 671	40,5
2013/14	913 356	1 889 979	48,3
2014/15	1 197 604	1 914 330	62,6
2015/16	1 238 120	1 965 291	63,0

Growth in requirements

The population of South Africa, per BFAP's current projections, will increase from 54,7 million in 2015 to 57,67 million in 2020 and 58,4 million in 2025.

The per capita poultry consumption will increase from 35,18kg in 2015 to 39,47kg in 2020 and 42kg in 2025. The number of breeders required to sustain the broiler production will increase from 7,96 million in 2015 to 8,81 million in 2020 and 9,47 million in 2025.

Egg consumption is expected to increase from 7,48kg per person to 8,58kg in 2020 and 9,39kg in 2025. Beef consumption is expected to increase from 16,6kg to 18,57kg in 2020 and 21,32kg per person in 2025. Milk consumption will increase from 54,81 to 60,38ℓ per person in 2020 and 67,18ℓ per person in 2025.

Pork consumption shows slow growth from 4,05 to 4,62kg per capita in 2020 and 5,16kg in 2025, while growth in mutton consumption is even more modest – only increasing to 2,65kg in 2020 from 2,53kg in 2015. The per capita consumption for mutton in 2025 is 2,66kg per person.

Table 2: Oilcake consumption for 2015/16.

Oilcake type	National consumption (ton)
Soya oilcake	1 204 436
Sunflower oilcake	400 000
Cotton oilcake	98 000
Canola oilcake	68 255
Palm kernel	30 000
Soya full-fat	120 000
Cotton full-fat	42 600
Canola full-fat	2 000
Total	1 965 291

Soya oilcake remains the dominant protein source in South Africa. This dominance has increased over time and will continue to do so.

Table 4: Projections of feed and oilcake requirements for the years 2020 and 2025.

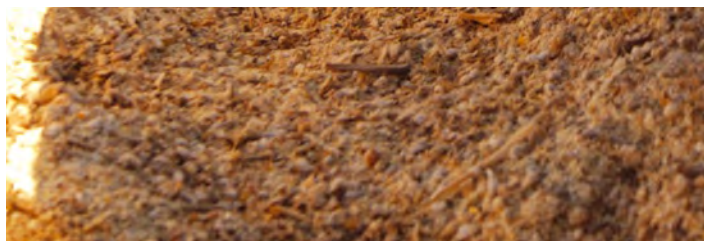
	Feed (ton)	Oilcake (ton)	Soya oilcake (ton)
2015	11 673 382	1 965 879	1 324 436
2020	12 767 149	2 074 931	1 537 927
2025	14 624 422	2 675 374	2 112 764

Soya oilcake remains the dominant protein source in South Africa. This dominance has increased over time and will continue to do so. Soya oilcake in 2010 made up 40% of oilcake requirements, which increased to 67% in 2015 and is predicted to increase even further to 74% in 2020 and 76% in 2025.

Poultry feeds make up only 39% of total feed consumed in the country. This market share of total feed is predicted to remain constant until 2020. Most oilcake is however used in this sector, with a share of 83% of soya oilcake consumption currently in this sector expected to remain relatively stable up to the year 2025.

Local soya oilcake production

The increase in local oilcake production from locally produced soya beans will make South Africa increasingly self-sufficient in respect of protein requirements.





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Table 5: Local vs imported soya oilcake.

	Local soya oilcake from local soya beans (ton)	Local soya bean production required (ton)	Total soya oilcake requirement (ton)	% local
2015	563 578	741 550	1 324 436	42,6
2020	1 216 000	1 600 000	1 537 927	79,1
2025	1 596 000	2 099 000	2 112 764	75,5

Table 6: National animal feed production 2020 and 2025.

Feed type	National feed consumption 2020 (ton)	National feed consumption 2025 (ton)
Dairy	2 295 316	2 606 020
Beef and sheep	3 908 470	4 650 657
Pigs	1 059 825	1 249 668
Layers	1 400 394	1 609 675
Broilers	3 437 963	3 728 545
Other	665 181	779 854
Total	12 767 149	14 624 422

Table 7: Oilcake consumption projection 2020 and 2025.

Oilcake	2020 ton	2025 ton
Soya oilcake	1 444 627	1 782 778
Sunflower oilcake	384 526	434 716
Cotton oilcake	37 424	44 033
Canola oilcake	88 795	123 786
Palm kernel	12 381	14 447
Soya full-fat	93 300	104 380
Cotton full-fat	48 553	53 734
Canola full-fat	2 749	3 629
Total	2 074 931	2 561 503

In conclusion

Feed requirements will increase to 14 624 422 tons in 2025 and 12 767 149 tons in 2020 from 11 736 738 tons. Oilcake requirements will increase from 1 965 291 tons to 2 074 931 in 2020 and 2 561 503 tons in 2025. Soya oilcake requirement will be 1 537 927 tons by the year 2020 and 2 112 764 by 2025.

The poultry sector plays a major role in oilcake and particularly soya oilcake usage. Growth and sustainability in the poultry industry will play a major role in oilcake requirements. The current increase in import volumes from Europe could play a major role in consumption in the future. It is not within the scope of this study to evaluate various scenarios. This will be conducted in a new study which is expected to be presented soon.

For South Africa to achieve 79% of soya oilcake requirement self-sufficiency by 2020, the country will need to produce 1,6 million tons of soya beans. To achieve 76% by 2025, the country will need to produce 2,1 million tons of soya beans.

For more information, contact the Protein Research Foundation at 011 234 3400. 🌱



PALM OIL

– a possible health and environmental dilemma

New findings in health research are a primary driver in the change of nutritional content of composite foods, cooking methods and nutrient additions. Numerous examples from the last 20 years demonstrate the symbiotic relationship between science and the food industry, including a reduction of saturated fats in foods, limiting salt, reducing refined sugar and, more recently, reducing the use of trans-fatty acids.

At the beginning of the new millennium, research started to emerge on the negative impact of this fat on cardiovascular health, as well as its role in diabetes and cancer. Trans fat is a type of unsaturated vegetable fat that has a trans configuration – instead of the more common cis configuration – that occurs through an industrial process which adds hydrogen (H) to liquid vegetable oils to make them solid.

High levels of heat can also cause vegetable oils to isomerise into trans fats if applied for long enough, for instance in industrial fryers that can reach temperatures exceeding 200°C.

In 2007, the World Health Organisation (WHO) published a scientific report to advise countries to actively aim to reduce this fat in foods. In 2010, the South African Department of Health (DoH) drew up legislation that aimed to regulate the use of trans-fatty acid in foods, and guidelines by the country's Heart and Stroke Foundation (HSF) followed suit, promoting the reduction of intake of this fat.

The implication was that manufacturers of many foods and fast food outlets required a fat alternative that did not convert to trans fats with heating, still providing the same solid (smooth) texture

and taste in foods without the industrial addition of hydrogen. The panacea to this problem was found in palm oil (PO).

What it is

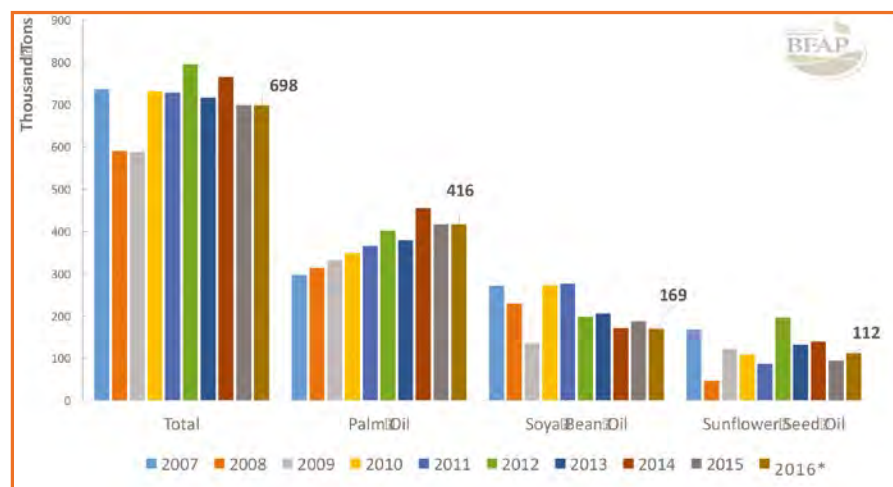
PO comes from the palm tree that is native to West Africa, South America and many Asian countries. In 2012, PO accounted for 32% of global fat and oil production and it has overtaken soya bean oil (SBO) as the main vegetable oil in the world.

PO consumption in South Africa has increased consistently and is now the most widely consumed vegetable oil. The country does not produce PO, and imports have increased from approximately 300 000 tons in 2007 to a peak of 455 000 tons in 2014, after which it seems to have settled at around 410 000 tons (Figure 1).



The nutritional analysis of palm oil's fat composition has indicated a high level of saturated fat, in particular palmitic acid, which amounts to 44% of the saturated fatty acid content.

Figure 1: Data on South African palm, soya and sunflower oil imports 2007–2016. (Source: Bureau for Food and Agricultural Policy)

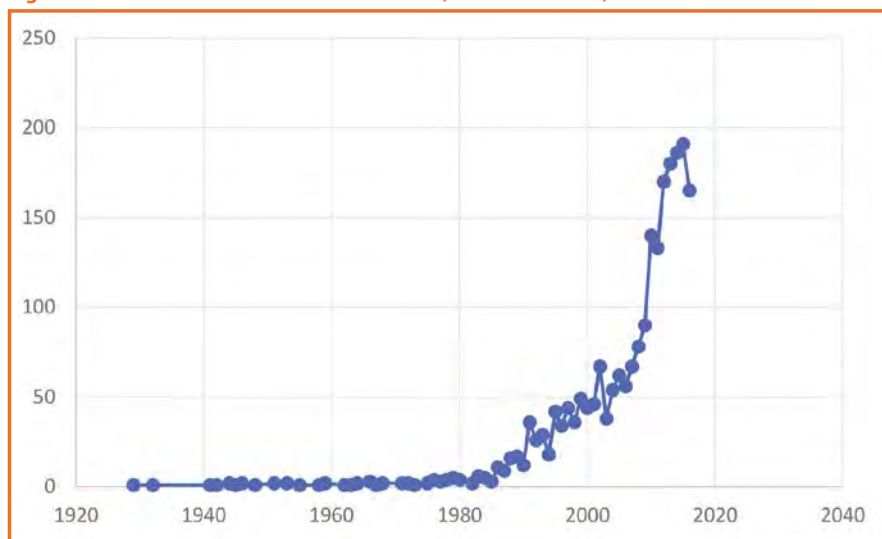


PO is not only a low-cost alternative to many other plant oils, but produces up to ten times more oil per unit area than other oilseed crops, and the fact that it is not genetically modified (GM) is attractive to the European market.

