The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

The South African Sunflower Complex

A report by the Bureau for Food and Agricultural Policy (BFAP)

Compiled for the

Olie- & Proteïensade Ontwikkelingstrust & Oliesade Advieskomitee
Oil & Protein Seed Development Trust & Oilseeds Advisory Comittee

Oilseed Advisory Committee (OAC)

Dec 2013 – Jan 2015

Acknowledgements

The Bureau for Food and Agricultural Policy is most grateful to the Oilseed Advisory Committee for providing the funding for further research in the sunflower oilseed industry. These research initiatives are greatly appreciated by the industry.

The various industry representatives are also acknowledged for their valuable contribution and collaboration in respect of the relevant topics addressed in this report. Included here are various seed manufacturers, primary producers of sunflower, sunflower seed processors within the oil industry, the South African grain industries – SAGIS, Grain SA and SAGL – as well as government agencies such as ARC-GCI and NAMC.

Compiled by

Mr Gerhard van der Burgh
Prof. Ferdi Meyer
Ms Tracy Davids

www.bfap.co.za

Disclaimer: *The views expressed in this report reflect those of BFAP and do not constitute any specific advice as to decisions or actions that should be taken. Whilst every care has been taken in preparing this document, no representation, warranty or undertaking (expressed or implied) is given, and no responsibility or liability is accepted by BFAP as to the accuracy or completeness of the information contained herein. In addition, BFAP accepts no responsibility or liability for any damages of whatsoever nature, which any person may suffer as a result of any decision or action taken on the basis of the information contained herein. All opinions and estimates contained in this report may be changed after publication at any time without notice.*

Foreword

The objective of this study was to evaluate and analyse the South African sunflower value chain in order to assess the overall state of the industry. The study maps out the sunflower seed, sunflower oil and oilcake value chain, displaying the linkages between the various components within the South African oilseed industry.

A further inclusion of global market trends creates the necessary arena for evaluation, while also setting the baseline context from which to work.

The sunflower oil industry is an extremely important segment of the country's oilseed industry as a whole. South Africa is expected to remain a net importer of sunflower oil and oilcake. On the processing side, the study provides a financial breakdown of the chain, highlighting the latest trends and developments taking place in the industry.

The study further aims to provide useful information to be used in identifying opportunities whereby the sunflower industry can improve and maintain international competitiveness, from both a primary and secondary production perspective.

Executive summary and recommendations

Sunflower production:

The ability of sunflowers to produce relatively consistent yields under adverse weather conditions, along with their overall characteristics of drought tolerance, make this crop an attractive option for farmers in dryland production regions. Sunflowers can also produce a crop on marginal soils and with very little or no additional fertiliser. Nevertheless, under ideal growing conditions or irrigation, sunflowers do not provide the same upward potential as crops like maize and soybeans. In essence, in South Africa, sunflowers are currently regarded as a favourable crop under conditions of low-input farming, where the yields are more resilient relative to other crops.

- On average, sunflowers account for approximately 3.8% of the total area cultivated in South Africa (which is estimated at 13.2 million hectares). Competing crops such as maize and soybeans account for approximately 20.5% and 3.7% respectively.

- Currently, areas such as the Southern and Western Free State, as well as the drier parts of the North West Province, are ideally suited to sunflower production. Crop rotation with sunflowers is proven to reduce risk. In recent years, major strides have been made in introducing soybeans as a rotational crop; however, these drier regions where sunflowers are produced successfully will most likely be regarded as the “final frontier” for soybeans to make a major mark as a rotational crop to maize.

- The cost of producing sunflowers tends to be less than that of maize, with an average cost difference ranging between R500 and R900 less per hectare (depending on the region) in 2013. The relative profitability of sunflower production changes rapidly – minor improvements in yields (e.g. 0.3 t/ha) have a substantial effect on returns per hectare and overall farm profitability due to high price levels. Significant differences are evident in the average yields reported in survey data, as well as the actual average yields obtained in the field. This supports the finding that in many instances, sunflowers are regarded as a “catch” crop, rather than a priority crop that receives the necessary inputs and attention.

- Therefore, the general perception is that sunflowers are not as profitable as maize, yet the crop budgets of the PRF, Grain SA and BFAP representative farms illustrate that with a good yield, the gross margin per hectare for sunflowers can in fact be higher than that of maize.
- One important drawback of sunflowers compared to maize is that whereas maize production provides a significant amount of crop residue for livestock grazing, there is hardly any crop residue for livestock grazing following the sunflower harvest.

- Ultimately, returns per hectare remain one of the key drivers of crop choice. This in turn creates the much-needed drive to enhance production practices that will result in yield increases comparable to those of major sunflower-exporting countries such as Argentina, Ukraine and Russia. South Africa’s national average yield is approximately 20% below the international average. However, the average yields of the national trials are 24% higher than the average international yield of the top 4 producing countries.

Executive summary and recommendations

Sunflower production (cont.):

- The national trial data is of great value to the long-term competitiveness of the industry. These trials provide an objective evaluation medium in the country, with the results being highly valued by the firms and farmers involved. The results also indicate that there is a substantial gap between trial yields and true farm yields, with this gap seemingly being larger for sunflowers than for crops like maize and soybeans. Soils, fertiliser applications, and planting and cultivation practices are believed to be the main constraining factors in terms of possible yield improvements, and these factors differ across production regions and national trials.

- Additional trial evaluations could incorporate a greater emphasis on elements affecting the profitability of sunflower cultivation, as opposed to a focus solely on yields. In other words, similar to the recent drive in research to illustrate the profitability of soybean and canola production, factors like time of planting, planting population, various fertiliser uses, the impact of Imazamox in the case of Clear Field sunflowers in a crop rotation, etc. need to be revisited. In addition to the herbicide factors, Atrazine persistence in soils (from previous maize crops) is believed to reside in soil for periods of up to 12 months, but this will also depend on the application levels. It is therefore further recommended that new trials should include herbicide evaluations, linked to yield and follow-up cropping.

- Conservation farming practices, as well as progress with respect to cultivar development, especially the Clear Field cultivars, are undoubtedly one of the key levers of change that will drive the future of sunflower production in South Africa. Without rapid improvements in yield potential, the level of sunflower production will remain stagnant, with maize and potential soybeans offering the most attractive alternative, even in marginal production areas.

Executive summary and recommendations

Sunflower oil & oilcake:

- South Africa currently has sufficient crushing and processing facilities to process a crop of at least 1 700 000 tons, with an additional dual capacity of 600 000 tons (Soybean or Sunflower Duals). There is currently surplus capacity in both soybean and sunflower oil processing.

- Sunflower oilcake imports increased by 46% over the past 5 years, whilst local production remained stagnant. South Africa is expected to remain a net importer of sunflower oil and oilcake. The amount of sunflower oilcake that the local animal feed industry could absorb would give a probable indication of the demand for domestic sunflower production. Average oilcake demand over the past five years was approximately 370 000 tons, whilst local production was only about 290 000 tons. Due to the growth in domestic demand driven by the feed industry, sunflower oilcake demand can grow by approximately 25%, which translates into a growing demand for sunflower seed.

- Based on the existing crushing capacity, as well as the average oilcake imports of roughly 80 000 tons, South Africa could expand production by approximately 150 000 hectares, or increase national yields from 1.3 t/ha to 1.67 t/ha to make up for this deficit in oilcake requirements. However, as soon as sufficient volumes are produced locally, the price of oil and cake will break away from import parity levels, which will have a negative impact on the crushing margins.

- Sunflower hybrids that combine genetics for high oil content and hulling characteristics are generally preferred by processors, even though South Africa does not necessarily see higher premiums being realised for a higher oil yield, as in countries like the US, where a 2% premium is paid for every 1% of oil content exceeding the US norm of 40%. South Africa has no formal specifications in terms of the "norm" for the oil content to be delivered. The Agricultural Product Standards Act 1990 (Act 119 of 1990) states that an FH1-grade sunflower seed delivered should be seed of a "high oil yield", thus not specifying what is meant by "high oil yield". The general industry-established norm is that all sunflower deliveries on SAFEX should be above a 36% oil yield and preferably at a 38% norm. The 38% norm was also used by ITAC (2006:12) in their anti-dumping investigation of refined sunflower oil from Argentina and Brazil. The SAGL (2013) reported a national sampled mean of 41.4% moisture-free oil content and 17.56% seed protein content across their 121 samples of FH1-graded sunflowers.

- The grading and pricing of sunflowers is a tricky subject, since processors argue that the value of the additional oil is already captured in the SAFEX price. Over the past 4 years, the SAFEX price traded on average 4% below the derived price calculated on an oil content of 39.5%. Yet, based on the SAGL report, the oil content of the SA crop seemed to be about 2% higher.

Executive summary and recommendations

Sunflower oil & oilcake (cont.):

- Further research is therefore recommended to provide a clearer understanding of the characteristics and trade-offs between higher oil content, protein content and crop yields, based on planting dates, growing regions and soil analyses. A better understanding of these traits would do much to support the industry, as the final off-take by the feed industry is high-quality oilcake, which is the result of high protein concentrations.

- Small volumes of sunflower oil are exported to the Southern African Development Community (SADC), with Zimbabwe importing more than 90% of both refined and crude sunflower oil. As palm production increases in Africa, current markets could come under pressure where there are numerous buyers opting for the less expensive alternative

Global sunflower markets:

Compared to the rapid growth in the area planted to soybeans and palm oil, the area under sunflower production has remained relatively stagnant. The main regions of expansion have been in the Black Sea countries, with Ukraine leading the way. There are growing customer concerns related to labelling and consumer health awareness in the vegetable oil markets. The reliable branding of South African products as originating from a non-GMO and high-oleic crop could reaffirm those products in the global, regional and domestic markets.

Attention to palm oil as a competing vegetable oil:

Significant expansion in global palm oil plantations is still occurring, with a cumulative average annual growth rate of 119% (1994-2013) being reported. Future expansions could prove to be closer to home, with significant expansions expected in Africa. It is reported that Africa (specifically in the Democratic Republic of the Congo) has over one hundred million hectares of rain forest area suitable for palm production. The SADC region remains South Africa’s primary export destination for sunflower oil.

As palm production in Africa continues to increase, many African countries could opt for this cheaper and closer alternative, resulting in pressure on the existing oil markets. However, the feed industries’ dependence on both sunflower and soybean meal implies that there will always be a need for crushing. Palm oil has a certain market demand, but the oilcake is not sufficient for animal feed inclusion, thus limiting the extent to which it can replace sunflowers and soybeans.

Executive summary and recommendations

Conclusion

- To summarise, there is a balance between the local supply and demand of sunflower seed, and the companies involved in the crushing of sunflower seed aim to maintain this status quo in order to secure profit margins. The basic argument behind this statement is that with its total crushing capacity of 1.7 million tons, SA has sufficient capacity to crush enough sunflowers to satisfy the current demand for sunflower oil and cake. However, if this should happen, the local prices of oil and cake would break away from import parity levels and trade lower. This would have a negative impact on the crushing margins of the plants, which would result in a decline in the demand for sunflower seed and therefore lead to lower producer prices for sunflower seed.

- In other words, the optimal position for crushers is not to oversupply the local market, but to rather keep both by-products trading at import parity levels and then source the feedstock at a derived price of sunflower cake and oil plus a crushing margin. During harvest time when stock levels are high, especially in years of large crops, the SAFEX price tends to trade well below its derived value, which implies that the profit margins of the processing companies are increasing significantly. However, these market conditions do not last very long, because with ample crushing capacity and high crushing margins, the utilisation rates of the crushing plants increase rapidly to benefit from the large positive crushing margins. As the demand for seed and the supply of oil and cake increase, the profit margins reduce and the market equilibrium is established.

- Structurally, this is the way the sunflower complex has been set up, and this structure is not bound to change soon. Therefore, no structural shifts can be anticipated in the sunflower industry over the medium term, and producers can only boost profits by improving yields and implementing efficient production systems. There are a number of factors that are highlighted in the report as possibly leading to improved profit margins for farmers. Further research can be undertaken to clarify the issue of the official norms for the quality of sunflower seed delivered and the potential additional value of sunflower seed with high oil content.

Setting the scene – Report outline

Content overview

Executive Summary

(A) South African Sunflower Complex
(B) International market conditions, production and trends in the sunflower industry
(C) Overview of the international oil game

Chain 1: Sunflower Production
- **Trends of local production, consumption and trade**
- **A specific focus on new cultivar trends**
- **South African sunflower opportunities and limitations**

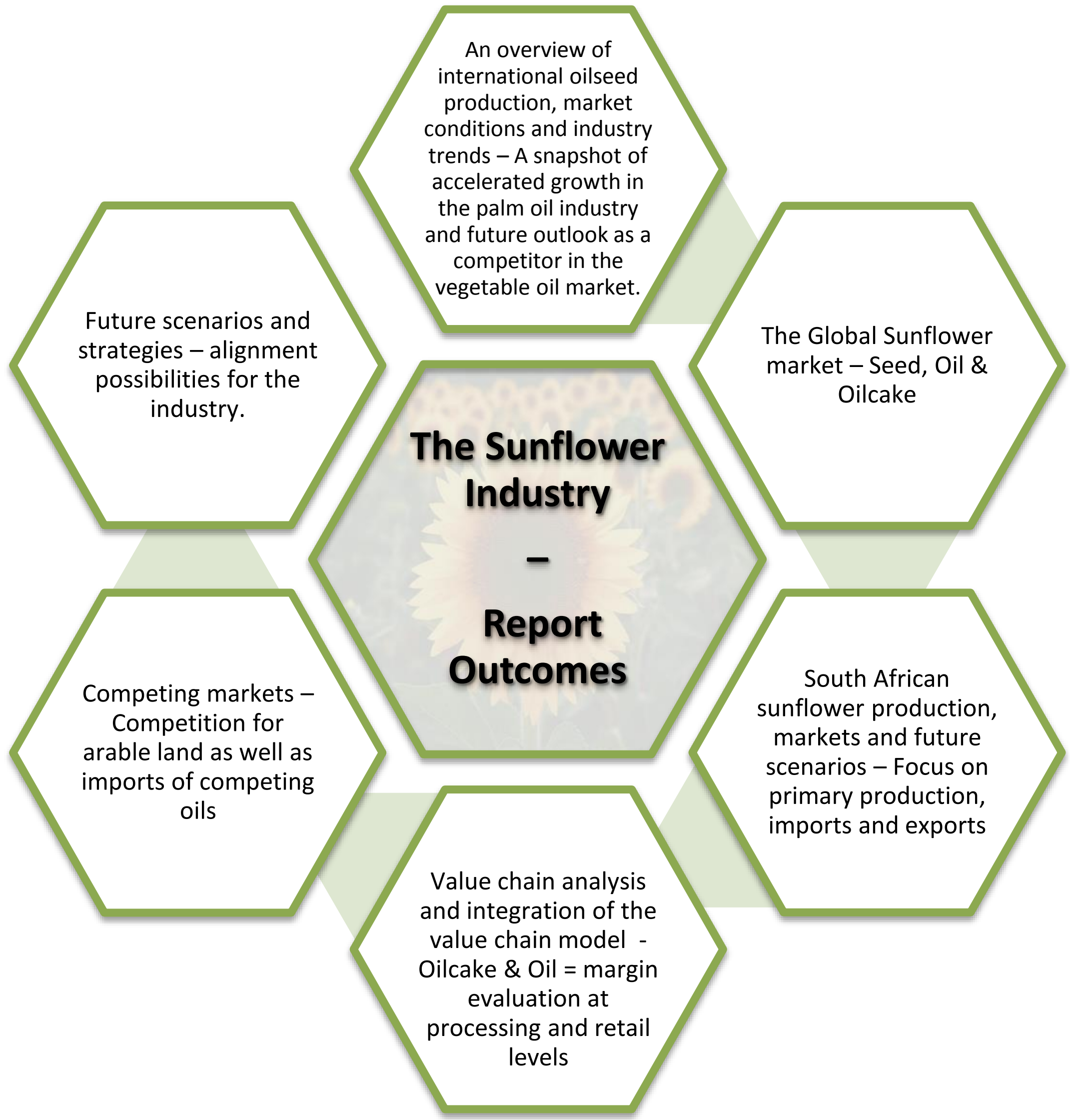
Chain 2: Sunflower Trade Flows
- **Imports and Exports of seed, oil & oilcake**

Chain 3: Sunflower – Domestic oil & oilcake
- **The processing industry**

Conclusion and recommendations (SWOT analysis)

References

APPENDIX



South African Sunflower Industry

Seed Companies

PANNAR PIONEER
SYNGENTA AGRICOL
MONSANTO/DEKALB
CAPSTONE SEEDS
K_2 Seed

Herbicides & Pesticides

BASF Bayer
Monsanto Syngenta
Dow AgroSciences Arystalifescience

Oil & Oilcake Companies

Continental Oil Mills
Epko Oil Seed Crushing
Nola Industries
Sun Oil Refineries
Sunola Oil Mills
Willowton Oil Mills
CEOCO
Nedan Oil

South African Sunflower Industry

South African sunflower production is widely adapted to accommodate cultivation on marginal soils, but according to Schulze and Maharaj (2007:1) sunflowers do not necessarily use water efficiently through the conversion of water into seed (720 g water per gram dry matter vs. 400:1 for maize or 300:1 for sorghum). Sunflowers are obviously worth more per gram, so from an economic perspective it makes sense. Sunflower is regarded as a beneficial cash crop following maize, able to take advantage of residual nitrogen and subsoil moisture that is sometimes under-utilised by other crops. It has been found that in rotation, sunflower can help break up grain disease cycles, whilst still retaining yield potential. Some of the most important decisions and management practices to be considered by growers in terms of successful sunflower production include:

- Proper hybrid selection and optimal planting date,
- Plant population and spacing,
- Proper management of weeds and diseases to ensure full yield potential.

A well-developed sunflower production guide published by PANNAR Seed (Pty) is currently available to facilitate and improve production and management practices. This production guide provides well-explained guidance for the optimal production of the crop, as all the required attributes of management are explained. The topics in this production guide include:

- Overall crop management practices
- Cultivar selection
- Optimal planting dates
- Soil requirements and optimal growing conditions
- Nutrient requirements
- Sunflower pests and diseases

The perennial yield-limiting factor for most sunflower growers is planting at the correct date, disease control and getting a uniform final plant population. It's critical to eliminate skips, doubles and gaps to ensure a uniform crop that makes efficient use of moisture and nutrients, produces uniform heads and seed size while competing well with weeds. Sunflowers will compensate for fewer plants per hectare but it requires uniform emergence and spacing. Uneven emergence with skips and doubles can result in 200-300 kilogram per hectare yield penalties. Breeding programs continue to actively seek new sources for resistant genes for Sclerotinia, but tolerance is limited in current varieties. Rotating away from susceptible crops for a minimum of 3-5 years will help manage stem rot, but head rot can develop from spores blown into a field, which limits the impact of rotation. Many of the industry-leading hybrids also have the Clearfield herbicide tolerant traits to manage difficult weeds escaping the initial herbicide application, which also contributes to higher crop yields. In the Free State and North West early planting has been shown to produce larger and heavier seeds, but early plantings can be more susceptible to disease problems.