Two different types of oils are extracted from the palm fruit: palm kernel oil (PKO) from the seeds and PO from the mesocarp. The most commonly used in products is PO, which has a significantly different nutritional composition to PKO (Figure 2). Crude PO is naturally reddish in colour due to its high beta-carotene and vitamin E content. However, since a bland and pale coloured oil is required by industry, PO undergoes a chemical process which removes the majority of these useful micronutrients.

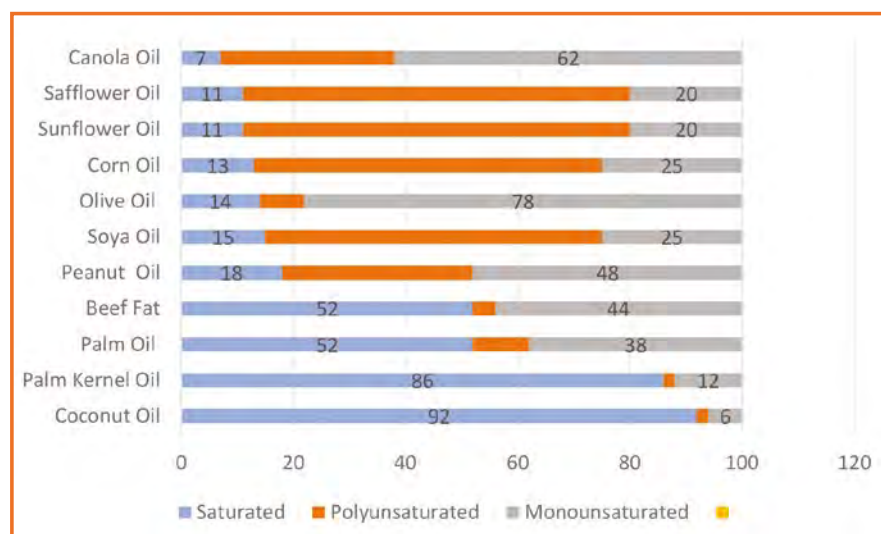
Although PO is classified as a vegetable oil, nutritional analysis of its fat composition has indicated a high level of saturated fat, in particular palmitic acid, which amounts to 44% of the saturated fatty acid content (Figure 2). In fact, its saturated fat content is similar to that of beef, something which has generated a significant amount of research with regard to implications to human health.

Figure 3: Publication on PO related to health. (Source: Pubmed)



Palm oil comes from the palm tree that is native to West Africa, South America and many Asian countries.

Figure 2: Nutritional content of common oils. (Source: British Nutrition Foundation)



Health research

Medical peer-reviewed articles on PO have followed the same trend in publications as its use in industry (Figure 3). In general health, there is agreement that fat per se – based on a moderate intake of 20 to 35% of total energy – plays a key role as nutrient.

In addition, a balanced intake of saturated, polyunsaturated and monounsaturated fats is advised, and avoiding excessive saturated fats (<10% of total energy intake) and trans fats is recommended by most health authorities, including the WHO and the Food and Agriculture Organisation (FAO).

The three main areas of concern that research has focused on with regard to PO is its impact on cardiovascular disease (CVD), cancer as well as obesity and type 2 diabetes. A recent systematic review of 30 publications has found that PO greatly increases low-density lipoprotein (LDL) cholesterol in comparison to vegetable oils. However, the findings concerning its negative impact on CVD is not universal and it is therefore acknowledged that further research is required.

It is known that dietary fat intake plays a key role in determining cancer risk. A

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Palm oil is not only a low-cost alternative to many other plant oils, but the fruit produces up to ten times more oil per unit area than other oilseed crops.



meta-analysis revealed that a high level of palmitic acid, the major saturated fatty acid in PO, is associated with an 89% increased risk of postmenopausal breast cancer. Moreover, another study has linked this fat to colorectal cancers.

Increased fat intake

However, as with the impact of PO on CVD, there are certain studies that found no impact related to patient population, dose exposure and lack of control for other dietary factors. Therefore, further studies are also required in this area.

The putative impact of PO on obesity and type 2 diabetes is related to the evidence that increased fat intake, in particular saturated fat as the main ingredient in PO, leads to inflammatory and oxidative stress, may impact negatively on gut microflora and lead to insulin resistance. All the aforementioned have been implicated in the pathogenesis of obesity and diabetes. However, numerous studies are based on mice models, and conflicting findings have been found in human subjects.

Although many questions remain with regard to PO and its health impact, it is important to consider the products that PO is generally found in. These include baked goods, sweets, cakes, cheese replacements, chips, chocolate, confectionary fats (i.e. chocolate spreads), biscuits, cooking oil, crackers, doughnuts, frozen meals (pancakes, pies, pizza), ice cream, industrial frying fats, instant

noodles, margarines, microwave popcorn, non-dairy creamers, peanut butter, salad dressings, snacks and soups.

The vast majority of the abovementioned foods are classified as energy-dense, high-fat, high-sugar foods and would not be recommended as part of a healthy diet. It is therefore important to note that the replacement of trans fats with PO in these products, have not made these foods 'healthier' or less harmful for humans.

Environmental impact

Even though countless questions still remain regarding the health impact of PO, the environmental impact of this oil is irrefutable. In particular, deforestation of rain forests in Indonesia, Malaysia and the Amazon has been blamed on the increasing demand for PO.

The United Nations Environment Programme (UNEP) estimates that most of the Indonesian forests will be decimated by 2022, and similar concerns exist with regard to the Amazon. The latter contains approximately 40% of the world's remaining tropical forests, along with its biodiversity and ecosystem services. Brazil has 29 million hectares of land suitable for PO cultivation in the Amazon, and 2,8 million hectares are available outside of this region.

In the Brazilian Amazon rainforest, more carbon dioxide (CO₂) is stored in trees than in any other country (47,9 billion tons in

3,3 million square metres). The loss of rain forests has devastating effects on the global environment, and efforts are made to ethically source PO and also to modify vegetable oils not to produce trans fats in a bid to ensure that more sustainable sources are used.

Public awareness, in particular among the younger generation, of this environmental impact in Europe has led to a reduction of PO use in products, customers increasingly avoiding the purchase of

products containing PO and fast food outlets sourcing modified oils that do not convert to trans fats when heated to high temperatures.

Conclusion

The increased use of PO has been driven by concerns over the effect of trans fats on health. While the use of PO in South African products has made it possible to abide by national legislation and international guidance to reduce trans fats and may have calmed consumer concern, it does bring with it two real ethical dilemmas.

The first is related to the paucity of data on the human health impact of PO in the long term, and whether its use in lieu of trans fats may, in fact, have negative health consequences for future generations. The second is related to PO having a significant negative impact on the environment.

Industry has no choice but to alter food ingredients based on current guidelines and PO is at present a cost-effective and simple way to achieve this. However, it is still the individual's decision whether he/she wishes to consume products containing PO or not. This choice should be influenced by current scientific data on the impact on both the health and environmental aspects.

For more information and references, contact the author at r.meyer@imperial.ac.uk.

Competitiveness

of local grain and oilseeds industries on the global market

Globalisation is becoming more of a reality, not only in the industrial sector, but also closer to home in the agricultural industry. It can be seen in the consolidation of input suppliers and the effect of international prices on local ones.

Locally, producers compare crops and regions to determine competitiveness through study groups and several financial aspects. The big question, however, is how do we measure up to the rest of the world's producers when it comes to globalisation and the free market.

One of the major contributing factors in competitiveness is the subsidies received by governments. Global grain and oilseeds stocks are currently high and this puts pressure on prices, which in turn has a direct impact on profitability. The United States (US) government recently announced plans to support its producers with R96 billion. The aid comes as a result of low prices and represents an effort to ensure sustainable agricultural production.

Subsidies globally

The US is not the only country whose producers are being subsidised. Subsidies are determined by taking producer support estimates (PSEs) into account, as calculated by the Organisation for Economic Cooperation and Development (OECD). It is clear that countries in the European Union (EU) receive as much as 19,25%, but other countries' subsidies are relatively low (Table 1). In financial terms, however, subsidies are not a good principle to follow.

Table 1: Subsidies in different countries according to PSE calculations.

Developed economies		3-year average
Australia	%PSE	1,89
Canada	%PSE	9,65
EU	%PSE	19,25
US	%PSE	8,71
Emerging economies		
Brazil	%PSE	3,33
Russia	%PSE	6,82
Ukraine	%PSE	-6,13
South Africa	%PSE	1,67

The real issue is how competitive our local producers can produce at farm level compared to other countries. The Bureau for Food and Agricultural Policy (BFAP) forms part of the international agri-benchmark network, which collects this type of data through typical farming methods to be made available for comparison.

According to the report, it is clear that local maize, wheat and soya bean yields are within the international average, except for our typical irrigation farms (Figures 1, 2 and 3).

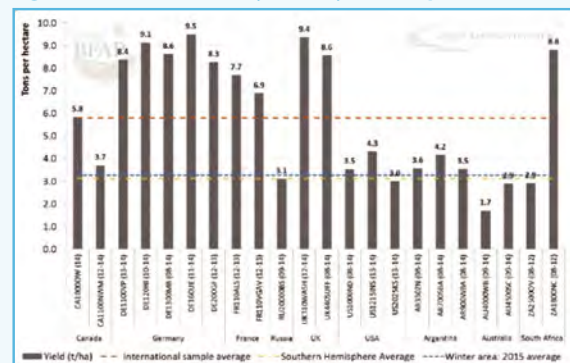
Figure 1: South African maize yield compared to other countries.



Figure 2: South African wheat yield compared to other countries.



Figure 3: South African soya bean yield compared to other countries.



Lower yields naturally have a direct effect on production cost per unit produced (Figure 4). From Figure 4, it is clear that South African production costs of maize are higher than the average of the participating countries, and that we cannot compete at cost level. This also applies to the wheat industry (Figure 5).

Figure 4: South African maize production costs compared to other countries.