South African Sunflower Production

National Production	Yields / Output	Cultivars
Production Summary	Production	Production Costs

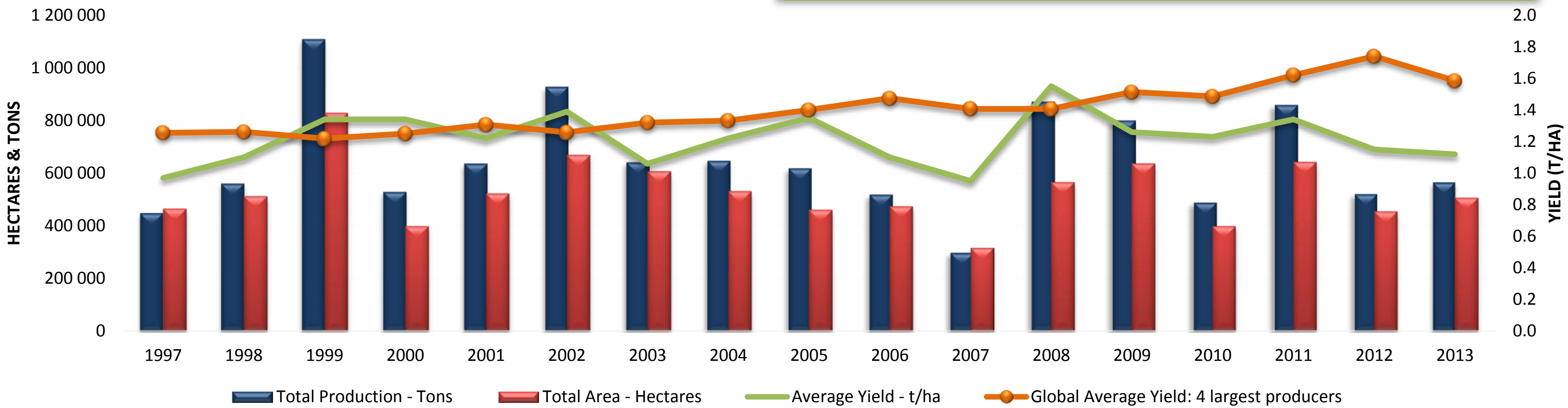


Figure 1: Historic area planted, production and output per hectare
Source: SAGIS (2013)

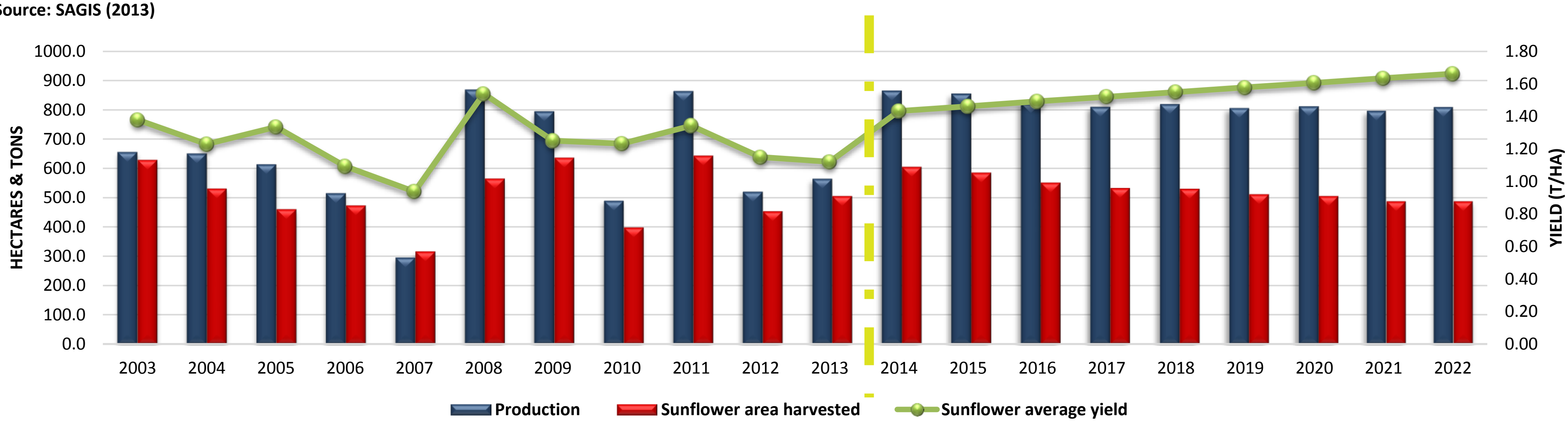


Figure 2: Outlook for area planted, production and output per hectare
Source: BFAP (2013)

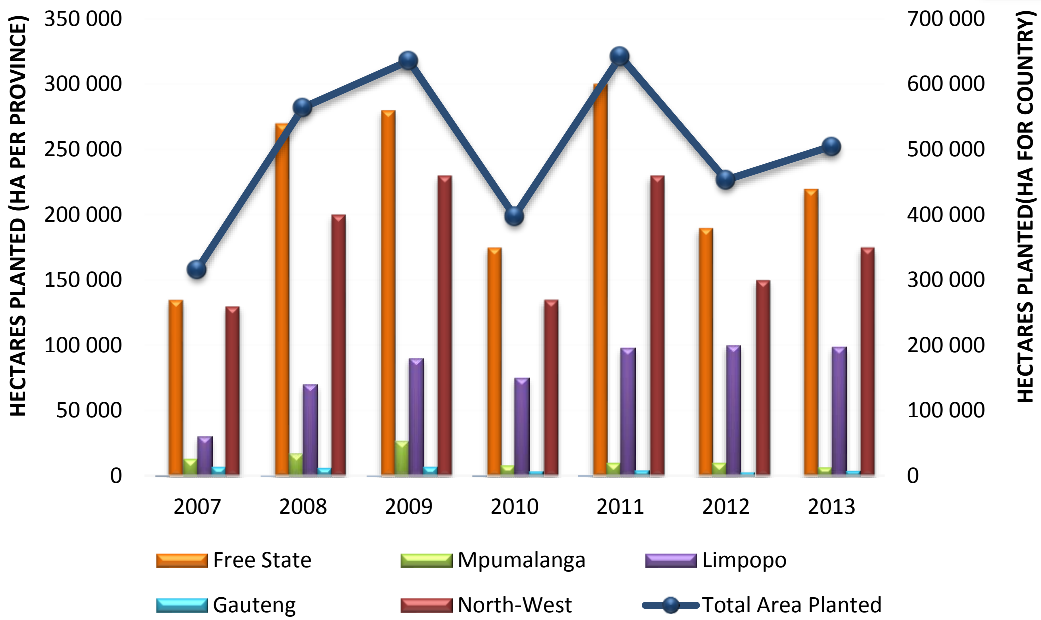


Figure 3: Total hectares planted per province and national total in South Africa
Source: SAGIS (2013) compiled by BFAP 2013

Sunflower area planted has followed a declining trend over time, with greater reduction in the North West Province and some reduction in the Free State (see appendix). Reasons for these reductions include: the adoption of new bio-tech maize cultivars with better yields, producer constraints with sunflower production i.e. negative sentiments to the crop based on historic incidents such as poor emergence, Sclerotinia, falling over problems, bird damage and the possible exclusion of marginal land under crop cultivation. Figure 4 illustrates the **intensity of production per managerial district** (2011 NW & 2010 FS) shown as a percentage of **total sunflower area** planted **in the respective provinces.**

*The 6 additional maps in the appendix follow the same methodology, but with different years depending on data availability from DAFF.

The average area planted to sunflower in South Africa for the period 1992 to 2012 is **516 000** hectares. In 1999 the sunflower area under production reached its peak when 828 000 hectares (figure 1) were planted. Production remains concentrated in the Free State (FS) and North West (NW) provinces, which together account for **79%** of the national area planted to sunflower. On average through the past 20 years, the FS accounted for **43%** and NW for **36%** of the total area planted.

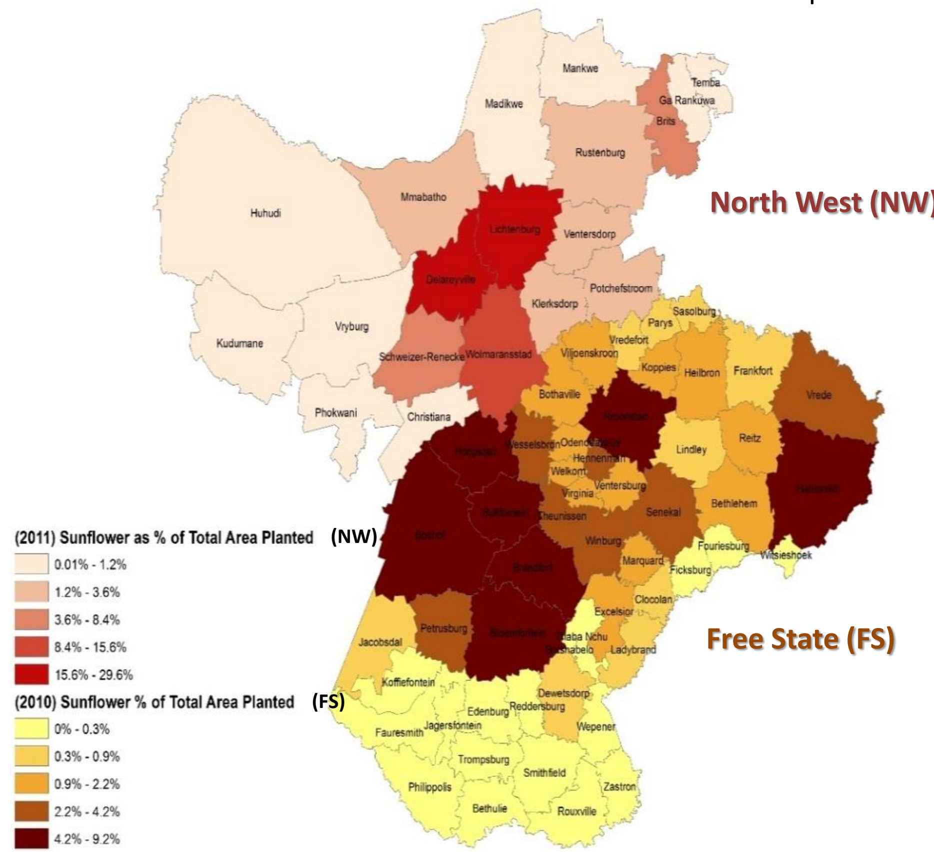


Figure 4: Sunflower production intensity: Free State and North West
Source: DAFF (2010 & 2011), compiled by BFAP 2013

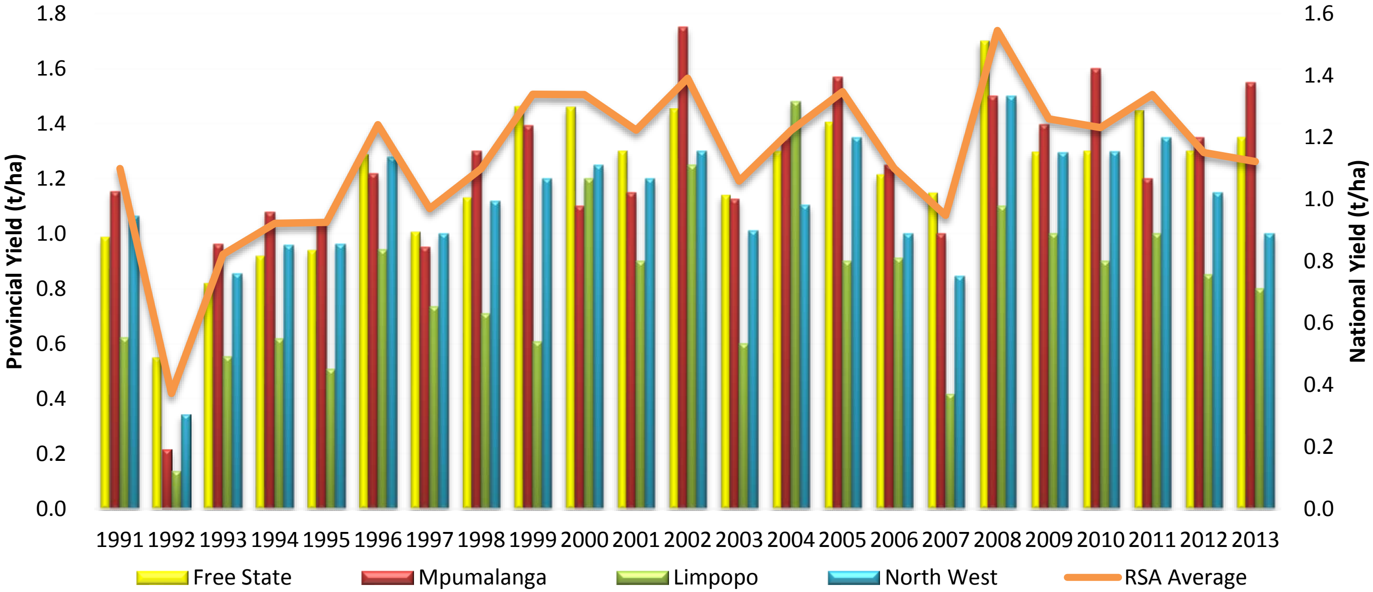


Figure 5: Average yields – provincial and national

Source: SAGIS (2013) compiled by BFAP 2013

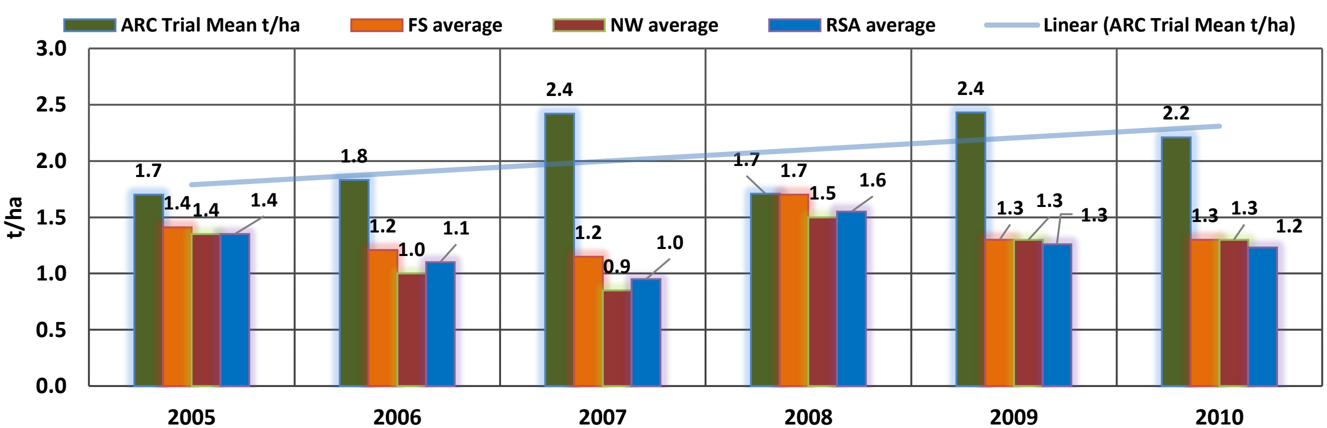


Figure 6: Average Yield Comparison –) ARC-Trial Study & National Averages (2005/6 – 2010/11)

Source: Nel A.A. in ARC-GCI (2012) compiled by BFAP 2013

It is not uncommon for certain production regions and producers to leave sunflowers as a last resort, waiting till the very last day to plant, ……"the 35th of January" in farmers' terms. Many producers see the crop as a "catch crop" and preference is not given to the timing of production – I.e. Optimal planting date and climatic conditions (soils might be too warm/lack of moisture could exist). The adverse effects of the wrong planting date has been explained and propagated to producers. Those who adapt to guidelines related to planting dates have shown drastic improvements in yields and oil content, which is well above international competition.

Large variations:

It is important to note that the gap between the average yields obtained in the ARC-GCI yield trials and the average yields obtained on farm is proportionally much larger than what is the case for maize or soybean trials versus actual yields obtained. From (2005-2010), the ARC average yield was 2.1 t/ha and country average was 1.2 t/ha over the same period. Naturally, in the farmer's case profit maximisation is prioritised above yields, but it does illustrate the yield gap that exists between the genetic potential of the plant and the actual yields that are obtained in the field.

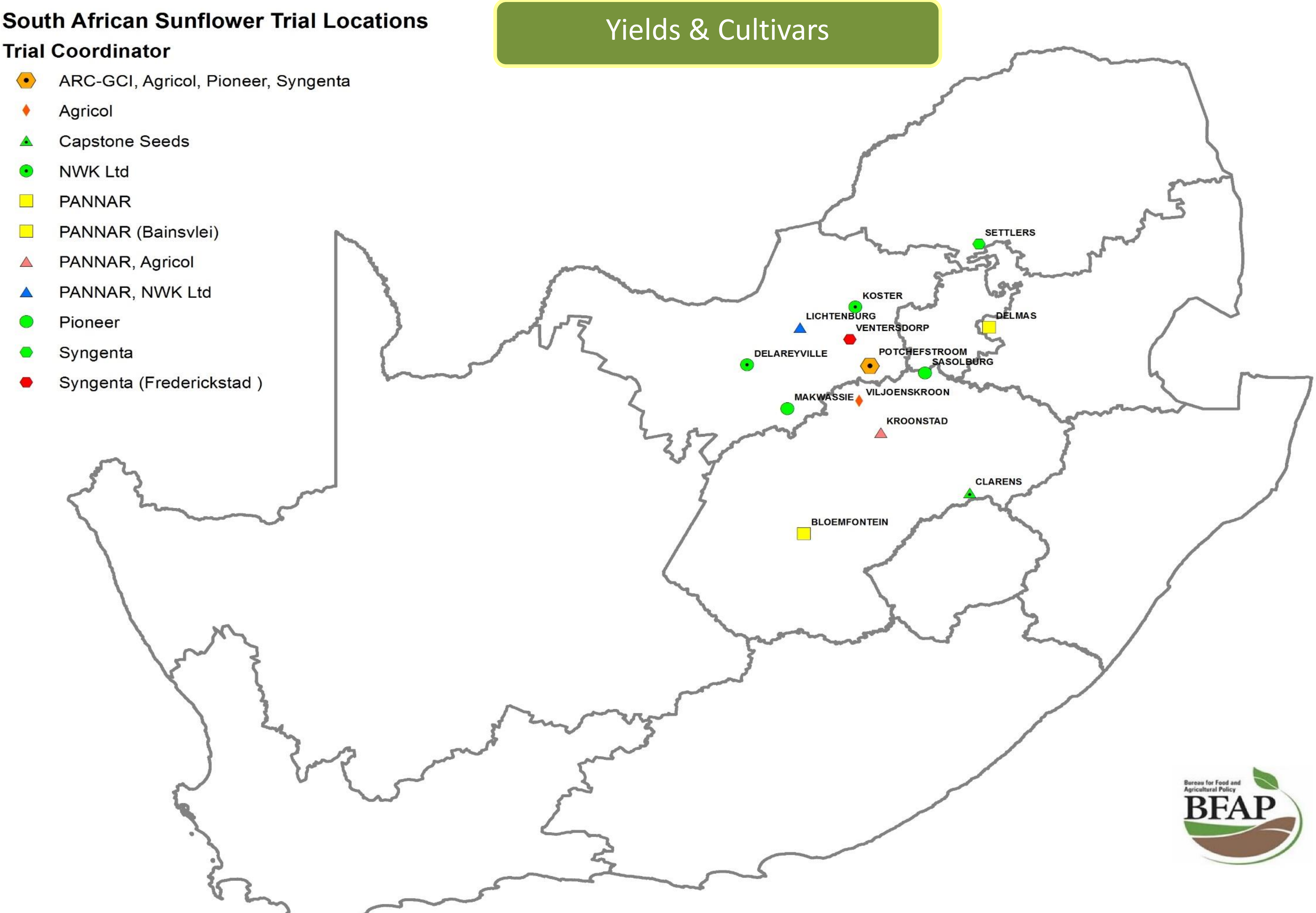


Figure 7: South African sunflower trial locations
Source: Data sourced from ARC-GCI, compiled by BFAP 2013

Cultivar choices for 2013/2014 – By Dr A.A. Nel - ARC-GCI, Potchefstroom

Maintaining a high level of efficiency is the basis for the financial success of grain production. The selection of well-adapted cultivars is a simple way to foster efficiency for which information on the performance of cultivars is needed. The aim of the sunflower cultivar trials is to generate such information, from which a thorough selection of cultivars for a given yield potential can be made. Seventeen cultivars, of which 6 were new introductions, were evaluated in 15 field trials during 2012/2013.

Yield reliability values relate to the future expected performances of cultivars. Yield reliability is the lower 90% confidence limit of the regression between the yields of a particular cultivar and the trial mean yields of all cultivars at several localities. The **yield reliability** of a cultivar at a selected yield potential is the yield that the particular cultivar is **expected to exceed 9 out of 10 times**. The yield reliability therefore takes the yield tendency, mean yield and risk into account and remains **a reliable measure for cultivar selection.**

Table 1: Sunflower cultivar recommendations for 2013/2014

Kultivar/ *Cultivar*	Dae tot 50% blom/*Days to 50% flowering*	Opbrengs/*Yield* ($t\ ha^{-1}$) 2011/2012	2012/2013	Gemiddeld/ *Mean*
AGSUN 5264	64	2.13	2.09	2.11
AGSUN 5270	64	-	2.25	-
AGSUN 5271	65	-	2.13	-
AGSUN 5272	66	-	2.12	-
AGSUN 5278	65	2.19	2.20	2.20
AGSUN 5279	63	-	2.12	-
AGSUN 8251	65	2.11	2.25	2.18
CAP 4000	62	2.08	1.66	1.87
PAN 7033	66	2.13	2.10	2.12
PAN 7049	64	2.20	2.19	2.20
PAN 7057	65	2.13	2.11	2.12
PAN 7080	65	2.25	2.26	2.26
PAN 7031 CL	65	-	2.09	-
PAN 7095 CL	65	-	2.27	-
PHB 65A25	68	2.02	2.00	2.01
SY4045	62	1.92	2.10	2.01
SY4200	67	2.07	1.98	2.03

Source: Nel (2013) in ARC-GCI (2013)

Table 2: Yield reliability (t/ha) of cultivars at different yield targets, mean yield recorded and yield stability (D-parameter) obtained in 2012/2013

Kultivar/Cultivar	Opbrengsmikpunt/Yield target ($t\ ha^{-1}$) 1	1.5	2	2.5	3	3.5	Mean ($t\ ha^{-1}$)	D-parameter††
AGSUN 5264	**0.77***	**1.27**	**1.77**	2.27	2.78	3.28	2.09	0.02
AGSUN 5270	**0.78**	**1.33**	**1.87**	**2.42**	**2.96**	**3.51**	2.25	0.03
AGSUN 5271	0.50	1.05	1.60	2.16	2.71	3.27	2.13	0.08
AGSUN 5272	0.48	1.02	1.57	2.11	2.65	3.20	2.12	0.10
AGSUN 5278	**0.89**	**1.37**	**1.85**	**2.32**	**2.80**	3.28	2.20	0.03
AGSUN 5279	0.43	1.00	1.58	2.16	2.73	3.31	2.12	0.09
AGSUN 8251	0.68	1.20	1.73	2.25	2.78	3.30	2.25	0.09
CAP 4000	0.42	0.78	1.14	1.50	1.86	2.21	1.66	0.10
PAN 7033	0.74	1.22	1.71	2.19	2.68	3.16	2.10	0.04
PAN 7049	0.62	1.19	1.75	**2.32**	**2.88**	**3.45**	2.19	0.05
PAN 7057	0.72	1.24	**1.77**	**2.29**	**2.82**	**3.34**	2.11	0.03
PAN 7080	**0.82**	**1.35**	**1.88**	**2.41**	**2.93**	**3.46**	2.26	0.04
PAN 7031 CL	0.71	1.20	1.69	2.18	2.67	3.16	2.09	0.05
PAN 7095 CL	**0.87**	**1.30**	1.73	2.17	2.60	3.04	2.27	0.10
PHB 65A25	0.74	1.19	1.64	2.08	2.53	2.98	2.00	0.03
SY4045	0.58	1.08	1.59	2.10	2.60	3.11	2.10	0.08
SY4200	0.72	1.15	1.59	2.03	2.46	2.90	1.98	0.04

Source: Nel (2013) in ARC-GCI (2013)

National sunflower cultivar trial (2005/06 to 2010/11)

Nel (2012) indicates that 44 cultivars were evaluated for seed yield, seed quality and some agronomical characteristics at 104 localities/planting dates from 2005/06 to 2010/2011. The results of these trials gave rise to some important components in the sunflower production industry such as optimal planting dates, soil moisture, fertiliser applications and cultivars selection, to name but a few.