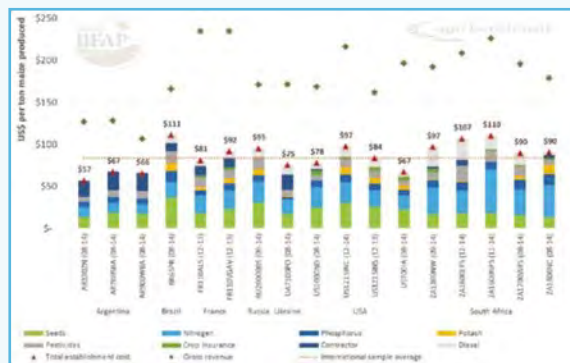
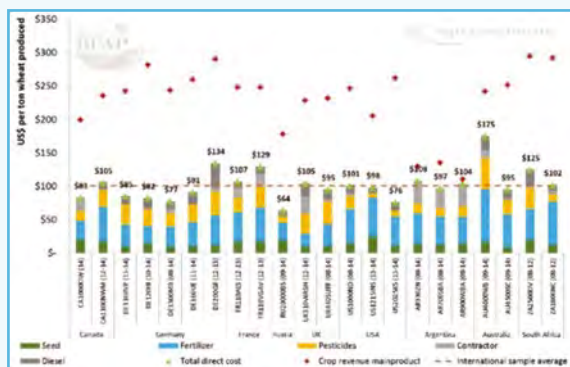
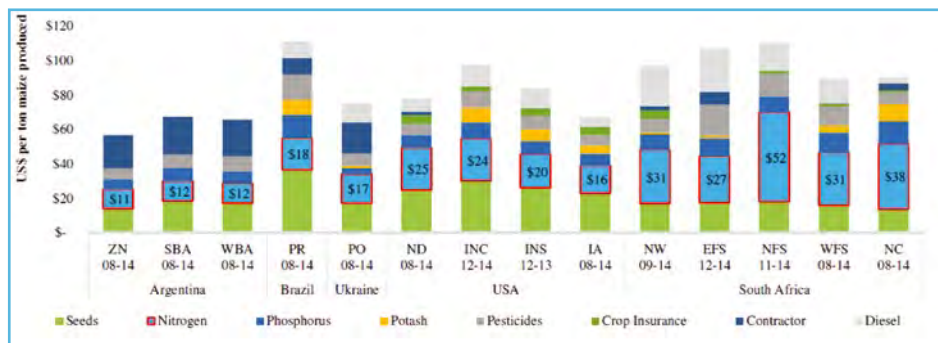


Figure 5: South African wheat production costs compared to other countries.



With regard to production costs, one of the major challenges is the effect of fertiliser prices on competitiveness. Fertiliser is one of the chief components of production costs, amounting to approximately 40% of maize production (Figure 6).

Figure 6: Percentage fertiliser of production cost.



Fertiliser prices

When comparing our fertiliser prices with those of other countries, it is clear that local prices are higher. Bear in mind that South Africa is a net importer of inputs. South African nitrogen (N) is the second-most expensive of the countries compared and its phosphates are the fourth-most expensive (Figures 7 and 8).

Figure 7: Cost of South African nitrogen compared to other countries.

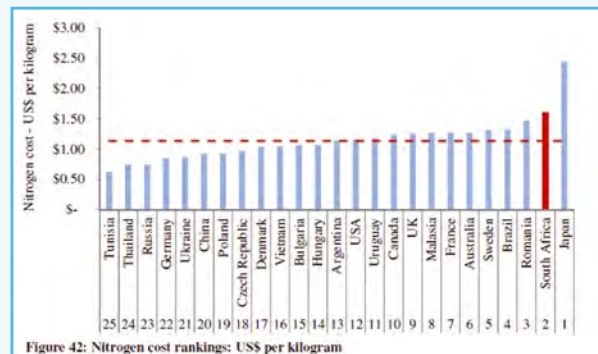
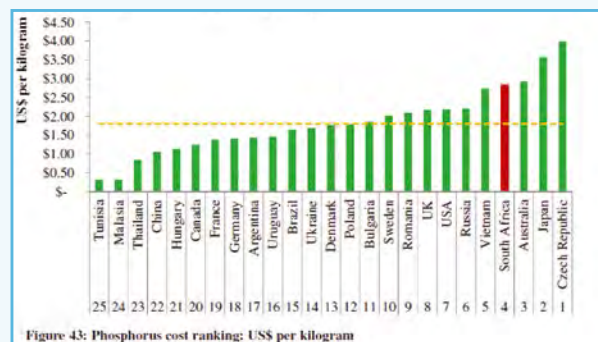


Figure 8: Cost of South African phosphates compared to other countries.



While local gross margins fall below the international average, South African production is not at the bottom of the spectrum. Our producers are still faring better than those in countries such as Brazil and Argentina (Figures 9 and 10).

The real issue is how competitive our local producers can produce at farm level compared to other countries.

Multi Mikro™ & Zinc Sulphate Monohydrate

Pellets available from Zinchem



Zinchem is proud to announce that as of June 2016, a selected range of Multi Mikro™ products and our Zinc Sulphate Monohydrate will be available in pellet form.

We recommend that farmers approach blenders to consider the pelletised technology.

Initially Zinchem will offer the following Multi Mikro™ products in pellet form:

- Grain crops, oil and protein seeds **B4501**
- Potato **B4498**
- Vegetable **B4500**

2-5mm round pellets with the following nutrient information:

	Reg. no.	Zn%	Cu%	Mn%	Fe%	Mo%	B%	Total %
Grain Crops, Oil & Protein Seeds	B4501	22.4	0.6	1.7	2.6	–	1.3	28.6
Potato – Foliar Application	B4498	8.0	1.1	2.0	2.6	0.4	5.9	20.0
Vegetable Crops – Soil Application	B4500	9.9	1.0	5.6	2.0	1.2	2.2	21.9

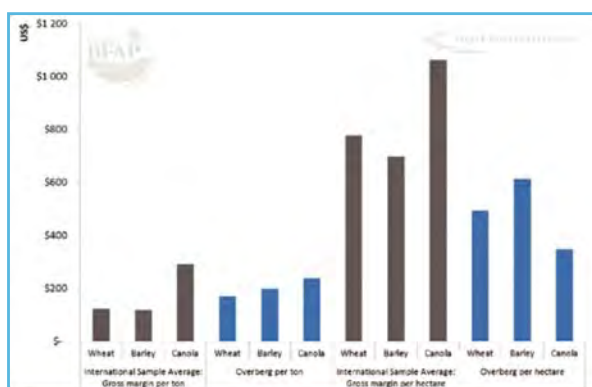
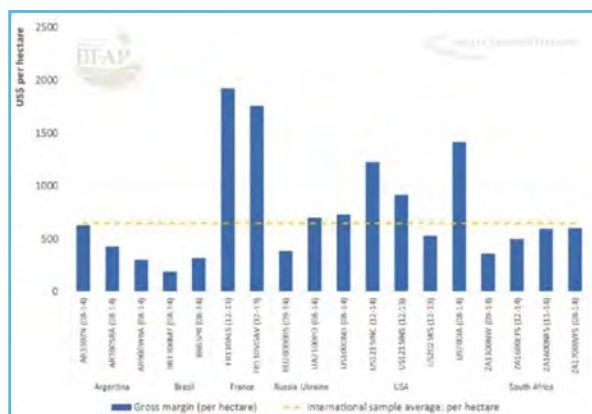
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The Zinc Sulphate Monohydrate Pellets – B621- with 34% Zn and B3987 with 28% Zn will also be available in 2-5mm round pellet format.

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Figures 9 and 10: South African gross margins in relation to other countries.



Does this mean that our local producers are not good farmers and that we cannot farm competitively? By no means: In certain industries, the margins are still positive and farming remains competitive. Local producers should be commended for the rapid growth in the market. Improved technology, production methods and availability of seed have resulted in better results, and if it is possible to build on this, the local market will certainly become more competitive. There has been good progress in our grain industries in relation to the major global role-players, according to *Figure 11*.

Figure 11: Progress in South African grain industries.

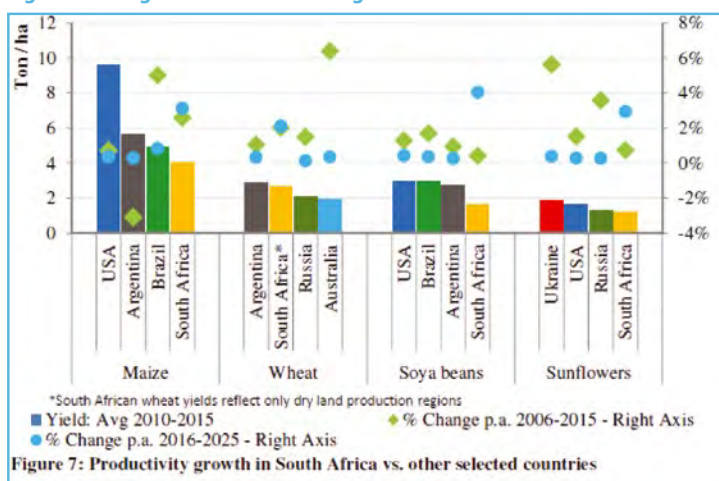


Figure 7: Productivity growth in South Africa vs. other selected countries



Local producers should be commended for the rapid growth in the market.

What, however, is needed to make South African production more competitive? The answer lies in support relating to sustainability and providing the producer with opportunities to build on recent growth, which will ensure food security over the long term.

Establishment of partnerships

More research and development should be undertaken to ensure that South Africa's growth is consistently superior to that of its competitors. This can only be realised by means of co-ordination and the establishment of public and private partnerships.

The availability of new technology specifically developed for local conditions, is extremely important to ensure yield growth. It is here that the end-point royalty (EPR) system will play a significant role in South Africa.

Crop marketing will play an even greater role in future. A substantial capital investment could see crop yields increase by a ton per hectare and with a good marketing strategy in place, even 3t/ha becomes a possibility. In short, it will become increasingly important to invest in marketing.

The effective use of inputs will be equally important. This does not necessarily mean using the most inexpensive inputs. Producers will have to consider applying standard financial principles to production, where input will provide them with the highest yield at the highest profit margins possible. Simply put, use the per-unit application that promises the highest profit.

Contact Dr Strydom on 086 004 7246 or dirks@grainsa.co.za, or Divan van der Westhuizen on 012 420 5021 or divan@bfap.co.za for more information.

High supply amid troublesome weather conditions

Supplies on the global market is still very high and prices are determined by overall weather conditions. According to the International Grains Council (IGC), the world will produce 334,2 million tons of soya beans which is 19 million tons more than last season.

The larger supply, however, is also supported by a greater demand. The growth in demand is from 319,2 million tons in 2015/16 to 332,6 million tons in 2016/17. All of this generates an ending stock increasing by 1,5 million tons to 35,4 million tons (Table 1).

Table 1: World supply and demand of oilseeds. (Source: IGC)

	2014/15	2015/16	2016/17
Opening stock	28	37,3	33,9
Production	320,5	315,7	334,2
Consumption	311,8	319,2	332,6
Ending stock	37,3	33,9	35,4

On the global front, the South American market, in particular Brazil, has started harvesting their crop. Increased rainfall is putting pressure on the harvesting of soya beans and there is some concern regarding the occurrence of diseases and deterioration of quality. The crop expectation in Brazil remains favourable at 103 million tons.