Nel (2012) concluded that only 32% of these cultivars were entered for 3 years or longer, reflecting the short lifespan of most cultivars (cultivars are entered by the seed manufacturing companies). The high-oleic (HO) and Clearfield (CL) cultivars were not included over the entire trial period, but Figure 8 illustrates how they competed on an average mean yield basis. The results show that these "new varieties" are well in line with conventional cultivar norms, and in some cases perform even better. It should be mentioned that further testing and development in these cultivars is required in order to obtain better yield reliability, since their reliable yields are still low. New 2013/14 HO and CL cultivars are commercially available, with higher yield reliability and stability, whilst even more efforts are made to improve these genes for future yield reliable HO and CL hybrids.

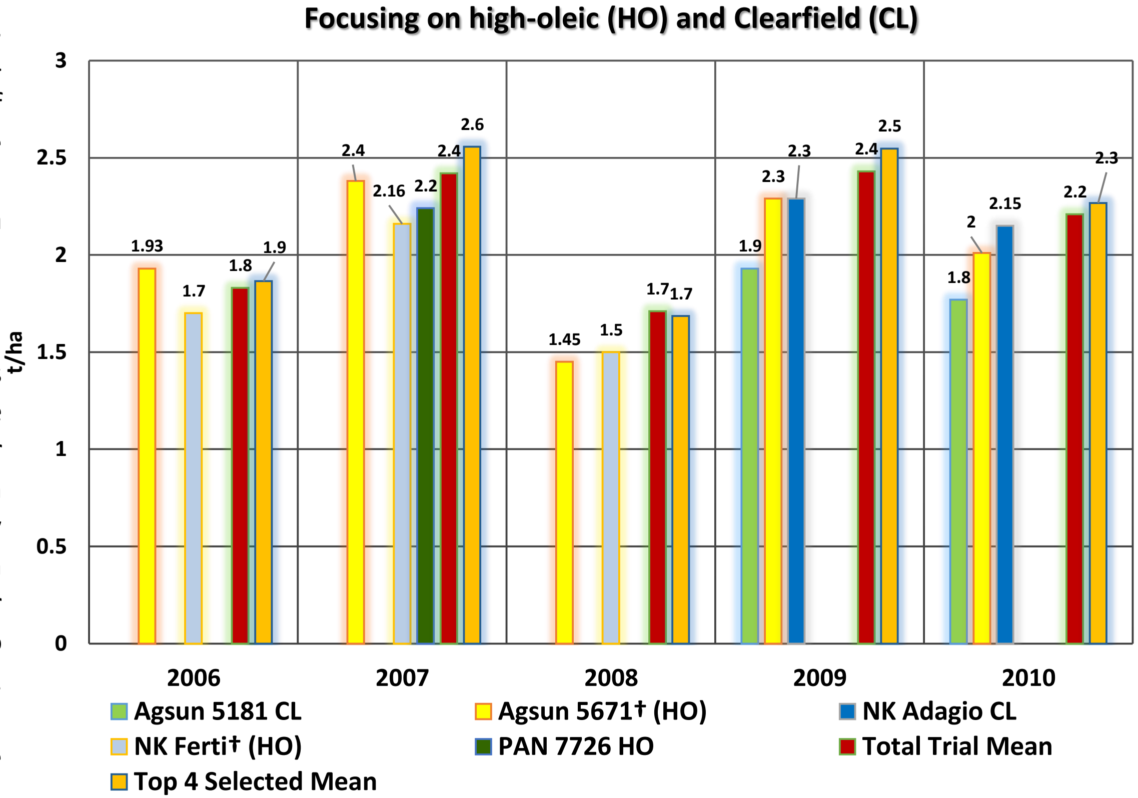


Figure 8: ARC trial yields: High-oleic (HO) and Clearfield (CL) focus

Source: Nel (2013) in ARC-GCI (2013) and BFAP (2013) calculations

The work and effort put into these trials are of high value to the long-term competitiveness of the industry. Currently the ARC trial evaluations are the only objective trial evaluation medium in the country, and results are highly valued by the firms involved. The ongoing evaluation provides a firm data bank to analyse and evaluate the competiveness of the cultivars bred and planted in South Africa. The results are positive and show that South African breeders are competitive in the international arena as while striving to give the best possible cultivar options to local South African farmers. Results further indicate that there is a very large gap between trial yields and true farm yields. The increasing lack of capacity to conduct independent cultivar trials at the ARC is seen as a major risk factor and the industry needs to consider the alternatives for undertaking independent yield trials.

Table 3: Yield reliability (t ha-1) of cultivars at different yield targets, mean yield recorded and yield stability (D-parameter) obtained in 2012/2013

Kultivar/Cultivar	Opbrengsmikpunt/Yield target (t ha^{-1})						Mean (t ha^{-1})	D-parameter††
	1	1.5	2	2.5	3	3.5		
AGSUN 5264	**0.77***	**1.27**	**1.77**	2.27	2.78	3.28	2.09	0.02
AGSUN 5270	**0.78**	**1.33**	**1.87**	**2.42**	**2.96**	**3.51**	2.25	0.03
AGSUN 5271	0.50	1.05	1.60	2.16	2.71	3.27	2.13	0.08
AGSUN 5272	0.48	1.02	1.57	2.11	2.65	3.20	2.12	0.10
AGSUN 5278	**0.89**	**1.37**	**1.85**	**2.32**	**2.80**	3.28	2.20	0.03
AGSUN 5279	0.43	1.00	1.58	2.16	2.73	3.31	2.12	0.09
AGSUN 8251	0.68	1.20	1.73	2.25	2.78	3.30	2.25	0.09
CAP 4000	0.42	0.78	1.14	1.50	1.86	2.21	1.66	0.10
PAN 7033	0.74	1.22	1.71	2.19	2.68	3.16	2.10	0.04
PAN 7049	0.62	1.19	1.75	**2.32**	**2.88**	**3.45**	2.19	0.05
PAN 7057	0.72	1.24	**1.77**	**2.29**	**2.82**	**3.34**	2.11	0.03
PAN 7080	**0.82**	**1.35**	**1.88**	**2.41**	**2.93**	**3.46**	2.26	0.04
PAN 7031 CL	0.71	1.20	1.69	2.18	2.67	3.16	2.09	0.05
PAN 7095 CL	**0.87**	**1.30**	1.73	2.17	2.60	3.04	2.27	0.10
PHB 65A25	0.74	1.19	1.64	2.08	2.53	2.98	2.00	0.03
SY4045	0.58	1.08	1.59	2.10	2.60	3.11	2.10	0.08
SY4200	0.72	1.15	1.59	2.03	2.46	2.90	1.98	0.04

Source: Nel (2013) in ARC-GCI (2013)

South African Clearfield cultivars:

The first commercially available Clearfield® hybrids introduced to South Africa were NK ADAGIO CL (Syngenta), AGSUN 5181 CL (AGRICOL**)** and PAN 7063CL (PANNAR)**.** Following the first ARC trials done on Clearfield cultivars in 2009/2010, the trail results indicated that the mean yield of the 2 Clearfield cultivars on trial AGSUN 5181 CL & NK ADAGIO CL was **15% lower** than the non-Clearfield cultivars. Besides the fact that yields were lower, these cultivars unfortunately did not show high yield reliability either.

As illustrated by the latest 2013/2014 ARC cultivar recommendations, the Clearfield cultivars included in the trials were PAN 7031 CL & PAN 7095 CL. Both of these cultivars did well in their mean yields and PAN 7095 CL had the highest overall average yield in the 2012/2013 group. However, yield reliability is a strong considering component in terms of cultivars selection, and the CL cultivars still does not show high yield reliability figures compared to the non-Clearfield cultivars.

Application of Clearfield:

Herbicide-resistant sunflower, its use and the herbicide application (Post – emergence)

According to the NSDU (2007) **BEYOND (Imazamox)** is applied as a post-emergence to Clearfield sunflower varieties from the 2-to-8-leaf stage and controls most annual grass and broadleaf weeds. It is further argued that Clearfield sunflower may boost no-till sunflower production. The South African version is called Euro-Lightning and is distributed by BASF, which also holds the Clearfield Plus genes.

Alternative to Clearfield

EXPRESS (tribenuron) is applied as a post-emergence herbicide to Express Sun sunflower varieties which will control annual broadleaf weeds. It will not control grass weeds. It is applied early post emergence to Express-resistant sunflower in the one-leaf stage but prior to bud formation. Broadleaf weeds should be 3 inches or less in height. A 70-day pre harvest interval is allowed. **Express Sun** application may help facilitate no-till sunflower production, NSDU (2007).

International Sunflower Seed Development – Clearfield Plus

Clearfield

Figure 9: Typical Clearfield sunflower tolerance to varying levels of Clearfield herbicide application. 2x, 4x, and 6x dosages
Source: Picture from BASF (2013)

Clearfield Plus

Figure 10: Clearfield Plus sunflowers treated with the same Clearfield herbicide at the same 2x, 4x, and 6x dosages, compared to an untreated plants on the far left.

Clearfield & Clearfield Plus:

According to BASF (2013) "The original Clearfield trait in sunflowers is based on a natural mutation discovered in 1996 in a wild sunflower". The aim of an advanced **Clearfield Plus** was to deliver a more efficient, single-gene breeding system, greater crop tolerance regardless of environmental stresses, improved weed control, oil content and grain yield. Clearfield Plus, like the Clearfield cultivars are all classified as non-transgenic. Data compiled from 16 trial sites (across 4 regions and 6 years) show Clearfield Plus sunflowers are much more reliable over a wider range of environments as well as enhanced resilience to high levels of herbicide application

Clearfield Plus was launched in Argentina (2010) and was scheduled for registration in countries around the globe in 2012 (BASF, 2013).

South African Clearfield Plus development:

The advanced Clearfield Plus line of sunflower breeds will be commercially available in South Africa in the 2014/2015 production season, with the first trials running in the 2013/2014 season. Seed breeders are including these traits to their cultivars, but it is at an additional cost. The regular Clearfield`s patent has expired, which consequently decreased the cost of reproducing and selling seed drastically. This is still not the case for Clearfield Plus as BASF holds exclusive rights for the use and re-use of the genes. The seed manufactures will therefore have to pay extra.

Based on personal correspondence with seed manufactures, the advanced trait does hold some additional benefits and international trial data shows definite increases in yields as well as improved overall stability of the plant under various production environments, as illustrated in Figures 9 and 10.

Possible externalities - Clearfield (Imazamox) persistence in soils

Colquhoun, Mallory-Smith and Ball (2003) state that Clearfield wheat and canola has been in production for several years, with more trial and field studies done on the effects of this herbicide and its soil persistence. Similar to sunflower, Clearfield wheat and canola varieties were developed by the traditional plant breeding methods – I.e. No DNA insertions were made to the plants. Scientists found a natural mutation of wheat cultivars against the herbicide Imazamox (Clearfield), which led to the enhanced use of the herbicide on Clearfield Wheat and Clearfield Canola (Colquhoun et al., 2003).

Table 4: Plant back intervals for different varieties

Plant Back Interval (Months)	Crop(s)
0	CLEARFIELD* Wheat, CLEARFIELD* Sunflower,
	CLEARFIELD* Canola, Dry Beans, Dry Peas, Soybeans
3	Alfalfa, Wheat (non CLEARFIELD*)
4	Cereal Rye
8.5	Maize (CLEARFIELD* and non CLEARFIELD*)
9	Barley ** , Oat, Onion, Sunflowers, Peanut, Watermelon, Pumpkin
18	Barley ** , Carrot, Potato, Broccoli, Turnip, Cabbage
26	Canola, Condiment Mustards, Sugar Beet, Table Beet
** See Beyond or Clearmax labels for soil pH, tillage system and cumulative rainfall and/or irrigation requirements that most closely approximate your production system to determine the appropriate barley plant-back interval.	

Source: Hulting, A.; Smith, C.M.; Jones, A.P. & Macnab S. (2008)

The reason for comparing Clearfield sunflower production to that of Clearfield wheat production can be ascribed to the herbicide registered for the use with both of these crops having the same active ingredient, Imazamox. According to Colquhoun et al., (2003), Clearfield wheat uses Imazamox, which is commonly traded under the name ‘Beyond’. According to the authors it is the same active ingredient used in the legume crops.

A conclusion from the literature available on Imazamox herbicide usage is its effectiveness over a variety of weed species, which may have vast benefits to the no-till or minimum till sunflower production practises. A sense of caution is recommended however on its usage in rotational cropping systems, based on the Imazamox soil persistence. According to Colquhoun et al., (2003) “The herbicide persistence in soil is affected by several climatic and soil factors. The imidazolinone category of ALS-inhibitor herbicides, including Imazamox, persist longer in undisturbed soils (no-till or reduced tillage production systems), in low ph soils and where moisture is limited”. These factors mentioned are typical to the highest sunflower production regions in South Africa. Consequently caution should be taken in advance as to the planning of follow-up crops.

South African Sunflower Production

Cultivar	Locality* Bloemfontein 02/12/2010	Bloemfontein 02/12/2010	Coligny 13/1/2011	Delareyville	Delmas 26/11/2010	Delmas 29/11/2010	Dohne 30/11/2010	Koster	Potchefstroom 26/11/2010	Potchefstroom 12/11/10	Potchefstroom 02/12/2010	Potchefstroom 08/12/2010	Potchefstroom 13/1/2011	Settlers 26/01/2011	Ventersdorp 14/12/10	Mean
Agsun 5284	45.2	44.63	45.1	44.1	45.3	45.7	46.2	45.6	45.9	45.3	45.4	48.6	51.1	45.5	46.2	46.0
Agsun 5181 CL	47.0	45.07	42.4	45.3	45.0	45.7	47.9	43.7	48.3	46.5	47.2	48.2	46.2	42.0	43.6	45.6
Agsun 5264	47.5	45.29	43.9	47.1	43.3	46.7	46.1	46.3	47.9	46.2	45.6	45.9	47.0	44.1	46.0	45.9
Agsun 5671†	47.7	46.85	44.8	46.9	44.7	46.3	48.2	48.1	46.1	47.3	45.3	47.6	45.0	44.9	46.8	46.4
Agsun 8251	44.6	45.83	46.0	45.5	45.0	46.0	43.2	44.4	49.1	44.4	46.6	47.6	47.2	42.4	45.5	45.5
CXEP 33	44.5	-	44.9	45.2	45.3	46.4	43.7	45.1	46.5	46.8	46.5	46.7	47.9	45.0	44.8	45.7
DK 4040	45.0	44.71	44.1	45.0	44.8	48.7	45.3	44.1	45.1	45.7	48.6	46.6	48.3	43.8	46.3	45.7
DKF 68-22	46.9	46.62	45.2	45.0	44.2	47.0	46.8	44.7	46.5	45.9	47.4	45.2	47.8	42.6	46.5	45.9
NK Adagio CL	45.4	44.06	47.6	47.3	43.9	46.0	46.4	43.9	46.0	44.6	46.3	44.2	50.0	46.2	44.0	45.7
NK Armoni	48.0	44.47	45.7	45.1	45.6	50.2	47.2	44.0	48.6	47.0	47.2	47.0	48.7	44.1	45.0	46.5
PAN 7033	45.0	45.66	44.6	47.4	44.1	47.5	47.1	44.6	45.7	44.9	49.6	46.3	47.9	42.7	45.4	45.9
PAN 7049	45.1	47.17	46.3	45.4	45.5	45.2	45.3	44.2	45.0	45.1	46.5	45.8	47.3	42.6	45.1	45.4
PAN 7050	45.6	45.28	42.9	47.7	44.7	47.1	48.9	44.7	46.1	45.4	46.1	47.4	49.2	44.0	46.0	46.1
PAN 7057	46.1	46.66	44.0	45.3	43.3	46.6	46.9	45.0	46.0	45.9	46.9	45.3	49.0	46.3	45.7	45.9
PNR 65A25	46.8	47.15	45.3	48.7	45.7	46.4	45.2	47.0	45.2	46.6	48.3	48.3	49.8	47.1	45.4	46.9
PNR 65A40	47.5	44.64	44.7	47.4	46.3	47.6	45.7	46.0	47.0	47.1	46.7	46.5	49.3	42.7	45.1	46.3
SY 4045	45.1	46.39	44.6	48.7	44.5	47.3	46.0	44.6	44.7	46.4	46.9	46.6	49.6	42.0	45.4	45.9
SY 4200	47.1	47.41	42.3	45.9	44.1	49.4	46.8	45.6	46.7	47.7	45.8	48.1	48.8	41.9	46.5	46.3
Mean	46.0	45.8	44.8	46.3	44.8	46.9	46.2	45.1	47.2	45.9	46.9	46.7	48.3	44.0	45.5	

Figure 11: The moisture free seed oil concentration (%) of cultivars at each locality 2010/2011
Source: ARC-GCI (2011)

Cultivar	Locality* Bloemfontein 02/12/2010	Bloemfontein 02/12/2010	Coligny 13/1/2011	Delareyville	Delmas 26/11/2010	Delmas 29/11/2010	Dohne 30/11/2010	Koster	Potchefstroom 26/11/2010	Potchefstroom 12/11/10	Potchefstroom 02/12/2010	Potchefstroom 08/12/2010	Potchefstroom 13/1/2011	Settlers 26/01/2011	Ventersdorp 14/12/10	Mean
Agsun 5284	1.80	2.51	2.41	2.29	3.51	2.97	1.32	1.27	2.83	2.89	2.27	2.02	1.70	1.61	2.41	2.25
Agsun 5181 CL	1.43	2.09	1.45	2.34	2.76	1.93	0.67	0.99	2.38	2.40	1.82	1.30	1.68	1.13	2.24	1.77
Agsun 5264	2.04	2.66	2.00	2.44	4.02	2.79	1.33	2.15	2.30	3.33	2.37	1.97	2.09	2.08	2.76	2.42
Agsun 5671†	2.03	2.77	1.89	2.22	2.47	1.29	0.95	1.52	2.76	3.32	2.10	1.46	1.19	1.73	2.42	2.01
Agsun 8251	2.25	3.14	2.00	2.85	3.78	3.74	1.12	2.32	2.81	3.15	2.30	1.87	2.10	2.22	2.68	2.56
CXEP 33	1.19	2.44	1.18	2.16	1.75	1.18	0.62	0.63	2.46	2.67	1.98	1.49	1.61	1.65	2.12	1.68
DK 4040	1.65	3.16	1.57	2.82	2.61	2.97	0.99	1.80	2.55	2.53	2.26	1.68	2.05	2.00	1.72	2.16
DKF 68-22	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	1.00	2.46	2.13
NK Adagio CL	1.72	2.58	2.17	1.66	2.97	2.31	1.14	1.68	2.71	2.75	2.32	1.81	1.99	2.06	2.38	2.15
NK Armoni	1.79	3.09	2.06	1.85	2.83	1.86	0.97	1.74	2.46	2.68	2.17	1.87	1.41	1.40	2.16	2.02
PAN 7033	2.20	3.42	2.23	1.64	4.11	2.46	1.33	2.01	2.87	2.77	1.91	1.88	2.09	1.94	2.52	2.36
PAN 7049	2.21	3.37	2.22	1.66	4.27	3.31	1.62	2.44	2.85	3.06	2.46	2.00	2.28	1.31	2.49	2.50
PAN 7050	2.09	2.95	2.01	1.71	3.80	2.97	1.63	1.64	2.97	3.39	2.93	1.80	2.06	1.05	2.52	2.37
PAN 7057	2.11	3.50	2.44	2.24	3.78	3.08	1.48	2.76	3.00	3.39	2.29	1.65	2.17	0.81	2.84	2.50
PNR 65A25	2.29	2.69	1.30	2.29	3.74	1.92	1.34	1.28	2.70	3.27	2.26	1.94	2.07	1.36	2.09	2.17
PNR 65A40	1.68	2.95	1.76	2.02	2.28	1.69	1.04	1.34	2.75	2.61	2.22	1.52	1.79	1.62	2.30	1.97
SY 4045	2.03	3.26	1.89	1.86	3.51	2.96	1.39	0.82	2.88	3.11	2.36	2.05	2.05	2.52	2.38	2.34
SY 4200	2.28	2.98	2.57	2.17	3.58	1.67	1.33	1.82	2.73	3.02	2.20	2.20	2.06	2.04	2.31	2.33
Mean	1.92	2.91	1.96	2.16	3.27	2.40	1.19	1.64	2.71	2.94	2.26	1.80	1.90	1.64	2.38	

Figure 12: Mean seed yield (t/ha) of cultivars at each locality 2010/2011
Source: ARC-GCI (2011)

Hybrid cultivar selection, planting date and oil yield

Sunflower hybrids that combine genetics for high oil content and hulling characteristics are generally preferred by processors, even though in South Africa, premiums are not necessarily realised for a higher oil yield. Producers and breeders have a challenge selecting and breeding hybrids with specific genetics as potential premiums are generally not realised for higher oil content and de-hull contracts, as in the case of other countries. Currently producers receive little incentive to produce hybrids with agronomic characteristics to support higher oil content even though the focus of breeders is aimed to achieve high crop yield, higher oil yield, maturity and standability.