In Argentina, floods have been a huge problem, with losses of as much as 500 000ha recorded. However, the country has seen drier weather patterns in the last two weeks of January. These weather conditions supported prices on the international market and the current crop expectation is 52,3 million tons, representing a three-year low. Therefore, there are still a few uncertainties regarding the current season. However, looking at the current expectations, supply will still be higher than demand.

Pressure on the maize price

In the Northern Hemisphere the United States (US) will start planting in April, begging the question whether more soya beans will be planted at the expense of maize hectares. The expected global maize ending stock is 225 million tons. These high stock levels have put pressure on the international maize price.

With the more stable soya bean price and the latest increases due to weather conditions, the price ratio of soya bean and maize favoured soya. A year ago, the soya/maize price ratio was at around two. Currently it is 2,3, as indicated in Figure 1. The expectation is that more soya bean hectares will be planted in the US. This means that soya bean prices may be under pressure in the longer term. However, this still depends on weather conditions and the adjustment in vegetable production, which is currently supporting the demand.

With the more stable soya bean price and the latest increases due to weather conditions, the price ratio of soya bean and maize favoured soya.

Prices on the local front are highly dependent on international prices and are a good indicator of derived prices. In the last two weeks of January, the two prices – namely the South African Futures Exchange (Safex) and derived – diverged from one another (Figure 2). This means that either the local price must decrease toward the derived price, or the international prices need to increase. This emphasises the importance of closely monitoring the South American market.

Figure 1: US soya-maize price ratio. (Source: Grain SA)

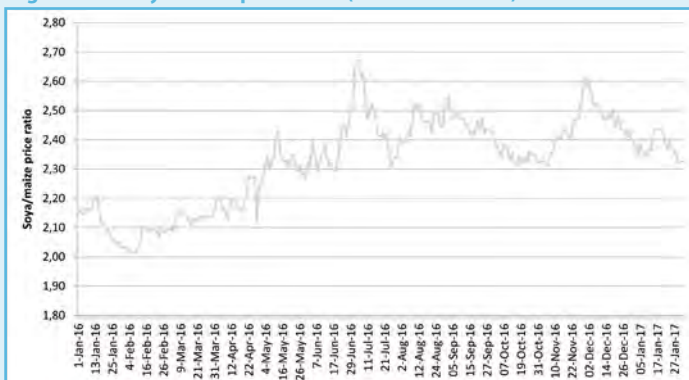


Figure 2: Prices of derived soya bean delivered in Randfontein.



Table 2: Supply and demand of soya beans in South Africa.

Updated 27 January 2017	Grain SA projection			
	27 January 2017	2017/18**	2017/18**	2017/18**
Marketing year	2016/17*	Scenario 1	Scenario 2	Scenario 3
Area planted (x1 000ha)	503	542,2	542,2	542,2
Yield (t/ha)	1,47	1,5	1,65	1,8
CEC crop estimate ('000 ton)	742	813,3	894,63	975,96
Retentions and production of seed	30	30	30	30
Early deliveries 2012				
Plus: Early deliveries 2013				
Available for commercial deliveries	712	783,3	864,63	945,96
	Grain SA	Grain SA	Grain SA	Grain SA
	('000 ton)	('000 ton)	('000 ton)	('000 ton)
Commercial supply				
Opening stocks (1 March)	89,1	146,8	146,8	146,8
Commercial deliveries	711,6	783,3	864,63	945,96
Imports	450	230	150	70
Total commercial supply	1 250,7	1 160,132	1 161,462	1 162,792
Commercial demand				
Commercial consumption				
Food	23,8	25	25	25
Feed (full-fat soya)	103,1	132	132	132
Crushed for oil and oilcake	960	850	850	850
Total	1 086,9	1 007	1 007	1 007
Other consumption				
Withdrawn by producers	0,6	3	3	3
Released to end consumers	1,3	3	3	3
Seed for planting purposes	7,0	6	6	6
Sagis (Note eight sundries)	0			
Total	8,9	11	11	11
Total RSA soya bean demand	1 095,8	1 018	1 018	1 018
Exports	8	9	9	9
Total commercial demand	1 103,8	1 027	1 027	1 027
Carry-out (28 February)	146,8	133	135	136
Pipeline requirements	135,9	126	126	126
Surplus above pipeline	11	7	9	10
Carry-out as a % of RSA consumption	13,4%	13,10%	13,23%	13,36%
Carry-out as a % of total commercial demand	13,3%	12,99%	13,11%	13,24%

Domestic market

On the local front the Crop Estimates Committee's (CEC) final report indicated that the soya bean crop was adjusted slightly upward from its previous report, from 741 550 tons to 742 000 tons, which represents 0,06% or 450 tons. *Table 2* illustrates the various scenarios that could realise locally.

Another key factor is the exchange rate which poses a huge risk for the current soya bean price, mainly due to its high volatility and unpredictability. If economic growth takes place in the first quarter, the rand with strengthen, albeit gradually. If political uncertainty were to remain intact and no to little economic growth is realised, there would be a more aggressive weakening of the rand.

Aspects that should be closely monitored in the short term, include the production conditions in South America and the exchange rate. Over the longer term, though, the more pressing issues will be the crushing margins of processing plants, the exchange rate, American plantings and vegetable oil production levels.

For more information, contact Dr Strydom on 086 004 7246 or dirks@grainsa.co.za.

Tariff classification of blanch^{ed} groundnuts



South Africa has always been a net exporter of raw groundnuts, with a high demand for our product in especially European countries and Japan. Likewise, we have a stable local demand with an average commercial consumption of around 60 000mt – of which half goes toward the direct edible market and just over 40% to the manufacture of peanut butter.

When considering exports – which are limited more by supply than demand – and local requirements against production, the import and export figures published by the South African Revenue Service (SARS) under the different tariff lines help to gain some insight and perspective.

Three tariff lines are relevant in groundnut trade (excluding peanut butter):

- 1202.42: Groundnuts, not roasted or otherwise cooked, shelled or broken.
- 2008.11.20: Groundnuts, roasted.
- 2008.11.90: Groundnuts, other.

Eight years' trade volume data (2009–2016) are available on the SARS website for all three tariff lines. For six out of the eight years, the combined imports exceeded the exports. During this period, an average of 95% of exports were reported under tariff line 1202.42, or so-called 'raw' groundnuts.

Changes to import duties

Between 2009 and 2013, on average only 21% of the imports were counted as 'other' under tariff 2008.11.90. The relevance of these figures is the fact that for as long as anyone in the industry can recall, blanched groundnuts have always been declared under the 'other' tariff line. In 2014, the 'other' or blanched portion

substantially increased to 48% of the combined imports, according to SARS data.

According to internal policy and circumstances, countries attach different import duties to certain harmonised commodity description and coding system – harmonised system (HS) – tariff lines. In South Africa, import duties for tariff 1202.42 and 2008.11.90 are set at 10% and 0,99c/kg respectively.

The process refers to the removing of the skin from the kernels (seeds) through application of heat and a mechanical process.

In early 2015, reports from importers emerged, claiming that SARS had indicated that blanched products should no longer be cleared under Chapter 20, but instead under 1202.42. Since no official notice had been received, this caused substantial confusion – not only for importers who had earlier SARS determinations in favour of Chapter 20 on record but due to general practice prevailing, based on peer conduct.

Initial consultation between SARS and the South African Groundnut Forum (SAGF) representatives did not shed any light on the reason for the sudden change in how SARS officials applied the rules of interpretation as prescribed in the HS. However, in a letter to the SAGF from the chief officer: Customs and Excise at SARS in January 2016, it was stated that the determinations in early 2015 was

supported by an "informal opinion" issued by the World Customs Organisation (WCO) – of which the SAGF were regrettably unable to obtain a copy or website reference.

Significant effect on importers

The effect of this unforeseen reclassification had a significant and detrimental effect on importers. Firstly, existing seasonal contracts were not negotiated considering the higher import duty prescribed for heading 1202.42, and as such the economic viability of these contracts were suddenly highly questionable.

Secondly, SARS began a process of auditing all imports for the preceding two years (2013 and 2014), claiming duty, interest and fines on the basis that 1202.42 should have applied. Especially in light of the increased blanched imports for 2014, the amounts in question run into the millions of rand and if enforced will most probably have a crippling effect on numerous smaller import businesses. Based on pre-existing determinations and practice, individual importers have engaged in the lengthy process of appealing these findings with SARS.

On further enquiry, it became clear that interpretation of this specific issue differs among groundnut-trading countries – with some classifying blanched groundnuts under Chapter 12 and others under Chapter 20. The SAGF requested SARS – representing South Africa at the WCO – to lodge an official request for the classification and tariff code determination for blanched groundnuts. The secretariat received a letter from South Africa in July 2015, requesting the committee to address the issue at the 56th session of the Harmonised System Committee (HSC) at the WCO headquarters in Brussels,



Belgium (September 2015).

In this letter, the official viewpoint from the South African representatives was that blanching of groundnuts does not alter the character of the product. They are not “otherwise prepared” and must therefore be classified under heading 12.02. The presentation further highlighted the various viewpoints from the local industry, and a presentation by the SAGF was submitted along with this letter.

Blanching process

From correspondence, it is clear that the various methods of blanching – not only applicable to groundnuts – are one of the main issues complicating this matter. In a working document, the secretariat noted that in terms of groundnuts the process refers to the removing of the skin from the kernels (seeds) through application of heat and a mechanical process (such as brushes), thereby aiding the subsequent processing into other products such as peanut butter.

The secretariat further noted that for heading 12.02 to apply, the heat treatment applied must fulfil two conditions:

- It must be carried out at temperatures below that of roasting and cooking of groundnuts.
- It must not alter the character of the seeds as natural products.

It therefore seems that the issue would be resolved by either amending the wording in the headings and/or explanatory notes, or to determine whether the process of blanching does indeed alter the character of the kernels.

At the 57th session held in March 2016, the HSC continued their investigation into the matter and it was concluded that three volunteer administrations – Japan, the United States (US) and Korea – would analyse samples of blanched groundnuts submitted by South Africa, relating to parameters deemed most relevant by the Science Sub-Committee (SSC), with particular reference to organoleptic properties, moisture content, enzyme activity (peroxidase and polyphenols) and nitrogen (N) solubility index.

Classification implementation

These results were made available to the committee and discussed at the 58th session held between 28 September and 7 October 2016. When put to a vote, the HSC decided by 26 votes to 19 to classify blanched groundnuts under heading 20.08 (Subheading 2008.11) by application of General Interpretation Rules 1 and 6.

**We have a stable
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Member countries had two months in which to file reservations against the implementation of the decision. Considering the great impact this decision would have on European imports in particular – where duty would increase from zero to between 11,2 and 12,8% – it is expected that major exporters such as the US and Argentina will continue with their diplomatic efforts to have this decision reconsidered at the next session set for March 2017.

For the time being, the SAGF has advised members to continue using heading 1202.42 until the process has run its course and the World Health Organisation (WHO) and SARS have given official statements and rulings in this regard. In any event, importers should ensure that they have an official SARS tariff determination at all times for any product they import, regardless of what is deemed as prevailing general practice.

The harmonised system and how it works

In over 200 countries, governments and private sectors use this internationally recognised, multi-purposed system as basis for custom tariffs and trade statistics such as taxes, trade policies, monitoring of controlled goods, trade and transport statistics, quota controls, economic research and analysis. The HS and WCO do however not provide information on duty rates as these custom duties are formulated and applied on a national level by WCO members.

According to the WCO website, the system covers around 5 000 commodity groups and over 98% of internationally traded merchandise, each identified by a six-digit code arranged in a logical structure and supported by rules and explanatory notes to ensure uniform classification and interpretation.

Developed by the WCO, the ongoing maintenance of the HS remains a priority in response to technology and trade developments. Contracted parties (member states) to the HS convention are represented on the HSC, which is tasked to examine and consider issues related to policy, classification questions, settlement disputes and preparing amendments to explanatory notes.

The full HS is also updated every five to six years. Decisions with regard to interpretation and application, for instance classification decisions and amendments to the explanatory notes, come into effect two months after approval by the HS committee, being reflected in amending supplements of the relevant WCO publications.

Any further updates will be communicated via the usual industry channels, including the SAGF meetings and correspondence as well as postings on the following blog page: <https://sagroundnut.com/>. For more information, contact Adri Botha at groundnutforum@opot.co.za. Visit www.wcoomd.org to learn more. 🌱

Competition for land use:

A threat to agriculture?

The competitive demand for agricultural land was discussed at the 2016 Agri SA congress by a panel of experts on the subject. Among others, the panel consisted of Dr Gerhard Verdoorn, director of the Griffon Poison Information Centre, Dr Victor Munnik, researcher in geography and environmental studies at the University of the Witwatersrand (Wits) and Derek Light, an attorney involved in environmental research.

Large tracts of land rich in natural resources have been used for mining, in which case it directly competes with the agricultural industry for available land. In certain cases, this is done with dire consequences to the environment and a complete disregard for proper licensing. Furthermore, land that has been used for mining can never be rehabilitated for agricultural use and has long-lasting effects on biodiversity and food security.

There is, however, a third major competitor for land, namely role-players involved in the conservation of natural habitats and the rich biodiversity of South Africa. Not only mining, but also agriculture threatens the delicate balance

required for a healthy environment. Preserving our country's natural resources is also vital for the survival of our booming tourism industry.

The mining, agricultural and tourism industries all contribute significantly to the local economy. Can a balance be achieved in dividing South Africa's land and water equally to support these three industries? And how can this be done in a way that ensures food security and preserves the environment?

The coal mining industry

According to Statistics South Africa (Stats SA) the mining industry contributes an average of R234 270,15 million to the country's gross domestic product (GDP). In comparison, the average GDP of R58 064,83 million derived from agriculture might not seem as impressive, but agriculture feeds the nation.

The damaging effects that mining has on the environment puts its value into question. The industry often contaminates water resources, leaves land infertile or eroded and pollutes the air. As was discussed by the panel, this is especially true for coal mining and fracking to

excavate shale gas. Mining activities are also often conducted without the necessary licences to mine and use water. Areas demarked for conservation are often mined on without permits, thereby violating several environmental acts.

Dr Munnik believes mining is unfairly privileged in land use decisions, without applying for proper licensing. At the congress, Munnik shared the findings of a 2016 study entitled 'Zero Hour: Poor Governance of Mining and the Violation of Environmental Rights in Mpumalanga', conducted by the Centre for Environmental Rights (CER). The study illustrates unfair land use by the mining industry and its devastating effect on agriculture in the province.

According to the report, "the Department of Mineral Resources (DMR) grants rights for mining without having regard for the cumulative impact on water resources, biodiversity, air quality and food security, nor the health or wellbeing of affected communities, despite the consideration of these factors being required by law."

Conserved wetlands in Mpumalanga are often mined illegally with devastating effects on biodiversity, water and soil quality.

A practical example

"In 2013, the Federation for a Sustainable Environment (FSE) addressed letters to the DMR and the Department of Water Affairs (DWA), alleging that Umsimbithi Mining (Pty) Ltd (Wonderfontein Colliery) operating on a farm in Mpumalanga, was conducting its mining activities in contravention of the *Mineral and Petroleum Resources Development Act, 2002* (Act 28 of 2002) (MPRDA), *National Environmental Management Act, 1998* (Act 107 of 1998) (Nema), the *National Water Act, 1998* (Act 36 of 1998) (NWA) and others.

"The FSE alleged that Umsimbithi was using water for mining purposes even though its water use licence (WUL) had been suspended. Under the NWA, a WUL is suspended when an appeal has been lodged against a decision to grant the licence, pending the outcome of such appeal. The FSE had lodged an appeal against the DWA's decision to grant the WUL in 2013, which has to date not been decided.

"The FSE also alerted the DWA about the company using water in contravention of the WUL by conducting mining operations within 500m of a wetland – an activity explicitly prohibited under the WUL.

"In addition, Umsimbithi was using the land for mining, whereas it was zoned solely for agriculture in the Emakhazeni Municipality's land use scheme. The DMR failed to respond to FSE's letter, nor to its follow-up letters and has, to date, not conducted a site inspection or taken any other action in response to these allegations."

(Source: CER, 2016)

Fracking in the Karoo

There has been great interest in the deep shale gas reserves in the Karoo, and several companies have applied to commence unearthing this by utilising the hydraulic fracturing process to explore for and – if viable reserves were established – produce methane gas from these reserves. According to Light, also involved in research on fracking in the Karoo, this followed in the wake of a wealth of concerns and objections raised by interested and affected parties, including agricultural landowners.

Light shared some of these concerns at the congress:

- The lack of meaningful legislation and regulation.
- Lack of compliance with already inadequate legislation.
- Potential negative impact on water quality and reserves in a water-scarce region.
- Limited scientific knowledge on the potential impacts on the environment and the geohydrology of the Karoo.

Threat to the agri industry

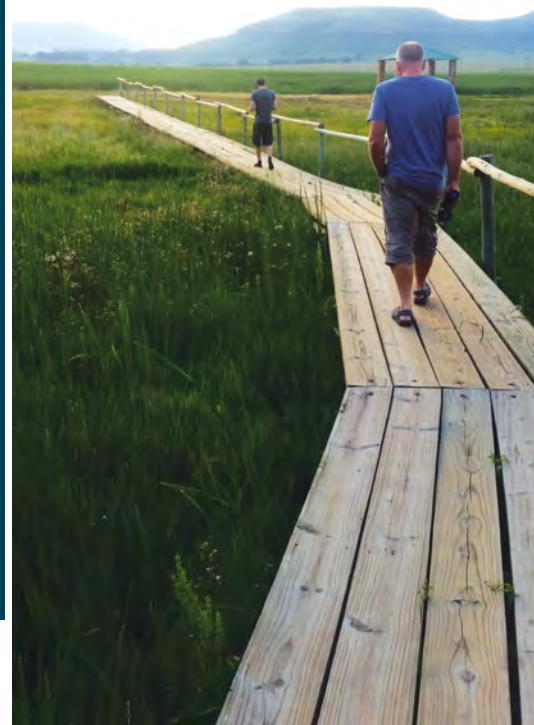
High-value agricultural land is a very limited resource in South Africa. This is according to Steve Galane, director of communication services at the Department of Agriculture, Forestry and Fisheries (DAFF). According to a recent study, the total land area with a moderately high to high land capability for agricultural purposes is 11,6 million hectares, less than 10% of the surface area of the country.

A study conducted by the department in 2011 indicated that more than two million hectares of arable land have already been permanently converted to other land uses. Mining is one of the land uses threatening the wellbeing of land. "Currently mining is ploughing

ahead with a devastating effect, without taking biodiversity, farming and water catchments into consideration," noted Dr Verdoorn, an environmentalist and agriculturist.

A study conducted by the department in 2011 indicated that more than two million hectares of arable land have already been permanently converted to other land uses.

The CER study reports that Mpumalanga produces a significant proportion of South Africa's staple foods, such as soya beans, maize and dry beans. However, the unbridled expansion of mining in this province is eroding its arable land, and there are rising concerns over the impact of mining on agricultural production. Water, soil and air pollution from mining affect agricultural yields,





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posing a threat to food and water security.

As emphasised by Light, the Karoo makes a massive contribution to local food security and the economy with its high meat, wool and mohair production. Fracking threatens agriculture in this region by competing for land and the already limited resource of groundwater, with the potential of contaminating water resources.

Impact of agriculture

If responsible farming practices are not the rule, agricultural activities can be very destructive to the environment and can have a devastating effect on biodiversity. "Harmful agricultural practices such as the misuse of pesticides and poisons to kill predators have a chain reaction in the environment, killing numerous mammals, birds and even reptiles. Total habitat transformation also impacts grossly on biodiversity as it denudes the habitat of vegetation supporting animal life.

"The current practices of dividing large natural areas into small camps for intensive breeding of game is another example of damaging agricultural practices that impact on biodiversity. There are numerous examples of bad agricultural practices, but just as many examples of good ones which contribute to biodiversity conservation."

Agriculture also requires large amounts of water, and producers were reminded of this fact – and several other damaging effects on the environment – by Dr Morné du Plessis, CEO of the World Wide Fund for Nature (WWF) South Africa, who was also present at the congress.

Importance of conservation

Ecological biodiversity is the support base for all life forms, including the human species. Without biodiversity, there would be very little to support humankind. Dr Verdoorn explained that biodiversity is not simply a diversity of species, but includes the diversity of landscapes, ecological regions, the diversity of habitats within ecoregions, species within habitats and genotypes within species.

"Tourism contributes 10% to the



GDP – more than mining which has declined to levels below this figure. The sector is therefore also important to the local economy. South Africa's popularity is thanks to our rich biodiversity of mountains, deserts, oceans and animal life. According to Verdoorn, conservation and agriculture, if managed correctly, can be both sustainable and very often complementary. Mining, however, is not.