According to NSA (2010:1), research in the United States has shown that planting sunflowers early favours higher oil content, these authors further argue that oil content is usually a combination of a hybrid's genetics and the specific growing season (National Sunflower Association) (NSA, 2011:1). According to the NSA (2011:1) "a longer-season sunflower should translate into additional yield potential and more oil production per acre". Unfortunately growing conditions such as soil, precipitation and the number of growing days differ from the Northern to Southern hemisphere and the above mentioned outputs is not necessarily the case in South Africa. As shown in Figure 11 & 12, earlier planting dates at the Potchefstroom trial did not result in higher oil content, instead higher yields were realised

Cultivar	Locality* Bloemfontein 02/12/2010	Bloemfontein 02/12/2010	Coligny 13/1/2011	Delareyville	Delmas 26/11/2010	Delmas 29/11/2010	Dohne 30/11/2010	Koster	Potchefstroom 26/11/2010	Potchefstroom 12/11/10	Potchefstroom 02/12/2010	Potchefstroom 08/12/2010	Potchefstroom 13/1/2011	Settlers 26/01/2011	Ventersdorp 14/12/10	Mean
Agsun 5284	18.1	17.87	18.4	18.1	18.7	19.1	18.0	18.3	18.1	18.4	18.7	17.9	17.1	18.7	18.6	18.3
Agsun 5181 CL	17.1	18.53	19.0	18.2	17.7	19.2	17.8	18.2	17.0	17.6	17.7	18.1	18.7	19.3	18.0	18.2
Agsun 5264	18.1	18.38	19.9	18.2	18.8	18.8	17.6	18.6	17.8	18.6	18.5	18.2	17.8	18.7	18.6	18.4
Agsun 5671†	17.6	18.50	18.3	18.5	18.5	19.0	17.4	18.1	18.5	18.0	18.6	18.5	19.0	18.9	18.3	18.4
Agsun 8251	18.4	17.73	18.5	17.7	18.5	19.2	18.3	18.4	17.9	18.5	18.7	17.8	18.0	19.4	18.9	18.4
CXEP 33	18.7	-	17.8	18.1	18.7	18.8	17.2	18.6	18.7	18.0	18.3	18.0	17.4	19.3	19.1	18.3
DK 4040	17.4	18.64	18.9	17.8	18.7	18.0	17.6	18.8	18.8	17.9	18.0	18.0	18.4	19.3	18.1	18.3
DKF 68-22	17.3	18.16	19.0	17.8	18.3	17.7	17.5	18.2	18.8	17.9	17.4	18.5	18.0	19.7	17.9	18.1
NK Adagio CL	17.3	18.62	17.9	16.9	18.8	19.1	18.5	18.3	18.8	17.8	18.6	18.6	17.3	19.2	17.9	18.2
NK Armoni	17.1	19.08	18.4	17.5	18.2	17.7	17.7	19.1	17.9	18.1	17.7	17.6	17.0	19.0	18.1	18.0
PAN 7033	17.7	18.11	18.8	16.9	18.9	18.8	17.3	18.9	18.6	17.9	17.8	18.6	17.6	19.1	19.0	18.3
PAN 7049	18.0	18.38	18.0	17.0	18.1	18.2	17.8	19.2	18.9	17.9	18.1	18.0	18.2	19.3	18.5	18.2
PAN 7050	17.8	18.42	18.8	17.2	18.0	18.2	16.8	18.6	18.7	18.5	17.9	18.6	18.2	19.4	18.4	18.2
PAN 7057	17.5	18.35	18.4	17.5	19.0	18.9	17.7	18.7	19.0	18.1	18.5	18.5	17.0	17.1	18.6	18.2
PNR 65A25	18.5	17.83	18.1	17.2	17.9	18.0	18.2	18.4	19.0	18.4	17.6	18.5	17.9	18.0	18.8	18.2
PNR 65A40	17.9	18.33	17.8	18.1	18.3	18.5	18.2	18.5	18.6	18.2	18.0	17.6	18.4	19.6	18.8	18.3
SY 4045	18.0	18.28	18.0	16.7	18.7	18.8	18.0	19.5	18.8	18.2	18.7	18.5	18.2	19.6	18.9	18.5
SY 4200	17.1	16.95	19.5	17.6	18.5	18.1	18.4	17.8	17.4	17.2	17.9	18.1	17.6	18.1	17.6	17.9
Mean	17.8	18.2	18.5	17.6	18.5	18.6	17.8	18.6	18.4	18.1	18.1	18.2	17.9	19.0	18.5	

Figure 13: The moisture free seed protein concentration (%) of cultivars at each locality 2010/2011

Source: ARC-GCI (2011)

The comparisons as shown in Figures 11, 12 and 13 points to the need for further research, as the characteristics and trade-offs between higher oil content, protein content and crop yields in South Africa is still undefined. These traits can boost the competitiveness of the industry, as the final off-take by the feed industry, is high quality oilcake, which is the result of high protein concentrations. The protein concentration required by the processing industry is approximately 17% or higher and current norm for seed delivery at silo's is seed with a moisture percentage of less than 10% and an oil concentration of at least 36%. These norms are further discussed in the processing section of the report. From Table 5 it is important to note that average or mean evaluated sunflower cultivars in the ARC trial, are well above the norm of the industry specifications and producers have all the necessary cultivars to obtain good yields combined with high oil and protein concentrations.

Hybrid cultivar selection, oil yield and protein concentration

Oil and protein concentrations per ton of seed versus planting dates were compared in the ARC (2010/2011) national trial evaluations as shown in Figures 11 & 12 (previous page) and Figure 13. Using the example of 2 different cultivars, at the same location, this ARC trial results show that oil content as test weight does not necessarily respond to earlier plantings (early November), as the proposed theory from the NSA show. The evaluation is based on similar growing conditions, but different planting dates at the Potchefstroom trial plots in North West province. It was therefore argued, that in the South African context, earlier planting dates and higher seed yield do not necessarily translate into higher oil concentrations. Based on Figure 13 , oil content seems to increase after November 30 plantings while crop yields decreased after mid-December planting.

Table 5: Average moisture free seed oil and protein concentration of cultivars at various localities in the 2010/2011 production season

Trial cultivar oil content evaluation (ARC 2011 national trial data)	MAX	MIN	MEAN
% Moisture (Estimated avg. harvested moisture)	7%	7%	7%
Moisture Free Oil Content (db)	50%	42%	46%
% Calculated Seed Protein Concentration (db)	19.6%	16.7%	18.2%

Source: ARC-GCI (2011)

In the 2012/2013 production season, the SAGL (South African Grains Laboratory) conducted a national sunflower crop quality survey. The aim of this survey was to accumulate quality data on the commercial sunflower crop on a national level, which was based on 121 (FH1 grade) samples throughout the country. The outputs from the report reveal general tendencies, highlight quality differences in sunflower produced at different local production regions and provide important information on the quality of commercial sunflower in South Africa (SAGL, 2013:17).

Table 6: SAGL quality report - oil and protein concentration of samples from the South Western Free State districts.

Free State South Western Region (SAGL crop quality report 2012/2013)	MAX	MIN	MEAN
% Moisture (Sampled moisture)	6%	3.6%	4.5%
Moisture Free Oil Content (db)	48%	40%	43%
% Calculated Seed Protein Concentration (db)	18.4%	12%	15.4%

Source: SAGL (2013)

Further evaluation of this report concurred the notion that producers are in fact already producing high oil and protein content seeds, as the SAGL (2013) reported a national sampled mean of 41.4% moisture free oil content and 17.56% seed protein content across their 121 samples of FH1-graded sunflower. Table 6 is presented as an example from the report, illustrating how the districts were evaluated for seeds delivered to silos in the South Western region of the Free State. These concentrations were evaluated similar to the manufacturers process. Evident from Table 6, it was calculated that this region produced a maximum delivered or Dry Matter Based (DMB) oil content of 48% and a mean of 43%, which can be reported as the oil extraction per ton of seed that the manufacturer would receive, free from any moisture. Evaluating the seed protein concentration, the sampled average for this district was a mere 15.4%, which is 1.6% below what the industry requires.

Table 7: Production costs per region at different yield levels

Target yields (t/ha)	**1.5**		**1.8**		**2**		**1.9**	
Region	**North West**		**Eastern FS**		**Parys (FS)**		**South Eastern FS**	
Total variable costs R/ha	R	3 285	R	3 845	R	3 664	R	4 601
Total overhead costs R/ha	R	1 625	R	1 714	R	1 539	R	1 829
Total Production costs R/ha (Before Marketing)	R	4 910	R	5 559	R	5 202	R	6 430
Total Marketing Costs R/ton	R	249	R	269	R	190	R	266
Estimated Gross Income/ha	**R**	**2 799**	**R**	**3 727**	**R**	**4 958**	**R**	**3 366**

Source: Grain SA (2013)

Grain SA`s production cost comparison between different sunflower producing regions illustrate that **average variable inputs** account for 70% of the total production costs. As illustrated by Figure 14, fertiliser (20%) and fuel (11%) are by far the largest cost components, followed by repairs (8%). These 3 components alone account for 39% of the **total production cost** per hectare. This further elaborates on the need to do more in trial evaluations with respect to the true cost of producing a ton of seed harvested.

Table 7 highlights the magnitude of the impact that high variable costs could have on returns per hectare. The Parys area is by far the most profitable region, due to its low input, high yielding structure. The North West seems low in comparison with the other regions, but comparing this to other crops can still out-perform for example maize returns per hectare in some production seasons.

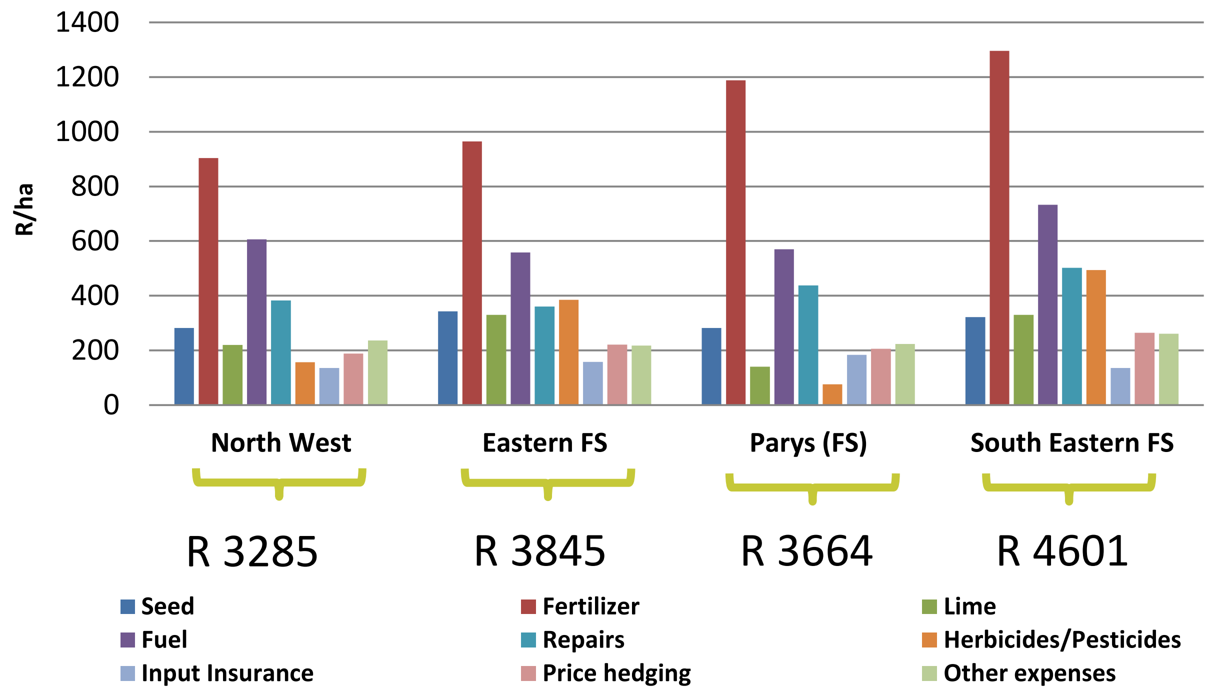


Figure 14: variable cost breakdown for different production regions 2012/13
Source: Grain SA

As with any decision in farming, the producer is faced with the question of gross return per hectare and in most cases they will opt for the product with the highest returns. In many cases, however, it is found that producers are also in a fixed or semi-fixed rotation cycle with certain crops to mitigate risk.

According to Nel and Loubser (2004) in their article named "The impact of crop rotation on profitability and production risk in the eastern and north western Free State" they compared the risk adversity of different cropping systems and some of their findings are that drybean and soybean improved net returns and reduced risk while **sunflower was the most effective in reducing risk**. Nel et al. (2004) further found that "at both localities, it is evident that sunflower is a crop with an inherent low risk." They also found that rotational cropping affected the follow-up crops to such an extent that the risk of cropping systems was substantially reduced despite a possible disaster target level. Nel et al., (2004) further explains "If the primary aim of crop diversification and rotation is to reduce risk, sunflower appears to be the best-suited crop for this purpose."

Figure 15 represents the profitability levels for the various grain and oilseeds regions in South Africa, based on the BFAP network of representative farms. It should be noted that the reflected profitability only refers to gross margins; therefore overhead costs are not included in the calculation.

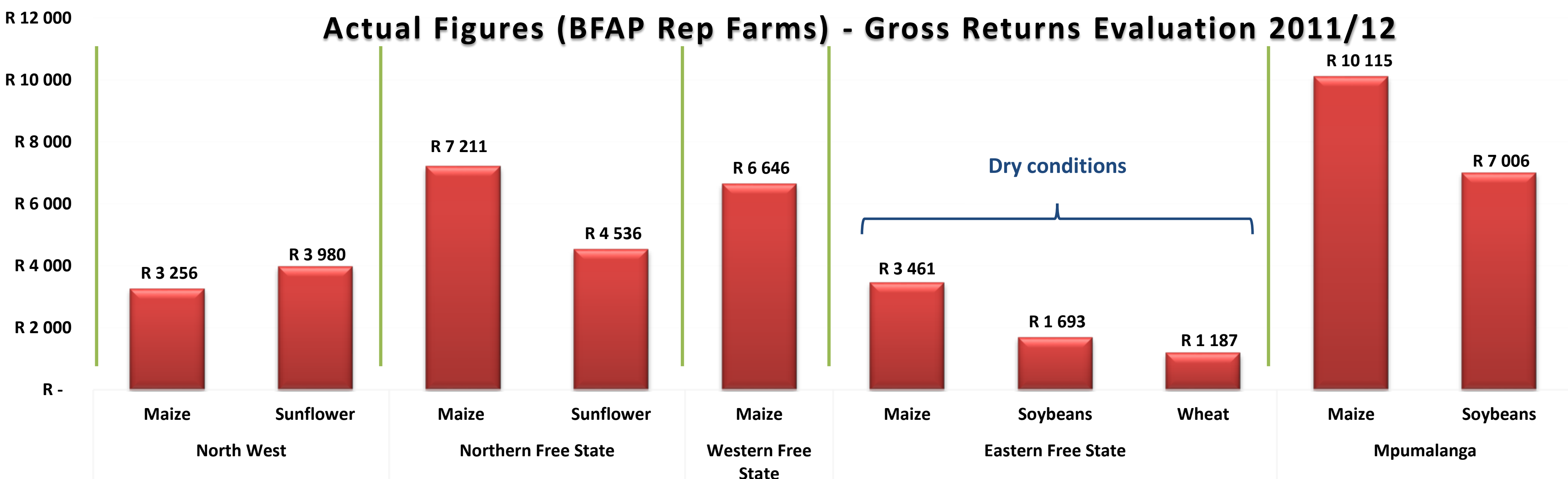


Figure 15: Evaluation of gross returns (2011/12)
Source: BFAP (2013)

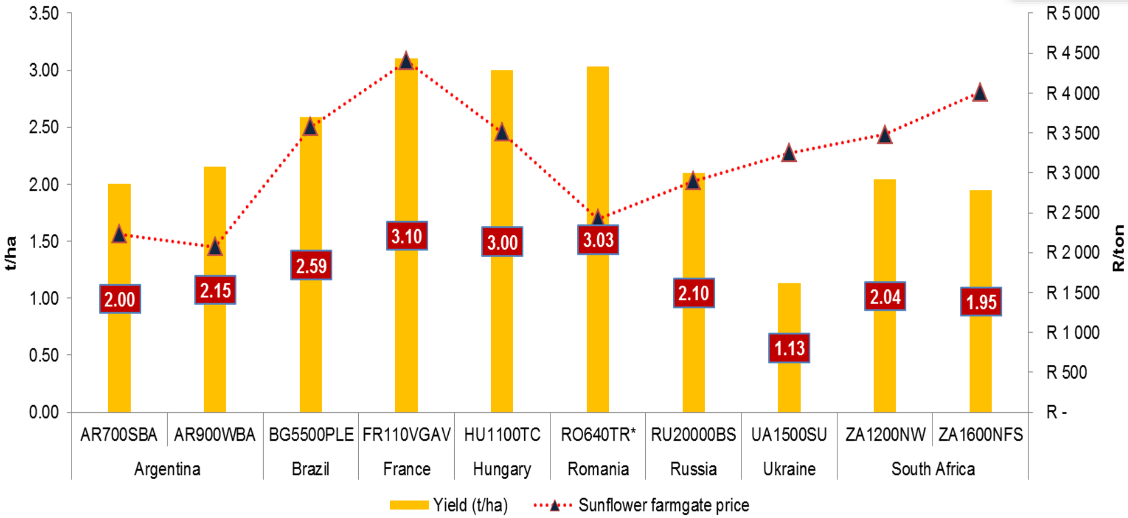


Figure 16: Sunflower yield and output price in different countries – Average 2010-2012

Source: Agribenchmark network

The information from figure 16 and 17 was compiled from BFAP`s "typical farms" which are included in the International Agri-Benchmark Network. These 2 farms (with sunflower rotation) were chosen due to their weighted contribution in their regions, making them representative of the sunflower production regions of South Africa. This is not the same throughout the country, but for the 2010 to 2012 production seasons the typical South African farms are well in norm with the international farms, which they are benchmarked against. In fact both the North West farm and the farm in the Northern Free State had above average yields during this period. As this benchmarking process is repeated, a more reliable average benchmark over a number of seasons will be obtained.

Farm Gate & Yield Comparison:

- South Africa farm gate price: R3 747 / ton
- Argentina farm gate price: R2 153 / ton
- Brazil, France, Hungary, Romania & Russia: R3 312 / ton

The SA farms receive the highest farm-gate price on a R/ton basis, but this does not result in the highest return per hectare due to the lower yields relative to higher direct costs. Figure 17 illustrates that SA has the highest application of fertiliser and the lowest cost to pesticide spray.

On average, the SA farms had the highest cost and application per hectare for Nitrogen, Phosphorus and Potassium, yet the yields are still below that of France and Brazil. Argentinean farms have very similar yields to SA, but their fertiliser application is much less, and a greater amount of pest & herbicide spray is applied. The North West farm ranked 3rd in technical nitrogen efficiency i.e. kg of suns/kg N applied. Russia was 1st, with 93kg of seed per 1kg of N and a yield of 2.1 t/ha.

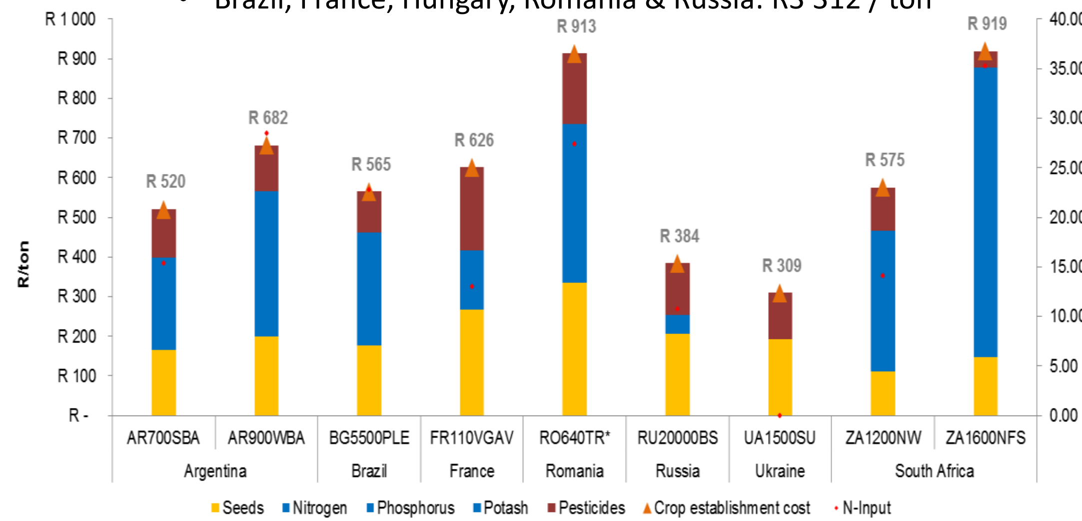


Figure 17: Direct costs attributed to sunflower production – Average 2010-2012

Source: Agribenchmark network

South African Sunflower – The Economics of Production

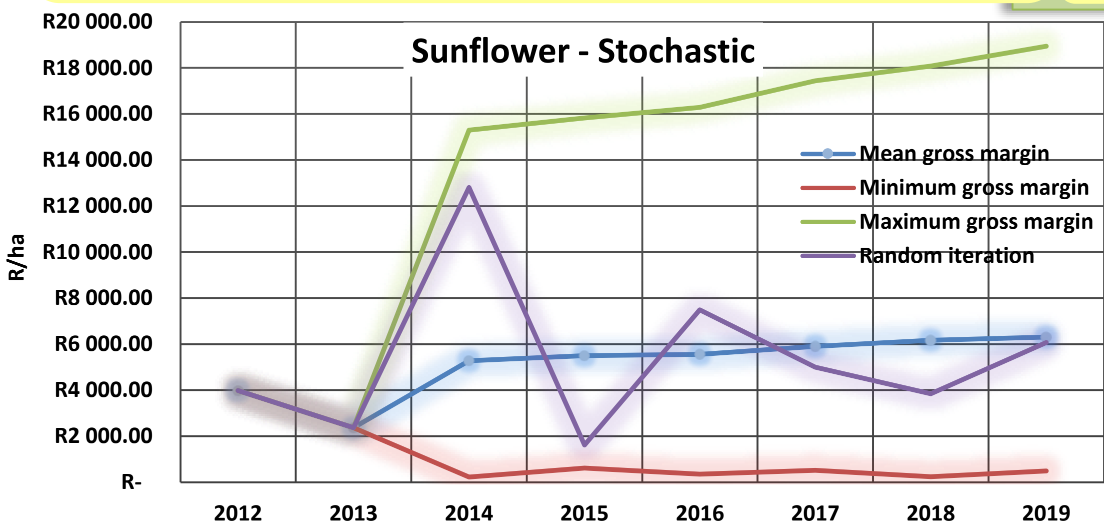


Figure 18: Stochastic evaluation of gross margin on sunflower production
Source: BFAP (2013)

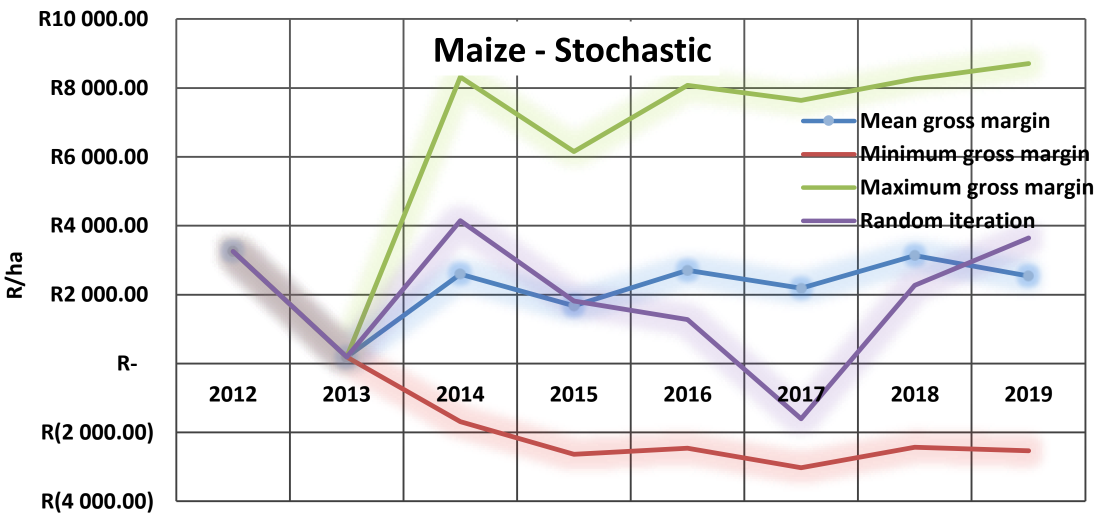


Figure 19: Stochastic evaluation of gross margin on maize production
Source: BFAP (2013)

The choice of crop is a major decision for farmers, especially those that face continuous risk of crop failure due to marginal production conditions. Figures 18 and 19 analyse a **North West representative farm** (same farm as Figure 16), illustrating the impact of the 2013 drought conditions in the North West region.

Figures 18 and 19 are the result of linking the BFAP FinSim model to the BFAP sector model, in order to illustrate possible future scenarios, given current macroeconomic trends and underlying assumptions such as the weather. The analysis is illustrated from a stochastic perspective, thus the output captures the random nature given past and projected trends of key output variables (KOVs). These are normally single inputs that are extremely volatile over any given period. In this particular case, the KOVs are commodity prices, yields, fuel costs and fertiliser costs.

When comparing the output of sunflower and maize production, it is clear that the risk profile for sunflower production in the North West region is much lower than for maize production. One of the key factors that contributes to this is that sunflower production is more drought resistant than maize (less output variance). Thus, stochastic modelling is able to identify these risk profiles due to the fact that actual historic data are taken into consideration (normally, ten years of data). The stochastic output therefore considers the projections from the BFAP sector model, but combines it with historic variation in order to capture the risky nature of the agricultural environment. It is important to note that the projections in Figures 18 and 19 are based on an exchange rate of R9.24 to the US $.

Summary & Opportunities in Sunflower Production

Crop production advances include that of conservation farming and no-till sunflower production. Figure 20 illustrates the extent to which farmers in the North And South Dakota regions of the USA adapted their practises in sunflower production. Advances in technologies such as Clearfield sunflower seed cultivars significantly advanced the process of adaption. Extensive trials on similar practices are scheduled to start in the 2013/2014 season in South Africa, under the leadership of Dr A.A. Nel from the ARC-GCI funded by OPOT.

These adapted practices have the possibility to give the higher-risk profile farmers in the drier North West and Free-State districts the opportunity to increase soil moistures in order to survive longer drier spells. The only additional trial that might need attention is the planting of maize as a follow-up crop I.e. the year after minimum-till Clearfield sunflowers were planted. Most farmers are aware of the technology, but adverse (if any) effects of Imazamox (Clearfield persistence) have not yet been shown or we are un-aware of these type of trials as they have not yet been extensively done in South Africa.

South African farmers will have to focus on reducing production costs, whilst still increasing yields. Some of these answers might lie in conservation agriculture and new bio-technology advances in the industry. Other advances should also be tested such as production techniques. Examples include: pressure wheels at planting, optimal soil moisture at planting, soil temperatures at planting, optimising planting dates, fertiliser application efficiency, seed age & storage of sunflower seed, after emergence weed control (effects on yields), and overall weed control trial (mechanical weeding vs. Clearfield herbicide) based on economic returns as well as increased yield.

Other possibilities and additional benefits from using sunflower in rotational cropping

With sunflower being a much lower growing crop, high-rise crop sprayers are able to spray with herbicides before harvesting. This process creates a much cleaner seed-bed for early spring plantings and reduces the amount of new weed seeds spreading. According to NDSU 2007, Monsanto has issued a supplemental label allowing certain applications of glyphosate (Roundup) for control of annual and perennial weeds in sunflower. I.e. Applying a formulation at the **pre-harvest stage of production**. In the study, Monsanto recommends that for pre-harvest use in sunflowers, farmers should only be applying for weed control and not crop desiccation when sunflower plants are physiologically mature (See NDSU 2007 report). This “pre-harvest spray” creates the opportunity to capture much needed extra moisture in the drying phases of the crop and this same process is usually not possible with the maize crop.

Figure 20: Technological advances in sunflower production

Source: NDSU 2007 - No-till one-pass seeding systems preserve soil moisture and ground cover when water is limited. (Roger Ashley)

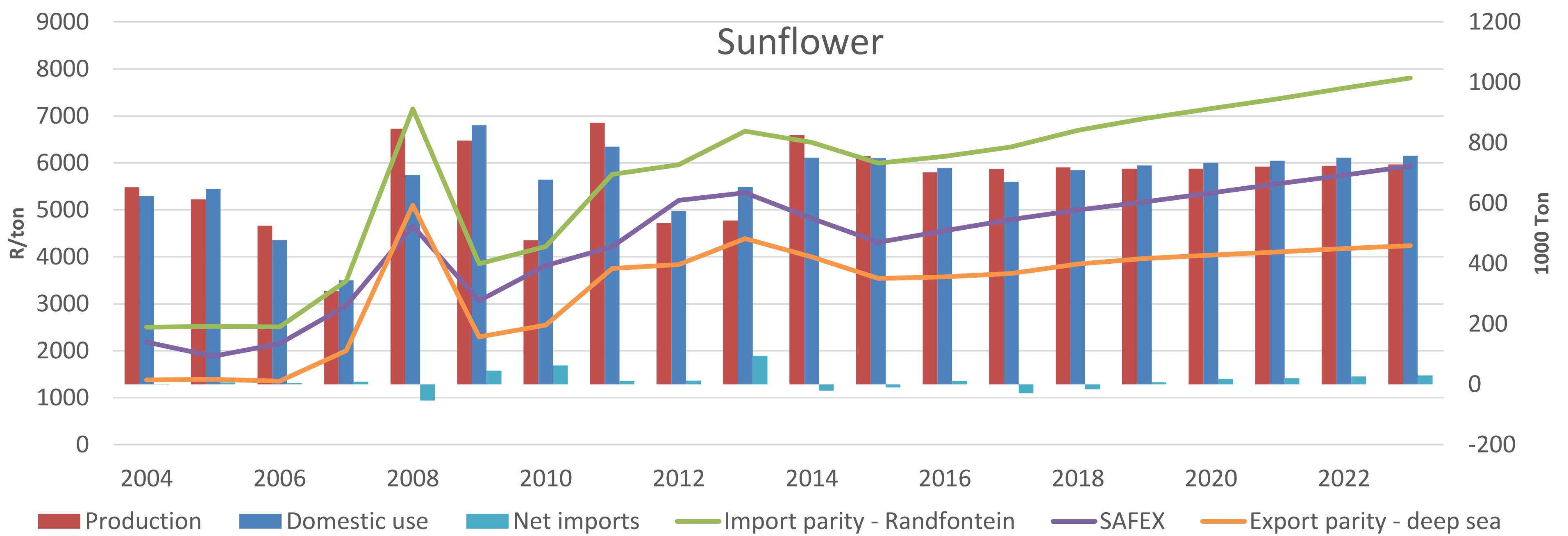


Figure 21: Sunflower outlook
Source: BFAP baseline (2013)

BFAP`s outlook on sunflower seed

The sharp decline in sunflower production in 2012 and 2013 depleted ending stocks and led to a sharp increase in the price, which was also supported by higher international prices. In the current production season the sunflower harvest is set to recover with a sharp rise of more than 50% bringing the production to more than 800 000 tons. In the long run sunflower production is expected to stabilise at around 800 000 tons under the assumption of normal weather patterns, but the area under production is projected to decline to around 500 000 hectares (Figure 21) by 2023. The national average yield is projected to increased to 1.6 t/ha. Over the outlook total demand and supply are closely balanced and as a result the local price will remain trading between import and export parity based on the derived value of oil and cake. However, towards the end of the outlook period is seems as if the local sunflower price will start easing further away from export parity levels and small volumes of sunflower seed might be imported.

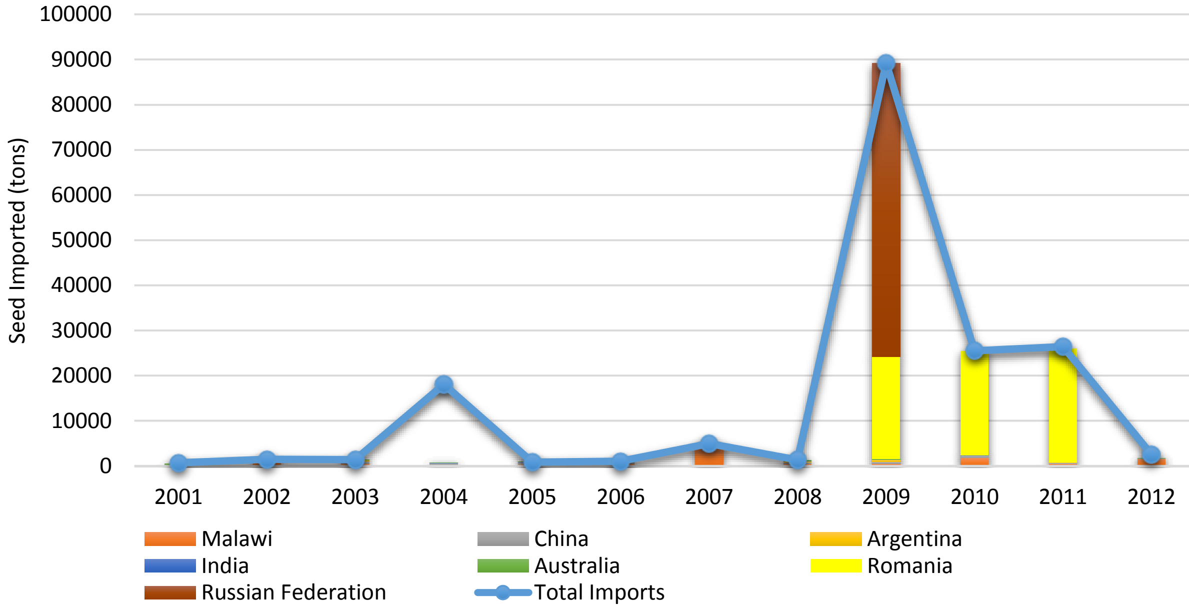


Figure 22: South African sunflower seed imports by country of origin
Source: ITC (2013)

Imports:

South Africa's international trade in sunflower seed is very limited. In stark contrast to soybeans and maize, the volume of both imports and exports of sunflower seed is rather insignificant, with imports averaging only 2% of domestic production through the past decade.

Average imports of seeds over the period 2001-2012 was 14 500 tons of which a single year high was imported in 2009. A total of 64 999 tons was imported from Russia and a further 22 606 tons from Romania. It goes to show what large impact the 2008 price-hike had on South African prices and local demand. Some of the imports and exports are rather for planting or breeding seed purposes, which accounts for the 1000 to 2500 tons of seed imported on a regular basis.

Exports:

Most of South African seeds are exported to the neighbouring African countries. In the past 3 years, more than 60% of the seeds exports were directed to African countries. Seed exports over the period 2010-2012 had an average export value of R9 780 000, which is very little compared to soybeans as its main competitor. The emphasis instead falls on the value-added products, such as sunflower oil.

Table 8: South African sunflower seed exports

Year	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Seed Exports in total (tons)	988	1240	1000	441	794	513	509	8056	1209	171	446	575
Africa Aggregation	166	241	100	39	464	333	335	1306	1187	158	308	384

Source: ITC 2013 & Own Calculations

South African Sunflower - Trade Flows

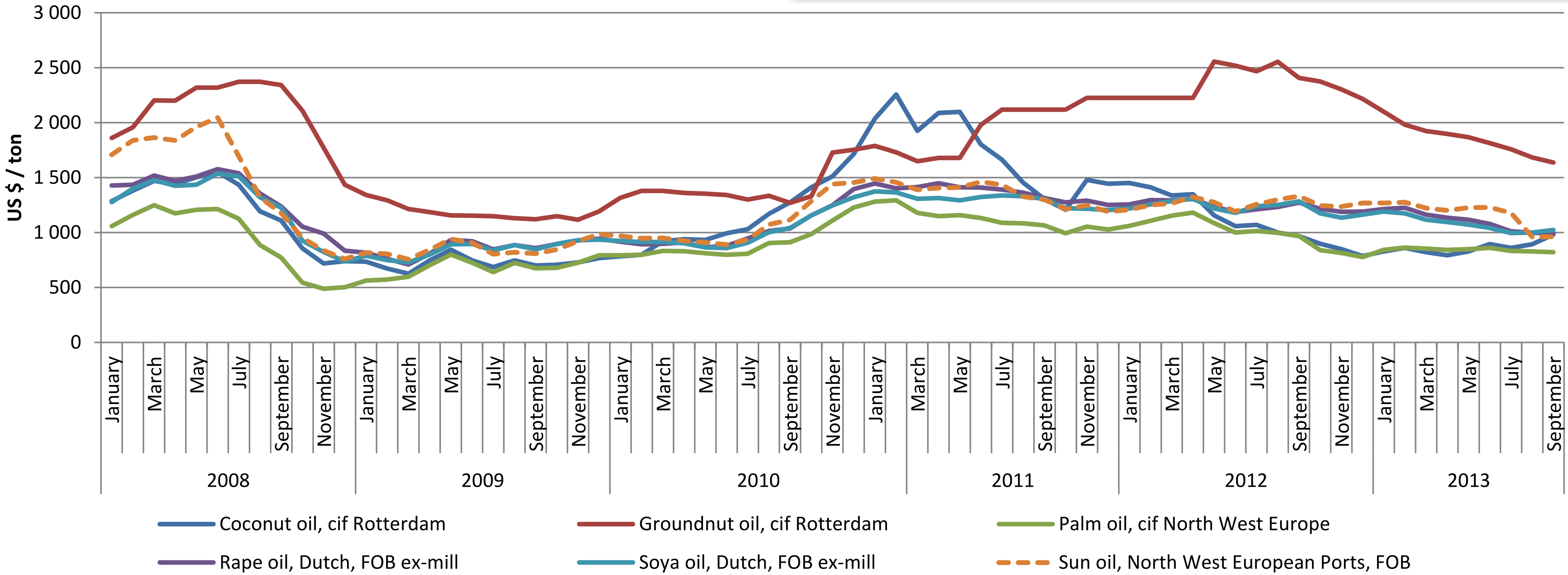


Figure 23: Monthly FOB oil prices per oilseed commodity
Source: Oilworld (2013)

- Since the high commodity prices of 2008 very few vegetable oils returned to their record prices, except groundnut oil.
- Palm oil remains the cheapest source of vegetable oil and follows the same trends as the international vegetable oil market.
- Groundnut and coconut oil is regarded as a niche oil, hence the higher price margins. Third to these oils was sunflower oil.
- Since early 2012, we find the scenario where crude soybean and palm oil compete for the lowest cost vegetable oil on the market, where sunflower always trades at a premium to these oils.
- Palm and Soybean oil can also be regarded as the drivers in the price formation of the other oils and sunflower oil is very much correlated to it.

These prices drive the trade flow of vegetable oils into Africa, as the cheapest alternative will always have the upper hand in the competing market. The following pages will elaborate on South African trade of sunflower oil and seeds, with the data provided in Figure 23 forming the basis and driver for many of the scenarios.