Legislation regulating land use

"Currently there is no protection of conservation and agricultural land," says Verdoorn. At present, DAFF administers the *Subdivision of Agricultural Land Act, 1970* (Act 70 of 1970) (SALA), the objective of which is to control the subdivision and use of agricultural land.

If responsible farming practices are not the rule, agricultural activities can be very destructive to the environment and can have a devastating effect on biodiversity.

According to Galane, "the act is 'old order' legislation not applicable to state land and state-owned entities, and mining applications are exempted from it. Therefore, agricultural land in these areas are subjected to conversion to other land uses. The resulting loss and fragmentation

of agricultural land impact negatively on the sustainability of agro-ecosystems and agricultural production."

However, a new agricultural land development and preservation policy and bill has been proposed to preserve and develop agricultural land. "The purpose of the bill and policy is to ensure that such land achieves its productive capacity to ensure that sufficient land is made available for food production to support national and household food security. The bill will also promote a balanced approach to the use of agricultural land in South Africa.

"In addition, the bill makes provision for the demarcation of agriculturally protected areas and the establishment of an agricultural land register. This will provide a more proactive approach and assist in improving the management of agricultural land in the country."

The policy and bill were gazetted for public comment on 2 September 2016. The department is currently processing the written inputs received as well as those received during the workshops. The intention of the department is to submit the final draft policy and bill for the preservation and development of agricultural land to the cabinet during the 2017/18 financial year. The completion of this process will depend on the parliamentary processes which are outside the control of the department.

Can balance be achieved?

Dr Verdoorn suggests that there must be a national plan in place which identifies biodiversity hotspots, prime agricultural land and prime mineral resources. "The plan should firstly ensure that biodiversity hotspots are protected against any invasive land use such as mining and unsustainable agriculture. Thereafter, prime agricultural land must be identified and protected against invasive land use practices such as open-cast mining.

"Once this is achieved, mineral resources can be developed under strict policies and guidelines to prevent downstream knock-on effects on biodiversity hotspots and prime agricultural land." 🌱

Consumption of soya bean:

The link to decreased breast cancer incidence

Breast cancer is one of the most lethal female diseases in Western countries. While the incidence of breast cancer in Caucasian women is higher than that in Hispanic and Asian women, the disease has been increasing in China.

The precise aetiological factors for breast cancers are still unclear. It has been shown that variant dietary factors partially account for the differing incidence of breast cancer among Caucasian, Hispanic and Asian females. In terms of dietary factors, there exists a marked difference in the consumption of soya bean products between Asian women and those from Western countries.

A number of epidemiological studies suggest that increasing soya consumption appears to be related to the decreased risk of recurrence and/or mortality. In this review, types of soya products and their nutritional functions, consumption and production are briefly described. Several lines of evidence are also presented, demonstrating the association of soya food consumption with the decreased incidence and prognosis of breast cancer. Several possible molecular mechanisms involved in the chemopreventive effects of genistein (Gen) on breast cancer are outlined.

Nutritional value and health benefits

Soya bean, called 'shu' in ancient Chinese, is one of the five main plant foods in China, along with rice, wheat, barley and millet. Soya bean originated in China and has been cultivated for approximately 5 000 years.

Soya bean was first introduced to



Human food products made from soya beans. (Photograph: www.gofitu.com)

Southeast Asia, later to Europe in the 18th century and to America in the 19th century. Since the 1940s, soya bean has become one of the chief economic crops in the United States (US). Currently, the US is the largest soya bean producer in the world, constituting more than 35% of global production in the 2011/12 season.

Soya bean has been widely cultivated, with a worldwide annual planting area of 102,77 million hectares and a harvest of 239,36 tons in the 2011/12 season, generating an income of \$114 billion for producers. The US, Brazil, Argentina and China are the current global leaders of soya bean production, with a combined harvest of 205,27 tons in the 2011/12 season making up 86% of international production. Over the past eleven years, worldwide production of soya beans has

been increasing.

The main commercial interest in soya is due to its oil and protein. Soya bean composition varies depending on variety, location, climate and farming practices. Dry, mature, raw soya beans typically contain 8,5% moisture, 36,5% protein, 19,9% lipids and 9,3% dietary fibre, according to United States Department of Agriculture (USDA) nutritional database.

Second only to palm oil

Protein and lipids combined constitute more than 60% of soya bean on a dry weight basis. Before the recent surge in interest in soya bean protein, oil was the main purpose of the commercial production of soya bean. According to a USDA report, soya bean oil (SBO) is the second-most produced vegetable oil in

the world, with a total global production of 42,92 million tons, after palm oil's 55,29 million tons produced in 2012/13.

SBO contains 15,6% total saturated fatty acids, 22,8% total monounsaturated fatty acids, and 57,7% total polyunsaturated fatty acids. Fat has long been considered a key issue in human diets and numerous scientific studies have focused on the impact of the consumption of various types of fat on health.

In the most recent release of the *Dietary Guidelines for Americans*, a USDA expert panel recommends consuming less than 10% of calories from saturated fat, and replacing them with monounsaturated and/or polyunsaturated fat associated with lowering the risk of cardiovascular disease.

SBO contains a very high level of unsaturated fatty acid and a significant amount of omega-3 fatty acids, which is considered part of the healthy fat group. Alpha-linolenic acid (ALA) (an omega-3 fatty acid) in SBO is an essential fatty acid for human nutrition, which means it cannot be synthesised by humans. Regular consumption of foods rich in omega-3 fatty acids can provide many health benefits, including reduced cardiac mortalities.

As more has been learned about soya bean over the past few decades, the focus has shifted to its other properties, especially its protein content. Protein provides amino acids (AAs) to human diets. Proteins from different sources have different AA compositions, which will affect its nutritional value in diets, especially concerning essential AAs.

Evaluation of nutritional quality

There are various methods to evaluate the nutritional quality of food proteins. The Protein digestibility-corrected amino acid score (PDCAAS) method is currently the most accepted one for such purpose, replacing the protein efficiency ratio (PER) method in 1989.

Soya protein's PDCAAS score (1,0) is ranked highest among vegetable proteins, equalling that of milk proteins (casein, whey protein) and egg protein,

which shows that soya protein provides complete AAs to human nutrition. In comparison, wheat gluten, another popular plant protein commonly found in vegetarian diets, only has a PDCAAS score of 0,25.

Recently, the FAO recommended a new method of evaluating protein quality – digestible indispensable amino acid score (DIAAS) – which is said to correct some of the limitations of the PDCAAS method. This will undoubtedly change the way people evaluate various proteins for their nutritional value.

However, there is a lack of available data to compare various proteins' nutritional value using this new method, due to the fact that this recommendation was only recently released by the FAO. Unlike other proteins, soya protein's health benefits reach far beyond simply providing AAs and there have been numerous studies on this subject over the past few decades.

For instance, Anderson et al. summarised 37 primary studies and concluded that the consumption of soya rather than animal protein significantly decreases serum concentrations of total cholesterol, low-density lipoprotein (LDL) cholesterol and triglycerides. Its mechanism was extensively studied.

Reducing the risk of heart disease

Crouse III et al. established a direct link of naturally occurring isoflavones in soya proteins and the lowering of total and LDL cholesterol. However, another study seemed to indicate that isoflavones did not play a key role in soya protein's cholesterol-lowering effect.

On 26 October 1999, based on all the scientific evidences, the US Food and Drug Administration (FDA) issued a final ruling on the health claim of soya protein, petitioned by Protein Technologies International (PTI). The ruling states that diets low in saturated fat and cholesterol, which include 25g of soya protein a day, may reduce the risk of heart disease. In the ruling, the FDA proposed that soya-based food should contain 6,25g soya protein per serving in order to qualify for this health

claim. This has been the most significant event for the soya bean growing and processing industry over the past few decades.

Since the FDA's endorsement of the soya health claim, a number of studies have further demonstrated the link between soya product consumption and lowering the risk of congenital heart disease (CHD). In 2003, Hermansen et al. reviewed 50 research studies and confirmed the positive relation between soya consumption and improving cholesterol profile. In 2011, Anderson et al. reviewed a total of 43 studies from 1996 and 2008, concluding that consuming a median of 30g soya protein per day significantly improves the lipoprotein risk factor of CHD.

Beneficial to overall health

However, the soya protein health benefit is not without controversy. In 2006, the American Heart Association's (AHA) science advisory panel reviewed 22 studies and found that isolated soya protein with isoflavones has minimal effect in lowering LDL. Although the finding does not agree with other studies, the panel still recommends that soya products are beneficial to cardiovascular and overall health because of their high content of polyunsaturated fats, fibre, vitamins and minerals and low saturated fat content.

The FDA's confirmation of the soya health claim serves as fuel for soya product market growth, and has dramatically altered the status of soya in mainstream diets. Between 2000 and 2007, more than 2 700 new soya-based food products were introduced in the US market, and the soya market grew 4,5 times to 4,5 billion between 1996 and 2009. This market reached 5,2 billion in 2011.

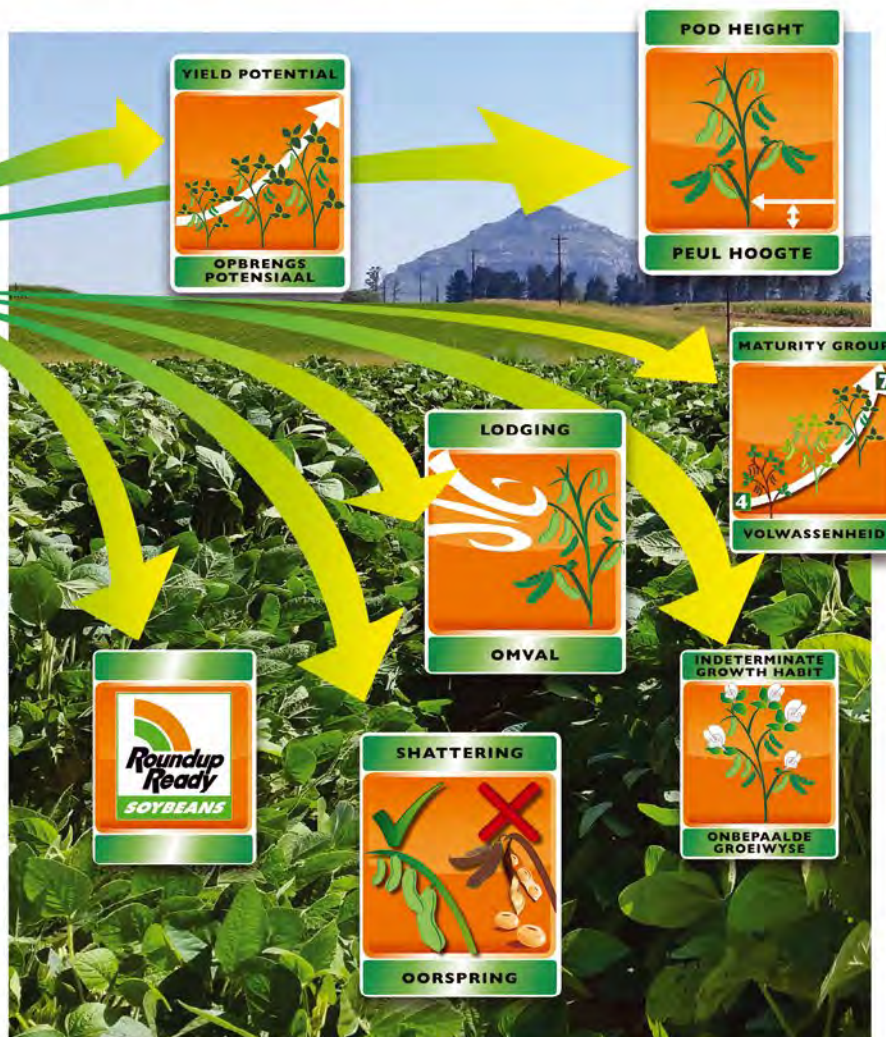
According to information presented on the website of the Soyfoods Association of North America (SANA), energy bars and soya milk are the two largest categories, with soya-based energy bars overtaking soya milk's number one position in 2011. The energy bars market also represents the largest growth from 2010 to 2011, with a 14,7% increase in total sales.