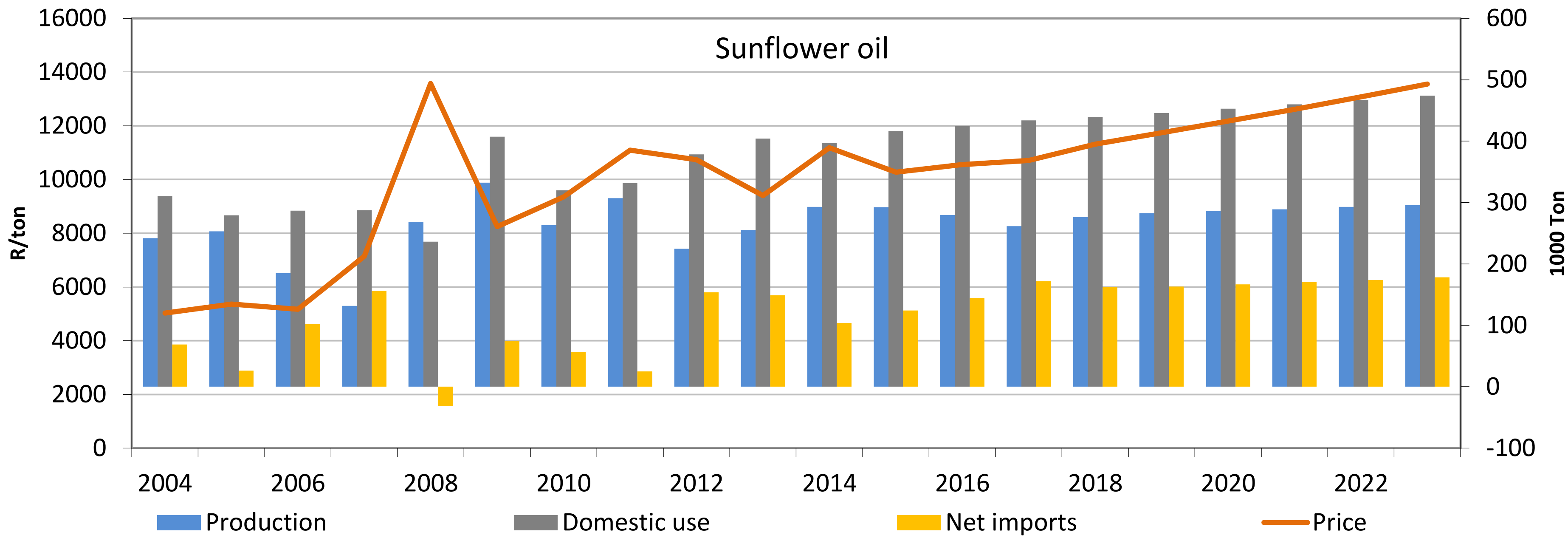


Figure 24: Sunflower oil outlook

Source: BFAP baseline (2013)

BFAP`s outlook on sunflower oil:

Domestic consumption of sunflower oil is projected to increase by an average of 2% per annum through the next decade, reaching an annual consumption of 474 000 tons by 2023. South Africa is expected to remain a net importer of sunflower oil throughout the baseline period, with imports projected to account for approximately 36% of domestic consumption by 2023, totalling 178 000 tons (Figure 24).

As a net importer of vegetable oils, the domestic price is influenced by a combination of international prices and the exchange rate. Given the assumptions associated with the exchange rate and the weaker international prices, the price of sunflower oil is expected to trade sideways through the medium term, before increasing at an annual average of 4% per annum through the baseline period. A greater depreciation of the rand will increase the cost of imported oil, driving the domestic price of sunflower oil higher and increasing the magnitude of the supply response.

South African Sunflower - Trade Flows

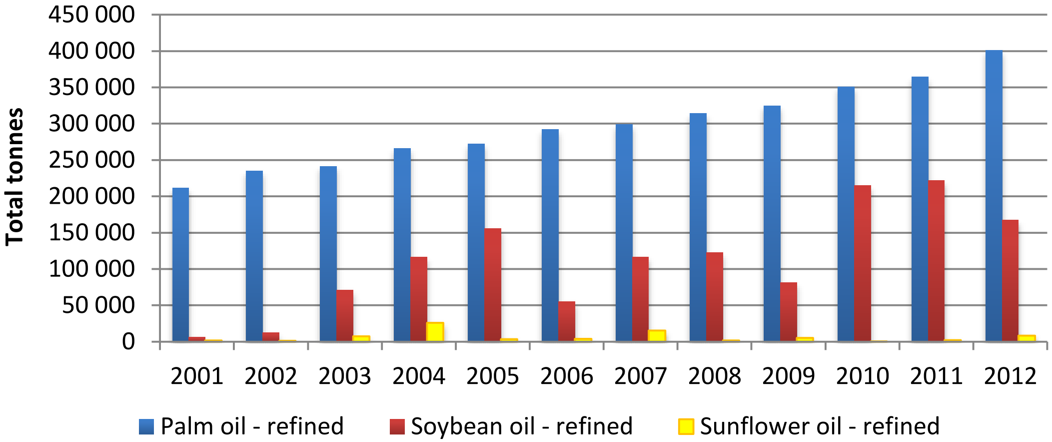


Figure 25: Top 3 imported vegetable oils - Refined
Source: ITC (2013)

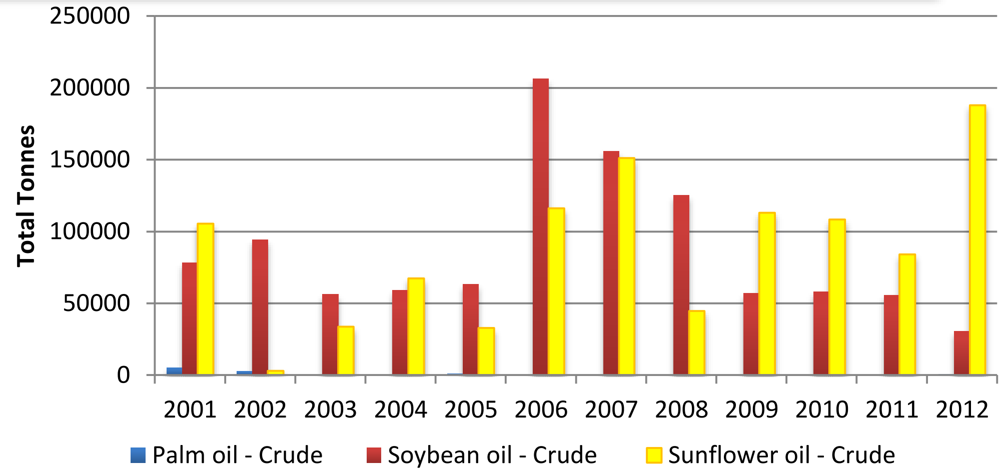


Figure 27: Top 3 imported vegetable oils - Crude
Source: ITC (2013)

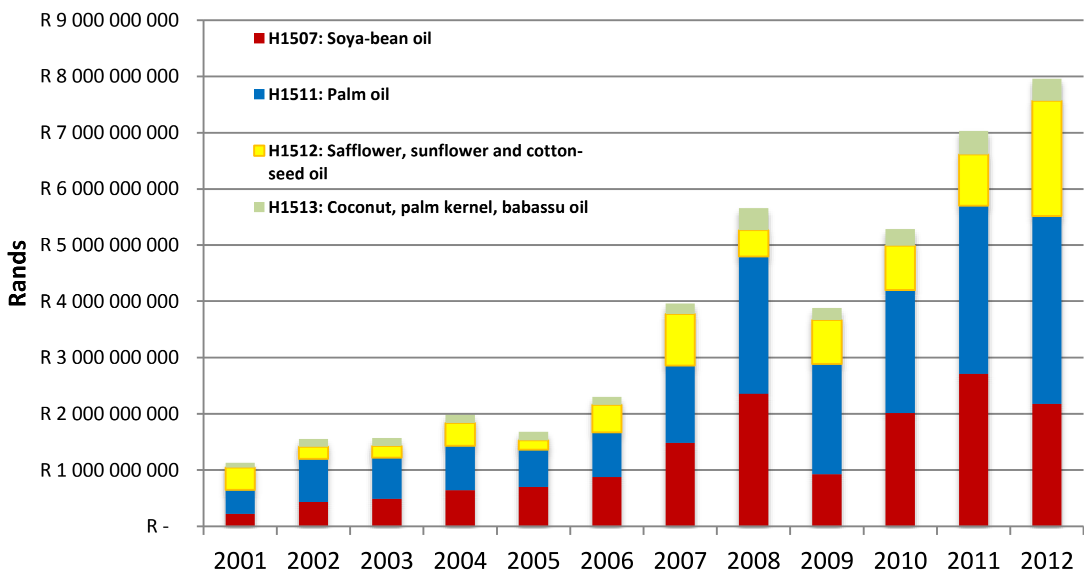


Figure 26: Total value of oil imports (refined and crude) per oilseed commodity
Source: ITC (2013)

South Africa imports very little refined sunflower oil. The 10 year average is 6 327 tons imported, originating mostly from Spain, Argentina and France. Crude vegetable oil imports is a different situation, with two of the largest refineries situated in Durban and Port Shepstone. The 2012 season was a record year for sunflower crude oil imports. Countries such as Ukraine (32 787 t) and Switzerland (12 475 t) added to the 187 484 tons imported, whilst Argentina (115 282 t) has always been the primary importing country for South Africa's crude sunflower oil, averaging 67 000 t of crude sunflower oil imported (2002-2012) .

Refined palm oil has the highest import value, totalling R 3 326 700 000 in 2012, which represents 57% of all **refined oils** (Soybeans represents the second highest value, accounting for 32%). This refined is imported at very competitive prices and the imported volumes gave doubled over the past decade.

Of **total vegetable oil imports (crude & refined)**, sunflower oil (crude and refined) represents 25% of the R8 124 034 104 worth of imports in 2012, Palm (41%) and Soybean (27%).

South African Sunflower - Trade Flows

Since 2007, the value of refined sunflower oil exports grew from R60 626 575 to R529 728 833 in 2012. Over the same period, refined soybean oil exports grew from R3 593 790 to R 870 696 992 and remains the highest value and quantity of exports.

The majority of the refined sunflower oils is exported to neighbouring SADC countries, accounting for roughly 90% of total exports. Zimbabwe is the leading export destination of both refined and crude sunflower oil, taking this position for the past 10 years. As crushing and refining capacities compete for market share, continuous pressure would be expected in the local market.

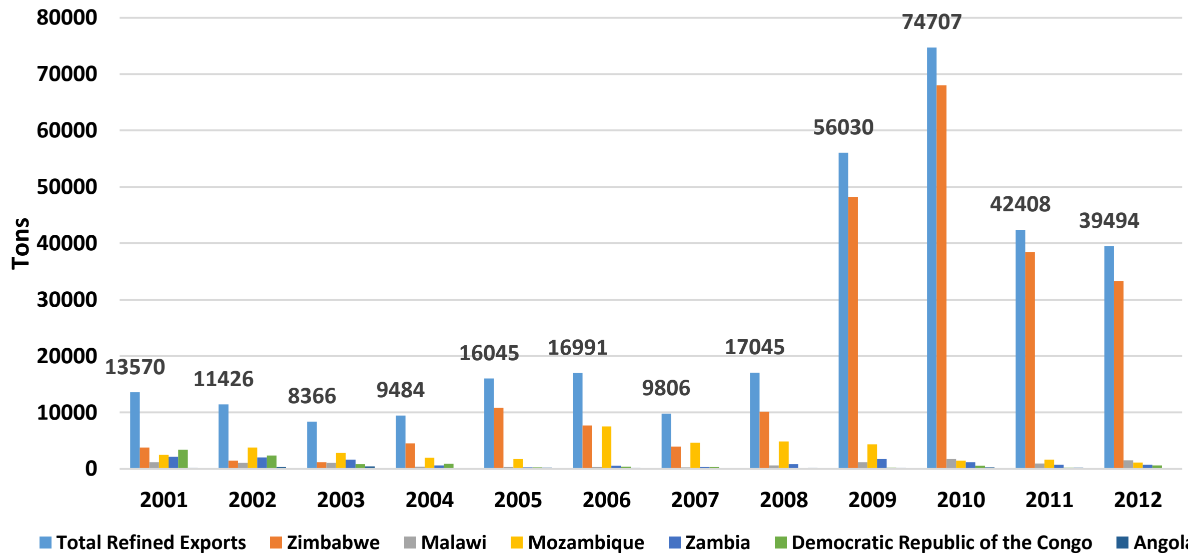


Figure 29: Refined oil exports and top export destinations
Source: ITC (2013)

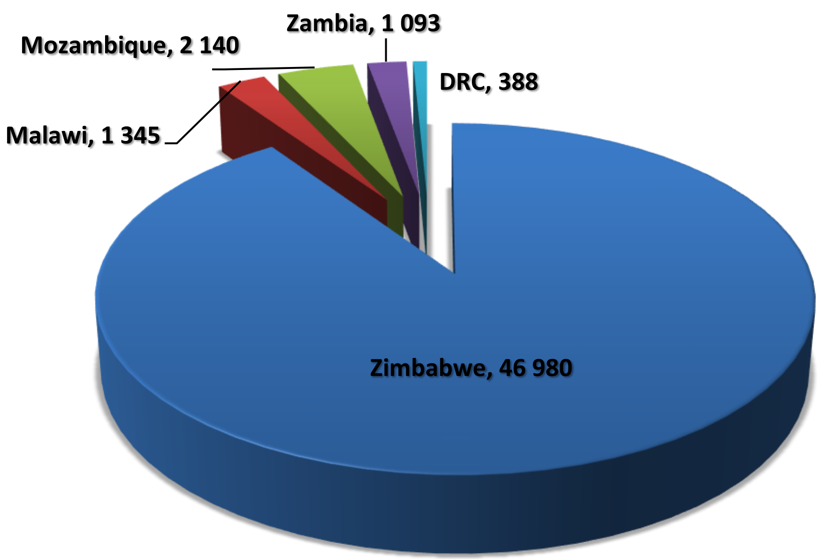


Figure 28: Average tons of refined sunflower oil exports to the top 5 SADC importing countries (2009-2012)
Source: ITC (2013)

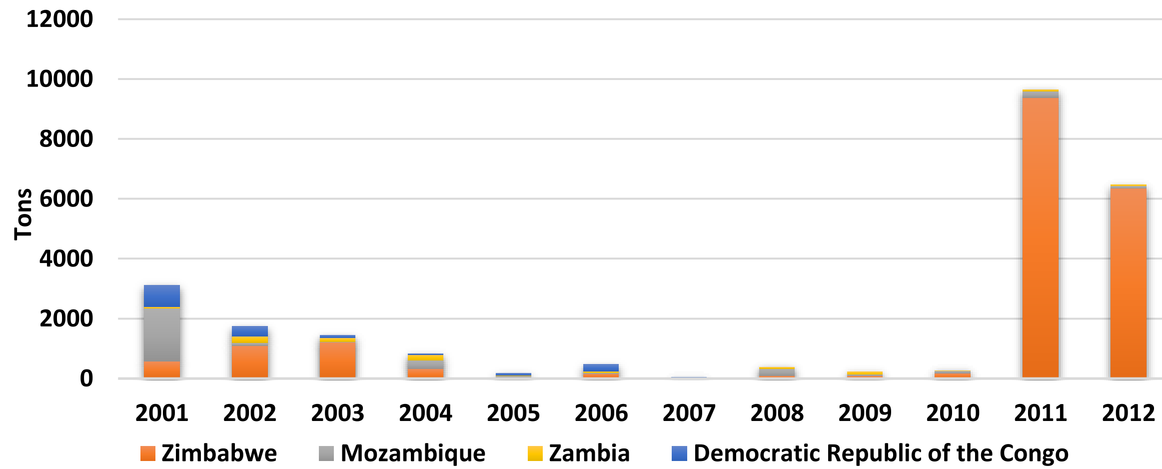


Figure 30: Crude oil exports and top export destinations
Source: ITC (2013)

South African Sunflower - Trade Flows

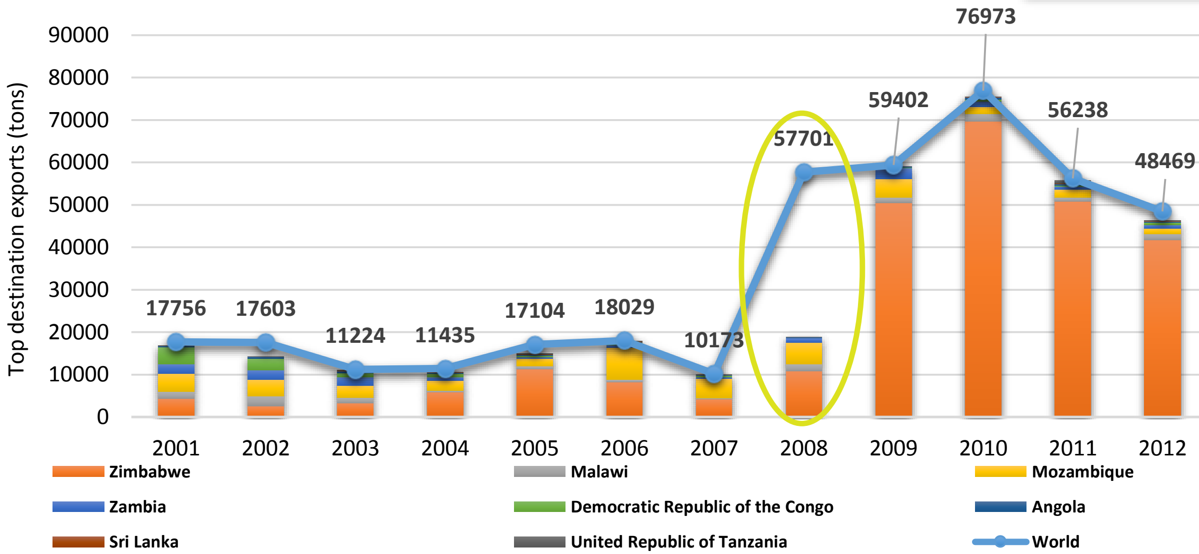


Figure 31: Sunflower oil exports and top export destinations (crude and refined)
Source: ITC (2013)

As illustrated by Figure 31, very little crude oil is exported (with the exception of the 2008 year). During 2008 various new markets were entered (Table 9) besides the existing trade with African countries as explained in Figures 28, 29 and 30.

New destination countries in the EU include the Netherlands and France, which again shows the impact of high commodity prices and the effect on global markets. It is important to note that these "foreign" markets have been entered and the possibilities for future exports do exist, obviously depending on the relative level of prices. The main limiting factor is freight costs, hence the need to optimise the trade with African countries where demand is still outgrowing local continent supply.

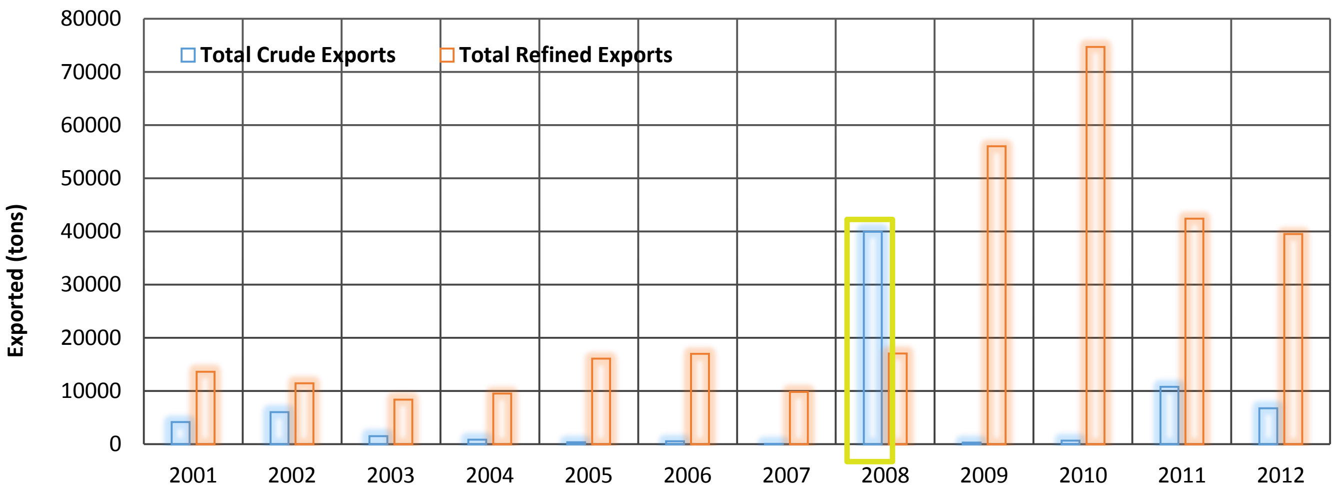


Figure 32: Sunflower oil exports (crude and refined)
Source: ITC (2013)

Table 9: Additional export destinations in 2008

Additional Destinations (Year - 2008)	Tons Exported
Netherlands	15724
Australia	2008
France	1855
Iran (Islamic Republic of)	1105
Malaysia	5900
Oman	6517
United Arab Emirates	4491
Kenya	902
Rest of Africa	19199
Total Sunflower Oil Exports	**57701**

Source: ITC (2013)

South African Sunflower - Trade Flows

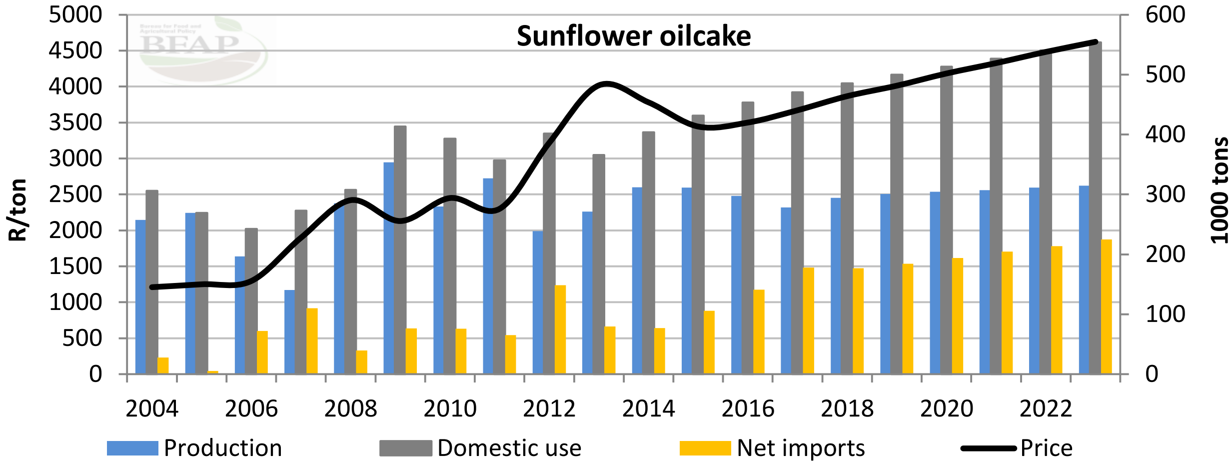


Figure 33: South African sunflower oilcake outlook
Source: BFAP baseline (2013)

As indicated in the processing section of the report, sunflower oilcake is a relatively small component of the total oilcake industry. Figures 33 and 34 illustrate the situation of increased imports from Argentina as well as some increases in exports of sunflower oilcake to some African countries. In the past 10 years, average oilcake exports were in the range of 1360 tons, which has a very small effect on the local market. Over the past 5 years, South Africa imported an average of roughly 80 000 tons of oilcake. The growth of oilcake imports in the period 2008-2012 was 46%, with the majority originating from Argentina - 98.6%.