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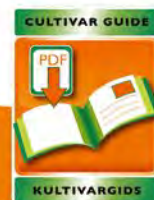


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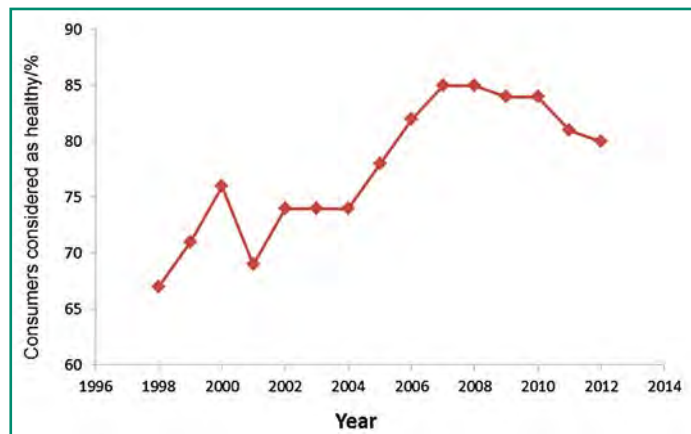
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Healthy image established

With extensive conventional media coverage and information flow in social media, soya's healthy image has been established among many consumers young and old. The United Soybean Board (USB) has been monitoring consumer attitudes toward soya for a number of years. In 1998, 67% of consumers considered soya products as healthy. This percentage increased to over 80% in 2005. Since reaching a peak of 85% in 2007 and 2008, it slightly dropped to 81% in 2011 (*Figure 1*).

Figure 1: Survey results of consumer attitudes to soya.



With a better understanding of soya protein's health benefits and consumers' increasing acceptance, soya product use has reached a wider market. In 2000, the USDA approved the use of certain soya products in school lunch programmes. This set a milestone in the soya industry, since it was the first time that soya products could be used in a USDA school lunch programme as 100% of the serving instead of only an additive.

A study of middle schools located in Maryland, US showed that students accept soya-based products just as well as other popular school lunch items. In February 2012, the USDA further approved tofu and soya yoghurts as a credit for meat or a meat alternative component in school meal planning. This policy came into effect on 1 July 2012.

The explosion of research on soya and its relation to human health has produced a large amount of information, offering a deeper understanding into soya's health benefits on a molecular level, and many related subjects have been extensively studied. Since 1994, the International Symposium on the Role of Soya in

Health Promotion and Chronic Disease Prevention and Treatment has been organised on a mostly biannual basis, with the 9th symposium held in Washington, DC in October 2010. Scientists from around the world shared their scientific findings and knowledge regarding various health issues impacted by soya consumption, including cholesterol, heart disease, breast cancers, prostate cancers, bone health, menopausal symptoms, weight loss, renal function and cognitive function, to name but a few.

Based on all these findings, soya products can play a critical and positive role in improving our health if incorporated into our diet, although there remains much to be understood, especially with regard to the mechanisms involved.

Summary

This paper outlines the available information regarding the consumption of soya-based foods, soya isoflavones and breast cancer incidence. Looking at the history and current status of soya bean production as well as several types of

products and their nutritional functions, there has been an increasing trend in the production and consumption of soya foods in the US and around the world over the last few decades.

Several lines of epidemiological evidence indicate a linear relationship between increasing soya consumption and a decreased risk of recurrence of breast cancer and mortality, particularly among Chinese women. The possible molecular mechanisms involved in the chemo-protective effects of Gen on breast cancer include the impact of Gen as an agonist of oestrogen receptors (ERs), epigenetic and genome-wide effects, activation of peroxisome proliferator-activated receptors (PPARs), induction of apoptosis and stimulation of autophagy.

However, the precise molecular mechanisms are still far from being clearly understood. Given that Chinese women have traditionally consumed more soya bean-based foods, which is related to lower breast cancer incidence, and the fact that there is an increasing trend of breast cancer incidence in China – partially due to the recent switch to Western diets – it is essential to conduct further in-depth and more comprehensive studies on the molecular mechanisms underlying the positive effects of soya bean isoflavones on breast cancer.

Such studies would be valuable in paving a scientific basis for future prevention of the increasing occurrence of breast cancer in China, by switching back to traditional diets based on soya bean-derived foods.

This article has been shortened and edited. For the full article and references, contact Fen-Jin Hea at support@naturesoya.com or Jin-Qiang Chen at Jinqiang.chen@fcc.edu.

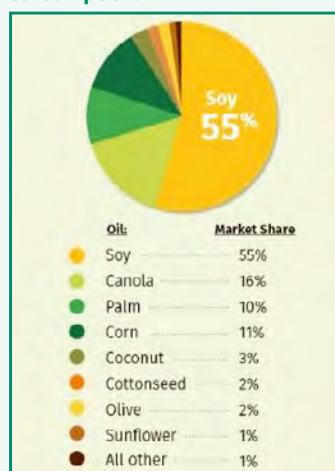
The untapped potential of soya bean oil in South Africa

In South Africa, sunflower seed oil is still the most commonly used bottled oil. In the United States (US), however, the most widely available and widely used oil is soya bean oil. According to a 2013 publication by the United Soybean Board (USB), approximately 60 to 75% of all fats and oils used for human consumption in the US is derived from soya bean oil.

Due to its neutral flavour and well-balanced fatty acid profile, it is a versatile oil with various uses such as cooking, frying, baking, preparing salad dressings and other food production uses. It is also preferred by consumers, since it is low in hydrogenated fat, contains no trans-fatty acid (TFA), is high in poly- and monounsaturated fats and high in essential fatty acids. According to the USB, it is the principal source and primary commercial source of vitamin E and omega-3 fatty acids in the US diet.

There may very well be untapped potential for the production of soya bean oil for human consumption in South Africa. Local soya bean production for oil is estimated at 190 000 tons, with 200 000 tons being imported. A total of 390 000 tons are consumed locally each year, compared to a total of 450 000 tons of sunflower seed oil.

Figure 1: US edible vegetable oil consumption.



Heart health and oil

In the early 1980s, research showed that animal fats and tropical oils typically used for frying, baking and confectionary increase blood cholesterol levels. This has raised concern over its contribution to heart disease, which forced food manufacturers to consider alternatives. (*Trans-fat update: Food Products and Design Supplement 2007*).

Many companies turned to partially hydrogenated vegetable oils, low in saturated fat and free of dietary cholesterol. This was considered ideal for frying, baking and giving the desired texture to foods, without the undesirable effects of saturated fats.

Hydrogenation is a process which adds crystal structure, making oils act like a semi-solid or solid fat. It increases the oil's stability and shelf life, and the shelf life of products it is added to. During this process, fatty acids

convert to trans form, producing TFAs. This makes oil adaptable to many uses. Dairy and meat products naturally contain trans-fats too.

Despite this, 21st century research showed that trans-fat – like saturated fats – also negatively impacted health. Research showed that trans-fat causes higher cholesterol levels and contributes to increased morbidity and risk to heart disease. It also promotes inflammation, causes endothelial cell damage and affects insulin sensitivity.

Need for healthier alternatives

In 2004, the US Food and Drug Administration (FDA) published regulations requiring producers of packaged food products to label the content of trans-fat in their products. The FDA further warned consumers to limit their intake of TFAs.

Consumers have consequently had a heightened interest in knowing which fats are 'good' or 'bad', and as a result food manufacturers have seen a demand for foods free of TFAs, low in saturated fats and rich in beneficial fatty acids such as omega-3s. Fuelled by this and the FDA's decision to include TFAs on food labelling, the fats and oil industry has diligently developed new ingredients and improved technologies, producing oils that preserve the structure and taste of foods without the negative health effects.

Healthier oils can be produced in a number of ways:

- Inter-esterification allows highly saturated hard fat and liquid vegetable fats to combine and produce fats with the best characteristics of both types of fat. This allows the production of customised fats with a range of melting points, increased stability and added creaminess. It can be used for margarine, baked goods and confections. Inter-esterified products are trans-fat-free and considered cholesterol-neutral.
- Hydrogenation modification involves modified techniques for producing highly hydrogenate oils, but producing minimal trans-fats.
- New varieties of seed have been bred to select seed mutations with modified fatty acid composition. Seed breeding and genetic engineering can produce oils with a targeted omega-3 fatty acid content, high- or mid-oleic acid content or low-linolenic content.

Alternatives to trans-fat oils

A switch to saturated fats is also seen as an alternative to hydrogenated fats, but benefits should be weighed against the negative effect on blood cholesterol levels.

Soya bean oil is an ideal alternative to other oils high in trans-fat. It is also high in healthy fatty acids and one of the few plant-based sources of omega-3. Research has shown that soya bean oil is a viable alternative to trans-fats, since it contributes to cardiovascular health.

Although its trans-fat content has also been up for discussion in the US, collaborative efforts by the USB are underway to bring enhanced soya oil traits to the marketplace which are trans-fat free

and higher in healthy fatty acids. As a result, the US soya bean industry reintroduced low linolenic soya bean oil as a substitute for partially hydrogenated vegetable oil products.