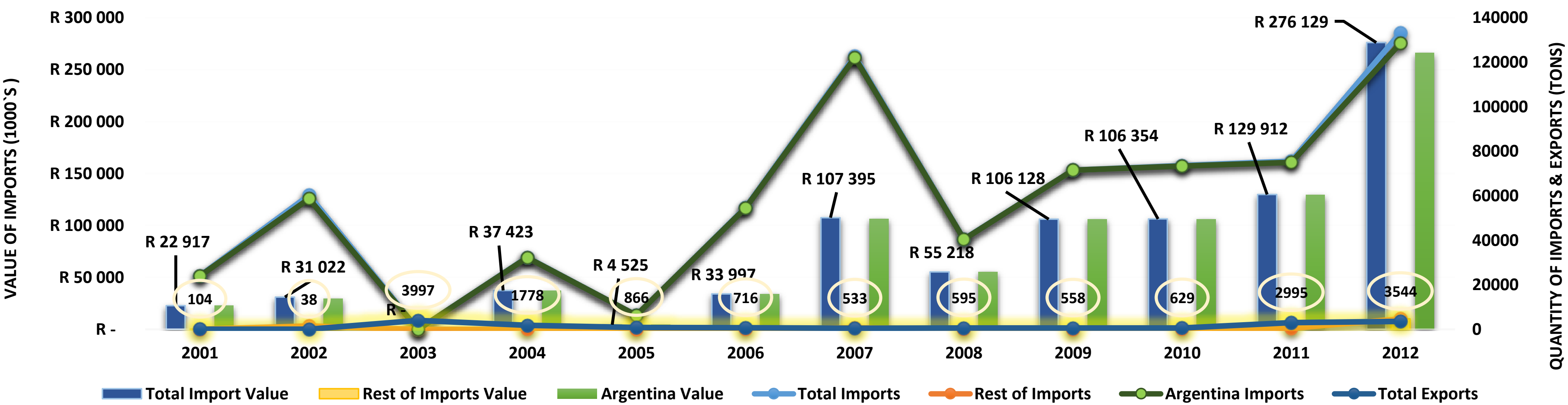


Figure 34: Sunflower oilcake trade
Source: ITC (2013)

Sunflower – Crushing & Refinery locations

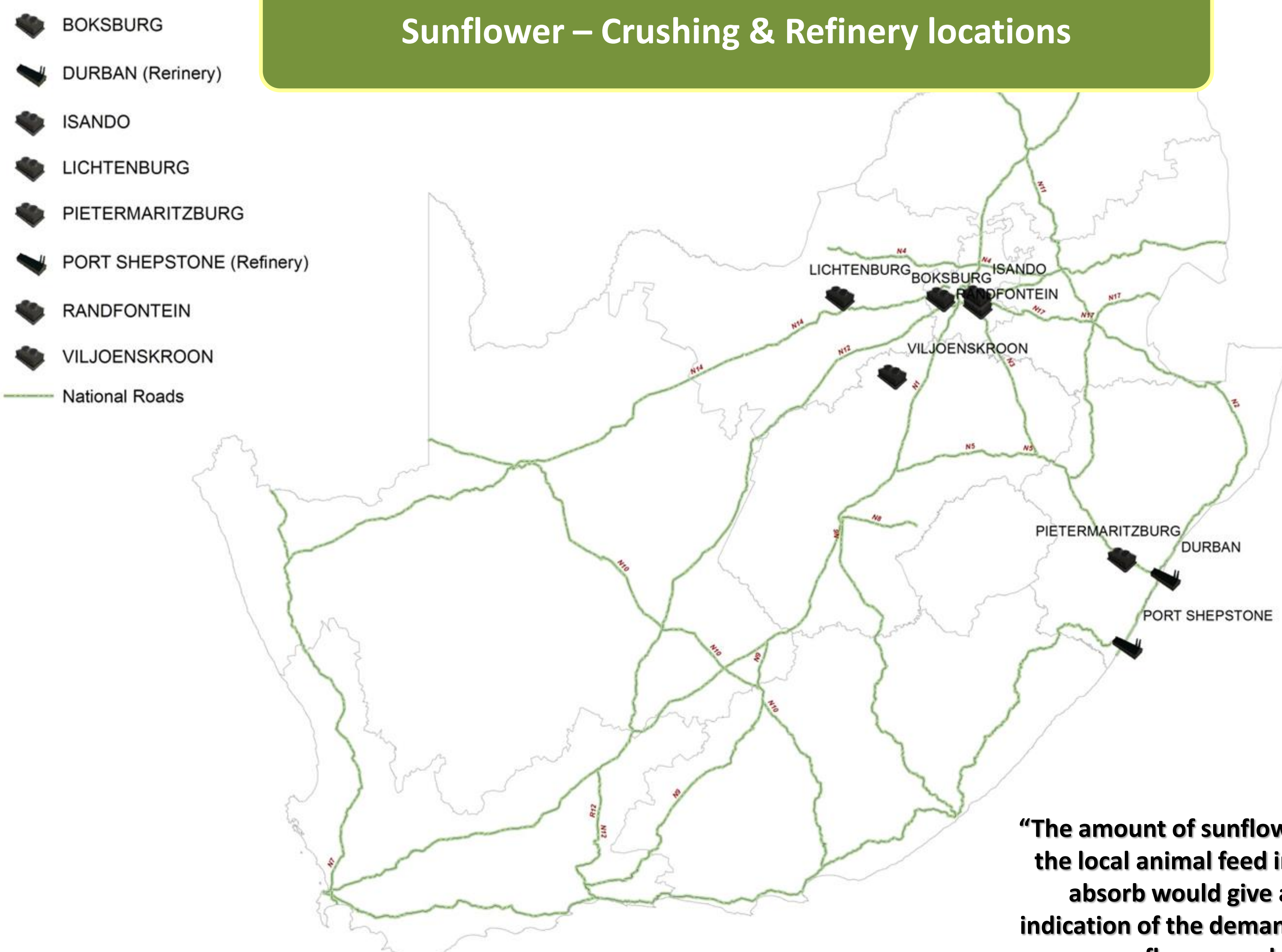


Figure 35: Sunflower processing locations in South Africa

Source: BFAP industry correspondence 2013

"The amount of sunflower oilcake that the local animal feed industry could absorb would give a probable indication of the demand for domestic sunflower production".

South African Crushing Capacities – Sunflower & Soybean

Table 10: Crushing capacities

Oilseed Crushers South Africa		Status	Refinery	No-Refinery	Dual	Suns Only	Soy's Only	Capacity			
Location	Name							Suns	Soy's	Total Suns	Total Soy's
								1000 t/month	1000 t/month	1000 t/year	1000 t/year
Historical											
Pietermaritzburg	**Capital Oil Mills**	Closed									
Viljoenskroon	**Continental Oil Mills**	Running						10		120	
Randfontein	**Continental Oil Mills**	Running						16	15	192	180
Isithebe	**Elangeni Oil & Cake Mills**	No more Suns									
Southdale/Soweto/Nasrec	**Epic Foods**	No plant									
Lichtenburg	**Epko Oil Seed Crushing**	Running						10		120	
Randfontein	**Nola Industries**	Running						10		120	
Gauteng	**Gauteng Oil**	Running						10		120	
Pietermaritzburg	**Sealake Industries**	Closed									
Durban	**Sun Oil Refineries**	Refinery only									
Port Shepstone	**Sunola Oil Mills**	Refinery only									
Cumberwood	**Hentiq 1320**	Closed									
Cape Town	**Willowton Oil Mills**	Use to be Ground nuts									
Pietermaritzburg	**Willowton Oil Mills**	Running						14		168	
Isando	**Willowton Oil Mills**	Running						20	23	240	276
Boksburg	**UBR**	Closed									
	CEOCO	Running						16		192	
Potgietersrus	**Nedan Oil**	Running						8		96	
Potgietersrus	**Nedan Oil**	Running							8		96
More Recent											
Potgietersrus	**Nedan Oil**	Running							19		228
Winterton	**Drak**	Running							4		48
Villiers Co-op	**VKB**	Running							8		96
Bronkhorstspruit	**Russel Stone**	Running							20		240
Standerton	**Noble**	Running						26	28	269	336
Nasrec	**Gauteng Oil**	Running							8		96
Krugersdorp	**Majesty**	Running						10	16	154	192
Bethlehem	**Russel Stone**	Starting - Up									
Total Individual Crushing Capacity (1000t`s)										**1790**	**1788**
Additional Capacity From Dual`s - *Accepting ratio adjustments. Sunflower crushing at 80% of Soybeans*										**634**	**821**
Total Adjusted Capacity - If Dual Shifts										**2424**	**2609**

Source: BFAP industry surveyed 2013

Crushing Capacities

The combined crushing capacity of sunflower and soybean is approximately 3.5 million tons. With additional dual crushing capacities of roughly 700 000 tons going both ways. It was found that only 4 crushers have dual capabilities and 3 of these dual plants currently focus on soybeans.

Sunflower Crushing Capacities

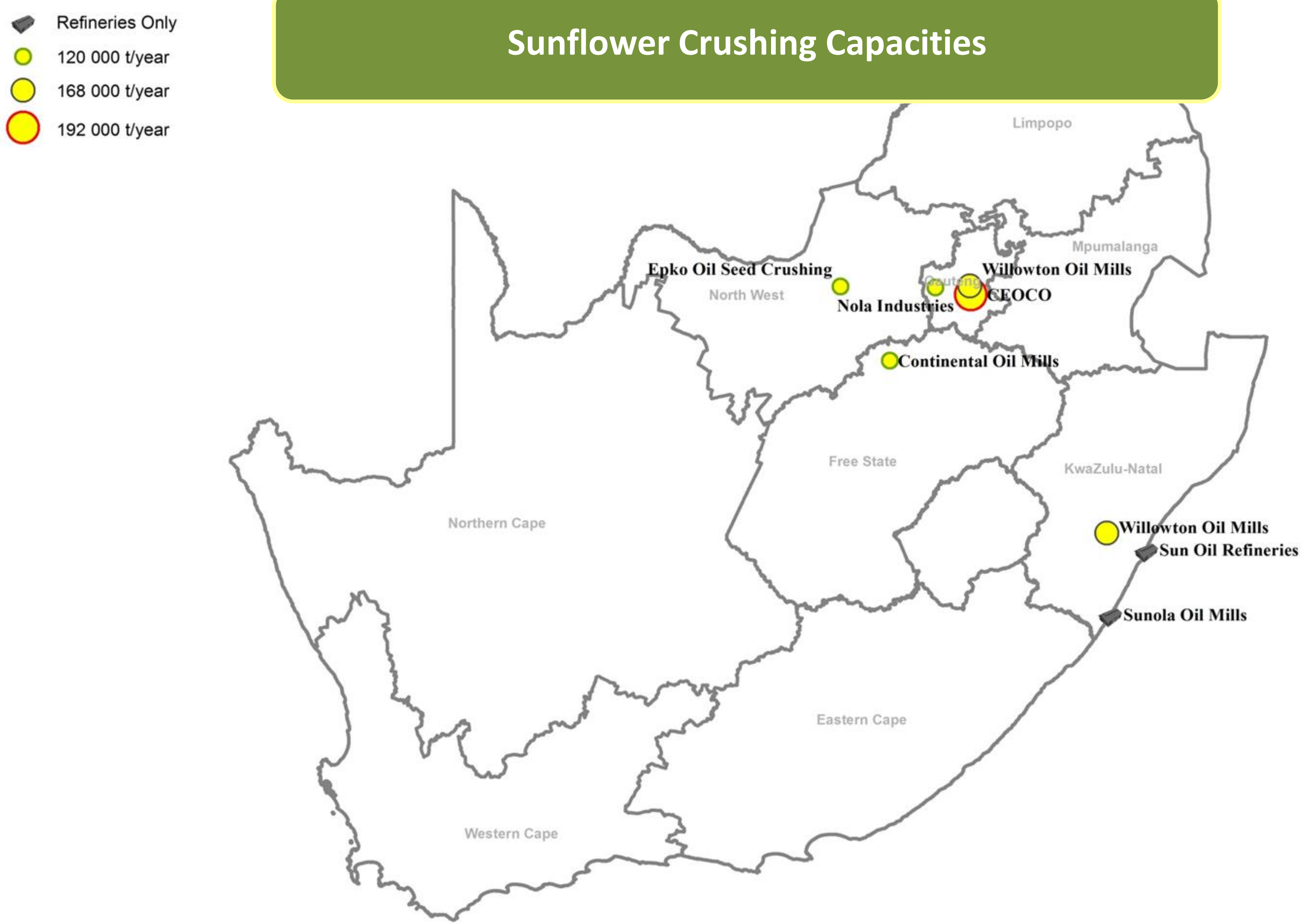


Figure 36: Sunflower crushing capacity
Source: BFAP industry correspondence 2013

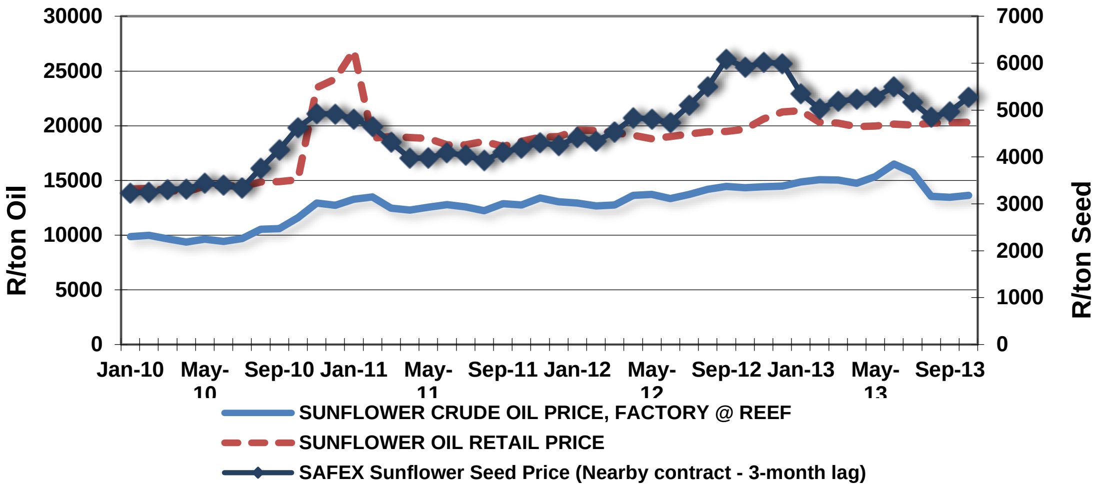


Figure 37: Sunflower oil and seed prices
Source: Own Calculations

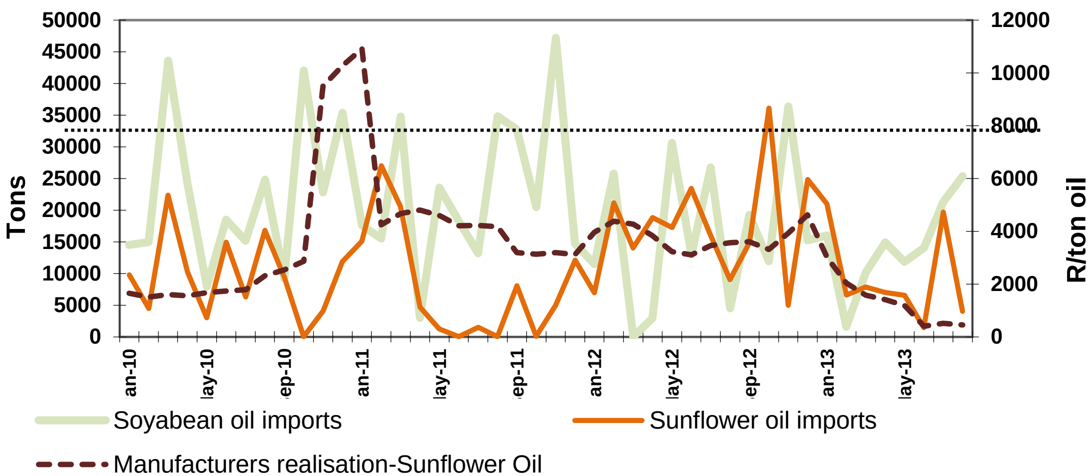


Figure 38: Manufacturers realisation vs. oil imports
Source: Own Calculations

International sunflower oil price derived back to RSA:

Factoring the international oil price back to the local landed price is illustrated in Figure 37, displayed as the "crude oil price – factory @ reef". This price shows the extent to which the international or North West European FOB price is related back to South Africa`s harbours. As the exchange rate weakens an increase in both the local seed and this imported crude oil price is typical.

Comparing the landed international oil price to the South African retail price shows that although there are some periods where the trends diverge, there is generally a strong level of transmission between the international price and the local prices. It is also worth noting that there seems to be a even stronger correlation between the retail price and the local SAFEX prices. Since there is ample crushing capacity by various companies, there seems to be tight competition for the sourcing of sunflower seed and crushers that also have refineries have to weight up the costs of crushing the seed versus importing he crude oil.

As domestic consumption is projected to remain higher than production, South Africa will remain a net importer of sunflower crude oil and probably export refined oils to the SADC region, when surpluses are produced

Average		Jan-Dec	Jan-Dec	Jan-Dec	Jan-Oct	Change %	Change %	Change %
		2010	2011	2012	2013	10-11	11-12	12-13
SAFEX nearby contract - 3-month lag	R/ton	R 3 806	R 4 218	R 5 192	R 5 183	10.84%	23.08%	-0.16%
SUNFLOWER CRUDE OIL PRICE, FACTORY @ REEF	R/ton	R 10 501	R 12 772	R 13 720	R 14 795	21.63%	7.42%	7.84%
SUNFLOWER OIL RETAIL PRICE	R/ton	R 16 887	R 19 352	R 19 595	R 20 284	14.60%	1.26%	3.51%
Manufacturer-to-Retail Margin	R/ton	R 2 682	R 3 373	R 2 525	R 1 917	25.77%	-25.15%	-24.08%
Farm Value	R/ton	R 9 222	R 10 206	R 12 670	R 12 611	10.68%	24.14%	-0.47%
Farm-to-Retail Price Spread of Sunflower Oil	R/ton	R 6 832	R 9 146	R 6 925	R 7 673	33.87%	-24.28%	10.80%
Farm Value Share of Retail Price of Sunflower Oil (%)	%	58.10%	53.07%	64.57%	62.19%	-8.66%	21.66%	-3.69%
Raw Material as Percentage of Retail Price (Crude Oil)	%	66.64%	66.85%	70.04%	72.98%	0.32%	4.77%	4.19%
Conversion Costs as a Percentage of Retail Price	%	18.77%	15.86%	16.36%	16.76%	-15.47%	3.15%	2.45%
Packaging as a Percentage of Retail Price	%	6.65%	5.75%	5.94%	6.09%	-13.57%	3.23%	2.53%
Marketing and Distribution Costs as a Percentage of Retail Price	%	13.82%	13.31%	13.39%	13.46%	-3.71%	0.63%	0.49%
Total Profits as a Percentage of Retail Price	%	18.64%	28.31%	18.47%	22.49%	51.90%	-34.74%	21.74%

Processor & Retail margin evaluation summary:

The purpose of evaluating the oil processing supply chain is not to reveal or expose margins, but rather to emphasise the importance of this industry in the context of a value chain approach. SAFEX contract prices have a direct effect on the retail prices, as the average annual SAFEX price increased by 27%, the average sunflower oil retail price over the same period increased by 17% (2010-2013).