Benefits of soya bean oil:

- Clean and natural taste that consumers prefer.
- Almost imperceptible smell enhances foods.
- High emulsifying ability makes it adaptable.
- Adaptable to bottled form and for use in other products.
- Ideal for baking, frying, confectionary, margarine and shortening.
- Provides essential fatty acids and vitamin E.
- Cholesterol-free and low in polyunsaturated fat.
- Low in hydrogenated fat and trans-fat-free.
- Various soya bean oil traits to choose from.

(Source: USB)

Various uses of soya bean oil

Soya bean oil is the natural extraction of whole soya beans. Besides the bottled version found in almost every American kitchen, soya bean oil is also widely used in everyday food products and for preparing food service products.

In the US, oils sold at grocery shops labelled as vegetable oil are usually 100% soya bean oil or a blend of soya and other oils. It is also used for manufacturing margarine and in shortening. It has also become an invaluable replacement for hydrogenated fats at food companies such as Kellogg's and Kentucky Fried Chicken (KFC).

The popularity of soya bean oil in the US can be attributed to its adaptability, large production volume and supply security. Another reason this oil is so popular among consumers is its high essential fatty acid (EFA) content and low TFA content, making it an ideal partial replacement for hydrogenated vegetable oils that are usually high in trans-fats.

Soya oil for custom needs

This also spurred a desire for seed producers to develop a soya bean with increased oil

yields and modified fatty acid composition. Genetically engineered (GE) seeds produce oils with a targeted fatty acid composition, such as soya bean oil with increased omega-3 fatty acids.

Soya bean production can therefore be customised to provide producers with an oil featuring the desired fatty acid composition and no trans-fats. For instance, a soya bean oil can be produced with 3% less linolenic acid compared to the 7% less in conventional soya bean oil.

A high-oleic soya bean oil can also be produced, containing more than 50% oleic acid versus up to 30% – making it more stable, less easily oxidised, having a long shelf life and used for deep-frying. This means the oil does not need hydrogenation and therefore trans-fats are eliminated. There are also varieties that offer increased omega-3s.

Although soya bean oil is already low in saturated fat compared to other oils, research has been conducted to develop soya bean oil containing even less saturated fat. It for example contains 7% less saturated fat than the traditional 15%.

Food products

Soya bean crops can also be processed into a number of different food products. Soya bean protein is a common alternative to meat-based proteins, and can be enjoyed fresh (edamame) or processed into tofu or other meat protein replacements.

Another common use is for soya milk production and it can also be used as dairy alternatives such as soya cheese or yoghurt. Such alternatives to animal products have become popular globally and in the local market, as consumers grow more aware of the role they play in a healthy diet and lifestyle.

Soya beans can also be turned into fermented products such as tempeh (soya cake) and the popular Asian condiments, miso and soya sauce (tamari/teriyaki). Other uses include gluten-free flour, infant formulas, soya nut butter, concentrated and isolated soya protein for supplements such as protein shakes and bars, and soya fibre that is produced from the hulls removed during initial processing.

References available from the author at email ursula@veeplaas.co.za.

Zimbabwe's soya bean production for cooking oil

THE ROAD TO SELF-SUFFICIENCY

For roughly 14 years, South African and Botswanan cooking oil brands dominated supermarket shelves across Zimbabwe. As the country's economic crisis impacted local manufacturers and farmers, President Robert Mugabe's government suspended the duty on imported basic commodities, making it possible for local retailers and ordinary people to purchase large volumes of

cooking oil, among other food items, from South Africa, Zambia, Mozambique and Botswana for resale and household consumption.

Around the same period, President Mugabe's land seizure campaign was at its peak. His government forcibly evicted

approximately 4 500 white farmers from their land and resettled 380 000 indigenous people there. Output of key crops – maize, tobacco, wheat and soya beans – dropped drastically.

As almost 95% of all cooking oil in the country is soya-based, processors ran out of raw material to manufacture the product. Then, according to the Oil Expressers' Association of Zimbabwe (OEAZ), locally produced cooking oil accounted for 15% of the market share, with 85% met by imported products.

Meeting the demand

It took a government ban on cooking oil importation in January 2014 to improve the availability of local brands. After two years, oil expressers say, their brands now control the market at 95%. This recovery, however, has exposed local farmers who are failing to produce sufficient amounts of the product, to meet manufacturer demand.

"There is a huge gap with regard to our ability to satisfy the demand from processors, not only of soya-based cooking oil, but sunflower as well," says Zimbabwe Farmers' Union (ZFU) president, Abdul Nyathi. "But the interest and skills are there. The problem is the price which is inadequate to cover production costs."

Information from the OEAZ indicates that Zimbabwe requires 300 000 tons of soya beans per year to produce 48 million litres of soya-based cooking oil, yet farmers produce an average of 70 000 tons per annum. A 2014 study by the Zimbabwe Commercial Farmers' Union (ZCFU)



It took a government ban on cooking oil importation to improve the availability of local brands.

indicates that a producer price of at least US\$800/t would be viable, but processors were buying the crop at a maximum of US\$520/t at the time.

Industry role-players

Given the failure by growers to produce sufficient amounts of soya beans and the relative expense of importing crude oil, manufacturers have this season started contracting farmers to grow the crop. United Refineries Limited, whose production capacity rose from 60% in 2014 to 80% in 2016, is spending US\$2 million on soya bean contract farming this season. The factory requires 96 000 tons of oilseed per year, but is receiving half of this volume from local farmers, says CEO, Busisa Moyo.

We import crude oils, since the country cannot produce enough soya bean.

Pure Oil Industries is planning to finance the growing of soya beans on 2 000ha under contract, while another manufacturer, Surface Wilmar, recently announced a plan to invest in 1 500ha to grow the crop. The Grain Millers' Association of Zimbabwe (GMAZ) and



Grain and Oilseed Traders' Association of Zimbabwe (GOTAZ) announced that they will invest US\$200 million in soya bean and maize contract schemes in 2016. Contracted farmers are set to put a total of 100 000ha under soya beans and 50 000 under maize.

OEAZ chairman, Sylvester Mangani, noted the following at a recent stakeholders' conference: "It is necessary for us to integrate backwards into corporate farming so we can produce the soya beans ourselves. We have made presentations to government and hopefully will receive a positive response. We import crude oils, since the country cannot produce enough soya beans. Agriculture should be geared toward producing more seed for us to crush and reduce crude oil imports."

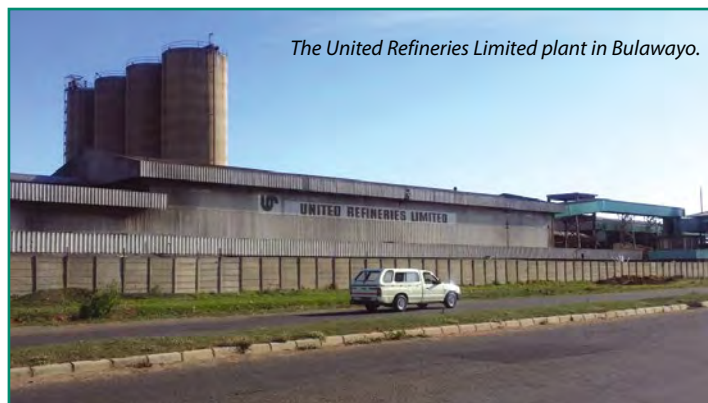
In an effort to beat the import restrictions, South Africa's Willowton Group has built a US\$40 million cooking oil manufacturing plant in Mutare. The factory was scheduled to start operations in December 2016, CEO Bruce Henderson said recently.

The plant will manufacture the full range of Willowton's products, including D'Lite cooking oil, a popular brand before the January 2014 import ban which has created 100 jobs. Pure Oil Industries, which is importing 50% of its crude oil, says its plant can produce seven million litres of cooking oil, but the shortage of soya beans is hampering progress.

Government involvement

Mugabe's government points to the recovery of the domestic cooking oil sector as evidence of the positive implications of its protectionist policies. In June 2016, his government imposed further restrictions on the importation of up to 80 products, defending the move as a strategy to minimise imported competition for local industries.

In its 2016 manufacturing industry survey report released on 23 November, the Confederation of Zimbabwe



The United Refineries Limited plant in Bulawayo.

Industries (CZI), the national union of manufacturers, said industrial capacity utilisation rose from 34,3% in 2015 to 47,4 % in 2016, thanks to the import restrictions. The foodstuffs subsector ranks third at 56,1%, metallic mineral products second at 57,5% and the wood and furniture subsector is at 57,8%.

Speaking after touring Surface Wilmar and Pure Oil Industries plants in Harare in September, vice-president, Emmerson Mnangagwa, praised the companies for increasing output, but was not pleased with the failure of farmers to grow enough soya. "Our Ministry of Industry and Commerce made correct recommendations to the government, since we are now producing cooking oil in Zimbabwe and I am advised that we have domestic supplies being produced locally, which has reduced our import bill," he told journalists.

Profitability of crops

He said the boom in cooking oil manufacturing has encouraged the government to consider expanding its command farming system – originally targeted at supporting some 2 000 farmers to grow 400 000ha of maize – to include soya beans. However, Davis Marapira, deputy minister of agriculture, recently observed in an interview that the average producer price of the bean will likely continue to discourage farmers from growing it. Maize, he says, is more profitable to grow than soya beans.

"We have three key crops whose growing we always want to encourage," said Marapira, also a farmer. "These are maize, wheat and soya beans. We are faring well with maize, but are facing a few challenges with wheat and slightly

more with soya. Our farmers show more profit when growing maize rather than soya, considering the fact that the Grain Marketing Board (GMB) is paying US\$390/t while private buyers are paying between US\$580 and US\$600 for a ton of soya beans.

"On the surface, it may seem that soya is more profitable, but locally a capable farmer produces more maize per hectare than soya beans. A skilled farmer growing maize can harvest between 12 and 15 t/ha, but 4t/ha will be the best he can achieve in case he grows soya beans. Therefore, with maize one can achieve as much as US\$5 850/ha, while the best soya bean grower reaches only US\$2 400 at best."

Locally a capable farmer produces more maize per hectare than soya beans.

Commercial maize millers and oilseeds processors, he says, do not offer an attractive price for soya beans under their US\$200 million contract deal announced in September. Therefore, chances are that they have failed to attract a sufficient number of growers to put 100 000ha under soya. "Be that as it may," said Marapira, "we want to grow more soya beans in a bid to reduce imports. Farmers who grow wheat can use soya beans as an effective rotational crop which also matures quite fast."

Edible oils manufacturers are importing crude oil from Zambia where ZCFU president, Wonder Chabikwa, says farmers are subsidised to up to 50%. "Without a subsidy," he says, "we cannot compete and they will continue to import their raw materials. Local farmers cannot bear the cost of production, given what the market pays. Local production cost is uncompetitive compared to other countries." 🌱

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