The crushers and refineries also deal with the volatile retail market and the fluctuations in price, not just the farmers. In some months, crushing margins were found to be negative, while negative conversion costs were also found in 2010-2011. Further analysis showed negative crusher profits in relation to retail prices, as shown in the table above (2011-2012). Figure 39 illustrates very little changes to convert crude to refined oil, whereas the prices of raw material increased more drastically and this the main cost driver.

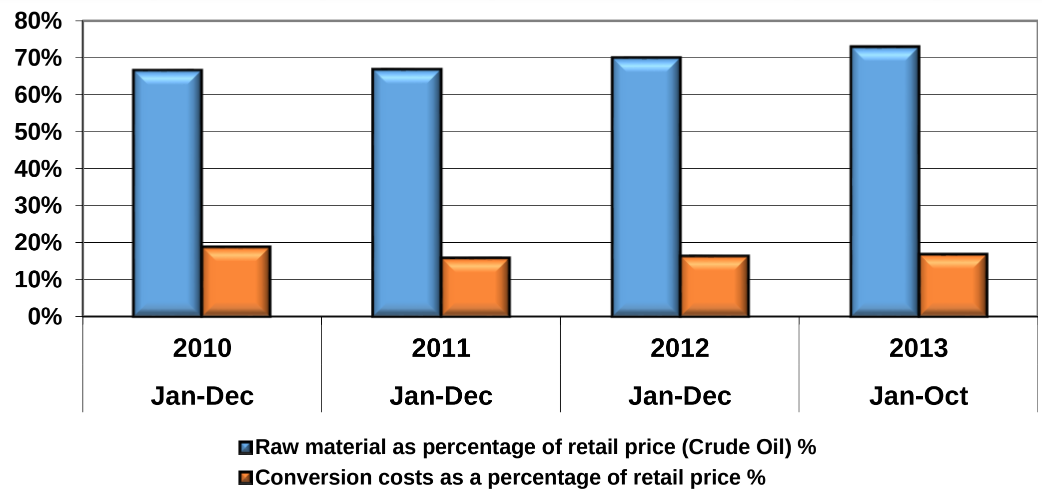


Figure 39: Raw material and conversion costs

Source: Own Calculation

Oil Content Analyses

Over the past decade, the domestic sunflower industry has remained stagnant with basically no growth in the production and consumption of seed, raising the question of what could provide additional incentives for the industry to expand. A potential premium for higher oil yields could prompt producers to prioritise higher oil-yield per ton and to follow optimal growing guidelines, as opposed to regarding sunflowers as a catch crop.

Processors generally prefer sunflower hybrids that combine genetics for high oil yield and hulling characteristics, yet in South Africa, premiums are not necessarily paid for a higher oil yield, as in the United States for example. The South African industry is set on an average oil content of 38%, with no distinction for higher oil content. The United States currently provides a 2% price premium for every 1% of oil content exceeding the norm of 40% (NSA, 2011).

Applying the US principle of price premiums for oil content in the South African market

In order to quantify the potential effect of a premium on higher oil yields in South Africa, data from cultivars evaluated in the 2010/2011 Agricultural Research Council (ARC-GCI) national trial was used (ARC-GCI, 2011). Table 11 indicates that when US principles are applied, the potential premium results in an increase of R633/ton in the producer price based on October 2013 price levels. From the evaluation conducted for the National Sunflower Quality Report of the Southern African Grain Laboratory (SAGL), it is evident that producers are in fact already producing high-oil-content seeds (SAGL, 2013). The SAGL reported a sample mean of 43% oil yield realised from seeds delivered to silos in the south-western region of the Free State, which is significantly higher than the standardised perceived norm of 38%. Even a 6% premium implied by this oil yield could provide a significant incentive, potentially resulting in a gain of R317/ton (Oct. 2013 SAFEX price).

Table 11: Producer's gain based on higher oil content premium

Assumptions based on 2% premium per 1% above 40%*, calculated on the SAFEX spot price		
Crude oil contribution (% extraction from 1 ton of seed)	46%** oil yield is calculated as DMB (Dry Matter Base)	6% higher oil yield results in 12% premium
SAFEX (Avg. Oct 2013)	**R 5 277**	
Producer's gain per ton of high-oil-yielding seed delivered		**R 633**

Source: Own Calculations

*South Africa has no formal specification for a "norm" oil content to be delivered. The Agricultural Product Standards Act 1990 (Act 119 of 1990) states that an FH1-grade sunflower seed delivered should be seed of a "high oil yield", thus not specifying what is meant by "high oil yield". The general industry-established norm is that all sunflower deliveries on SAFEX should be above a 36% oil yield and preferably at a 38% norm. The 38% norm was also used by ITAC (2006:12) in their anti-dumping investigation of refined sunflower oil from Argentina and Brazil. To relate back to the United States example, a 40% (DMB) is used.

**46% (page 24) is the average from the 2010/2011 ARC-GCI national trial data. Total moisture is already extracted from this figure.

A proposed price premium could essentially enhance the overall attractiveness of the crop, resulting in increased production. The hypothetical increased production could be absorbed by the sunflower industry's current crushing capacity of at least 1 700 000 tons per annum (excluding the dual sunflower-soybean facilities). The evaluation of a proposed processor's premium back to the manufacturer's/crusher's profitability is also essential. The higher oil content does result in more oil being extracted, but this will also imply less oilcake extraction per ton of oilseed crushed. Table 12 was developed using the BFAP sunflower value chain model, using the SAFEX seed price, the derived sunflower oil price, as well as the derived sunflower oilcake price to calculate the levels of extraction and the gains/losses derived. Table 12 illustrates that the crusher`s margin increases by approximately 49% due to the higher oil extraction, as opposed to the industry norm of 38%.

Table 12: Crushing margin analyses based on higher oil extraction

Supply Chain Evaluation: Crushing Margin Analysis	Current Industry Norm – Dry Matter Base	Higher Oil Yield – Dry Matter Base	Difference
Crude oil contribution (% extraction from 1 ton of seed)	**38%**	**45%**	**7%**
Cake Contribution (% cake from 1 ton of seed)	**43%**	**36%**	**7%**
Manufacturer's/Crusher's Gross Margin (After Costs and using the Dry Matter Base %) [Oct. 2013 Sunflower Oil and Oilcake Prices]	**R 1 169**	**R 1 745**	**R 576**

Source: Own calculations

The average value of sunflower oilcake imports for the period (2009-2012) was R154 000 000, which can be ascribed to an average of 88 000 tons being imported over the same period. If South Africa were to produce the 88 000 tons of oilcake from their own crushers, an additional 206 000 tons of additional seed would be required. Even more importantly, the deficit of 206 000 tons would result in the current crushing capacity of the country being optimised, as the average total harvested crop for the period 2009-2012 was only 610 000 tons. In essence; South Africa is importing oilcake at an average cost of R154 000 000, whilst our own crushing capacity is under-utilised by at least 900 000 tons.

Crushing capacity in the sunflower industry is currently under-utilised by approximately 900 000 tons per annum (excluding the new dual sunflower-soybean facilities that have been constructed), which would indicate that the hypothetically increased production could be absorbed. Nevertheless, despite the under-utilisation of the current crushing capacity, South Africa remains a net importer of both sunflower oil and sunflower oilcake, which implies that even without paying the proposed premium, it seems that the relative profitability from current crushing margins is not sufficient to induce additional crushing domestically. Consequently, a more detailed study looking into the viability of an additional oil premium would be required before any conclusions could be drawn.

South African Sunflower – Processing Oilcake

The average sunflower oilcake consumption over the period (2008-2012) was 370 000 tons, of which approximately 80 000 tons was imported. Figure 40 provides an overview of the extraction rates (oil and oilcake) and the amount of sunflower seed required to meet the average sunflower oilcake demand of 370 000 tons.

Using the current industry norm of 38% oil extraction and a 43% oilcake extraction, the country would need 860 465 tons (current scenario) of seed to crush in order to supply local oilcake demand. To supply the same amount of oilcake that the market requires, based on a 45% oil extraction and 36% oilcake extraction, would imply a crop of 1 027 778 tons. In other words, under this scenario, the sunflower area should either expand due to higher prices based on increased oil content, or yields should increase as shown on the next page.

Tons of seed required to supply average oilcake demand		% Oilcake Extraction (DBM)														
		45%	44%	43%	42%	41%	40%	39%	38%	37%	36%	35%	34%	33%	32%	31%
% Oil Exctraction (DBM)	36%	822 222														
	37%		840 909													
	38%			860 465												
	39%				880 952											
	40%					902 439										
	41%						925 000									
	42%							948 718								
	43%								973 684							
	44%									1 000 000						
	45%										1 027 778					
	46%											1 057 143				
	47%												1 088 235			
	48%													1 121 212		
	49%														1 156 250	
	50%															1 193 548

Figure 40: Oil and oilcake extraction combined with amount of sunflower seed required

Source: Own compilation

Hectares required to supply average seed demand (for crushing)		% Oilcake Extraction (Based on *1.3t/ha* seed yield)														
		45%	44%	43%	42%	41%	40%	39%	38%	37%	36%	35%	34%	33%	32%	31%
% Oil Exctraction	36%	632 479														
	37%		646 853													
	38%			661 896												
	39%				677 656											
	40%					694 184										
	41%						711 538									
	42%							729 783								
	43%								748 988							
	44%									769 231						
	45%										790 598					
	46%											813 187				
	47%												837 104			
	48%													862 471		
	49%														889 423	
	50%															918 114

Figure 41: Oil and oilcake extraction combined with number of hectares needed to supply local demand; Yield 1.3 t/ha (1.3 t/ha is South Africa`s average yield)

Source: Own compilation

Utilising the alternative scenario, which is aimed at increasing oil extraction at the cost of decreasing oilcake extraction while at the same time increasing seed yield, results in two basic gains: firstly, the manufacturers/crushers run at full capacity (even some of the dual plants will be required), and secondly, the producers could gain a proposed premium per hectare (higher seed yield and higher oil content premium).

By achieving the international average yield of 1.6 t/ha, South Africa would be getting closer to self-sufficiency in the production of oilcake. This is based on the current extraction rates, as well as the average area planted to sunflower, which is roughly 515 000 to 530 000 hectares (2008-2013). If yields were to increase to the level achieved by the ARC national trials, it could result in a probable reduction in hectares, but under the higher oil extraction scenario, this could still be beneficial to both producers and crushers.

Hectares required to supply average seed demand (for crushing)		% Oilcake Extraction (Based on *1.67 t/ha* seed yield)														
		45%	44%	43%	42%	41%	40%	39%	38%	37%	36%	35%	34%	33%	32%	31%
% Oil Exctraction	36%	492 349														
	37%		503 538													
	38%			515 249												
	39%				527 516											
	40%					540 383										
	41%						553 892									
	42%							568 095								
	43%								583 044							
	44%									598 802						
	45%										615 436					
	46%											633 020				
	47%												651 638			
	48%													671 385		
	49%														692 365	
	50%															714 700

Figure 42: Oil and oilcake extraction combined with number of hectares needed to supply local demand; Yield 1.67 t/ha (1.67 t/ha is the international average yield)

Source: Own compilation

Hectares required to supply average seed demand (for crushing)		% Oilcake Extraction (Based on 2.1 *t/ha* seed yield)														
		45%	44%	43%	42%	41%	40%	39%	38%	37%	36%	35%	34%	33%	32%	31%
% Oil Exctraction	36%	391 534														
	37%		400 433													
	38%			409 745												
	39%				419 501											
	40%					429 733										
	41%						440 476									
	42%							451 770								
	43%								463 659							
	44%									476 190						
	45%										489 418					
	46%											503 401				
	47%												518 207			
	48%													533 911		
	49%														550 595	
	50%															568 356

Figure 43: Oil and oilcake extraction combined with number of hectares needed to supply local demand; Yield 2.1 t/ha (2.1 t/ha is the average national ARC trial yield period: 2005-2010)

Source: Own compilation

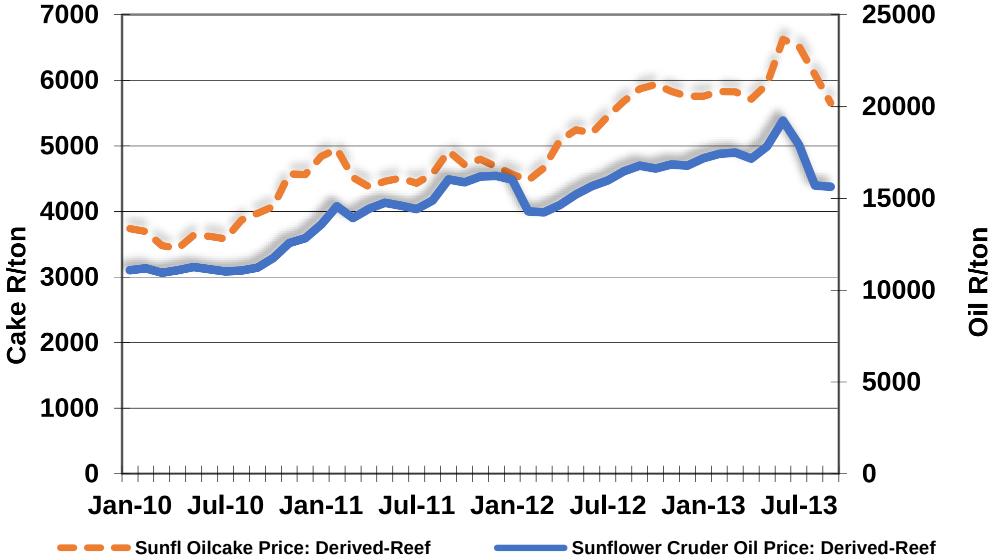


Figure 44: Derived oil and cake prices at the Reef
Source: Own compilation

It is widely acknowledged that soybean oilcake has a higher protein content than most other oilcakes; but still, there is a specific need for sunflower oilcake in terms of its higher fibre content and amino acid composition in animal feed ratios. The driving force for oilcake demand remains the animal feed industry, with the typical inclusion rates for sunflower oilcake illustrated in Table 14.

Table 14: Feed inclusion rates for sunflower oilcake

Feed Ratio	Inclusion Rate
Feedlots (Beef)	20 – 25%
Broilers	1 – 5%
Layers	1 – 12%
Dairy Cows	20 – 25%
Pig Feed	1 - 15%

Source: Dunn (2007) in Van Zyl (2010) and Own Calculations

Table 13: Average oil and oilcake yields (from 1 ton of seed)

Oilseed	Oilcake	Oil
Sunflower	45.7%	39.8%
Soybeans	79.1%	18.0%

Source: Kruse (2003) as cited in Van Zyl (2010)

The amount of sunflower oilcake that the local animal feed industry could absorb would give a probable indication of the demand for domestic sunflower production. Excess production of oilcake could, however, be exported; or if the market is over-supplied, a reduction in price may increase consumption by the animal feed industry. Poultry feed would consume most of the sunflower oilcake available for the animal feed industry. Even so, the allowable amount for inclusion remains the constraint with regard to poultry specifically.

In the early feeding phases of broilers, sunflower oilcake is highly favourable as a protein source. However, a maximum of just 5% is considered to be safe until a broiler is approximately 18 days old. This is not due to the protein value of sunflower oilcake, but rather the high fibre content; the fibre content of sunflower varies with each load due to the processing of the sunflowers seeds. The fibre part, which is mainly a constituent of the hulls, decreases the digestibility and availability of the fibre and protein of the sunflower oilcake, thus limiting the inclusion in early broilers phases, when young chicks are not yet able to degrade the high fibre content. As broilers age, the maximum inclusion increases since the aging broiler is able to handle the amount of fibre and also the protein requirement decreases as broilers age, thus sunflower oilcake is ideal – diluting the feed, but still providing the necessary crude protein.

With regard to layers and breeders, young pullets are reared until approximately 20 weeks of age. Maximum inclusion of sunflower oilcake in the diets of early-rearing pullets is also limited, for the same reason as in the case of young broilers. However, since the lifecycle of broilers is only about 5 weeks, and pullets require about 20 weeks for rearing after which they start to lay for another 50 weeks, the diets for layers and breeders include sunflower at levels of up to 12%. Layer diets are much lower in protein compared to broiler diets, since the birds are not used for meat production, and their weight must be kept constant and on breed standard so as to prevent overweight birds, which are non-productive. Sunflower oilcake therefore serves as a “filling raw material”, also contributing to the protein needs of these birds.

The inclusion of soybean oilcake in a diet is typically at a level of 20 – 30%. Soybean oilcake is also very high in energy, although there is a fibrous part that is also indigestible to poultry. However, due to the production requirements of soybean oilcake, undercooked or under-processed soybean oilcake is also a serious problem in any poultry diet, especially for young birds. Under-processed soybeans are the result of insufficient heat exposure and cooking time, and therefore the hazardous trypsin inhibitor component is not yet broken down. Young birds are not able to process these soybeans, since a high volume of proteolytic enzyme activity is required, which develops with age. As with undercooking, soybeans can also be overcooked, which decreases the quality of the protein as well. The amino acids in the protein are not available as with undercooked sunflower oilcake.

According to calculations by Van Zyl (2010), the significant increase in animal feed demand did not result in an increase in sunflower oilcake. Van Zyl (2010) further explains that the high fibre content of sunflower oilcake still limits it inclusion into high-density feeds such as the ones formulated for the poultry industry. The inconsistent quality of South African oilcake also played a role in the reduction in usage (Dunn, 2007 in Van Zyl, 2010). Personal correspondence with feed scientists explained a correlation between soybean and sunflower oilcake prices, with the import parity price of soybean oilcake being the main driver of this price. Van Zyl (2010) points out another constraint in the use of sunflower oilcake as having a shelf life of no more than 4 months, before it needs to be consumed.

Table 15: Comparing different oilcake inclusion rates in animal feed

Raw Material	% inclusion in feeds (2012/2013)	% inclusion in feeds (2011/2012)	% inclusion in feeds (2010/2011)	% inclusion in feeds (2009/2010)
Sunflower Oilcake	4.82%	4.68%	4.45%	5.91%
Soybean Oilcake	13.59%	14.83%	14.91%	13.19%

Source: AFMA (2010-2013) complied by BFAP (2013)

South African Sunflower SWOT analyses

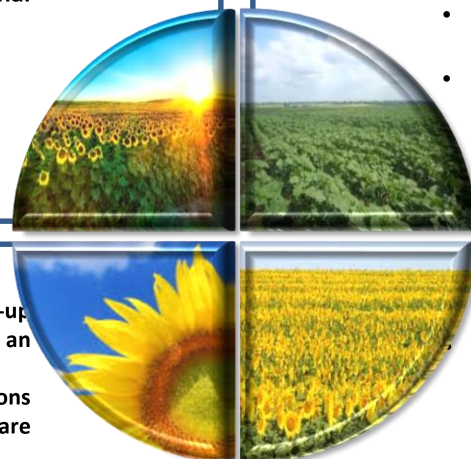
Conclusion

Strengths

- Lower input cost structure
- Marginal soil usage – optimising natural resources and available arable land
- Non-GMO crop – EU & Africa markets (currently opposed to GMO soybeans and related GMO crops, as well as their manufactured products)
- South Africa produces a high-quality refined sunflower oil
- The ARC national trial yields surpass the international average by 24%.

Weaknesses

- Production issues: Weak crop emergence - more fragile than other summer crops in terms of surviving the first 2 weeks.
- Susceptibility to plant diseases such as: Charcoal rot & Sclerotinia. No advances to protect production against Sclerotinia
- Sensitivity to soil persistence effect of Atrazine; if excessive dosage occurs (mostly used as pre-emergence herbicide for maize).
- Almost zero growth in true crop yields and productivity, versus other crops like maize and soybeans.
- No trial data on Euro-lightning (Imazamox) persistence in soils - effects of crop rotation after Clearfield sunflower production
- Average national yields are still 20% below the international average of 1.6 t/ha



Opportunities

- Mitigation for weed resistance has been found for Round-up (glyphosate) usage in maize and soybean production – an alternative to glyphosate usage is needed
- Changes in crop management and adaptation to marginal regions will be necessary to increase production, but margins are favourable
- Clearfield (Imazamox) combined with HO gene cultivars are developmental phases
- International demand for vegetable oils is still growing and supported by the biofuels industry
- Developing markets for HO oils & Non-GMO labelling of oils. Health benefits of HO sunflower – African & Asian consumer awareness of health benefits.
- The evaluation of a potential premium in the industry does exist, as current cultivars are bred with high oil content as well as high protein content, making them ideal for both the crusher and feed industries – Producers can also gain from these traits.

Threats

- South Africa's competitiveness in the oil industry – Palm oil imports and the expansion of palm production in Africa. This could become a major competitor for the South African sunflower and vegetable oil industry
- Positioning of the " South African Sunflower Oil" market – Little further marketing other than limited African exports
- If proper rotational cropping is not applied with Clearfield cultivars, yields might be affected on follow-up crops due to Imazamox.
- Extraction rates remain a concern, as South African manufacturers have old crushing equipment and they need to realise higher oil gains to remain competitive.
- Little progress in the fight against Sclerotinia. The disease has been affecting more and more regions over the past 3 years, reducing production yields significantly.

Global Sunflower seed – Output

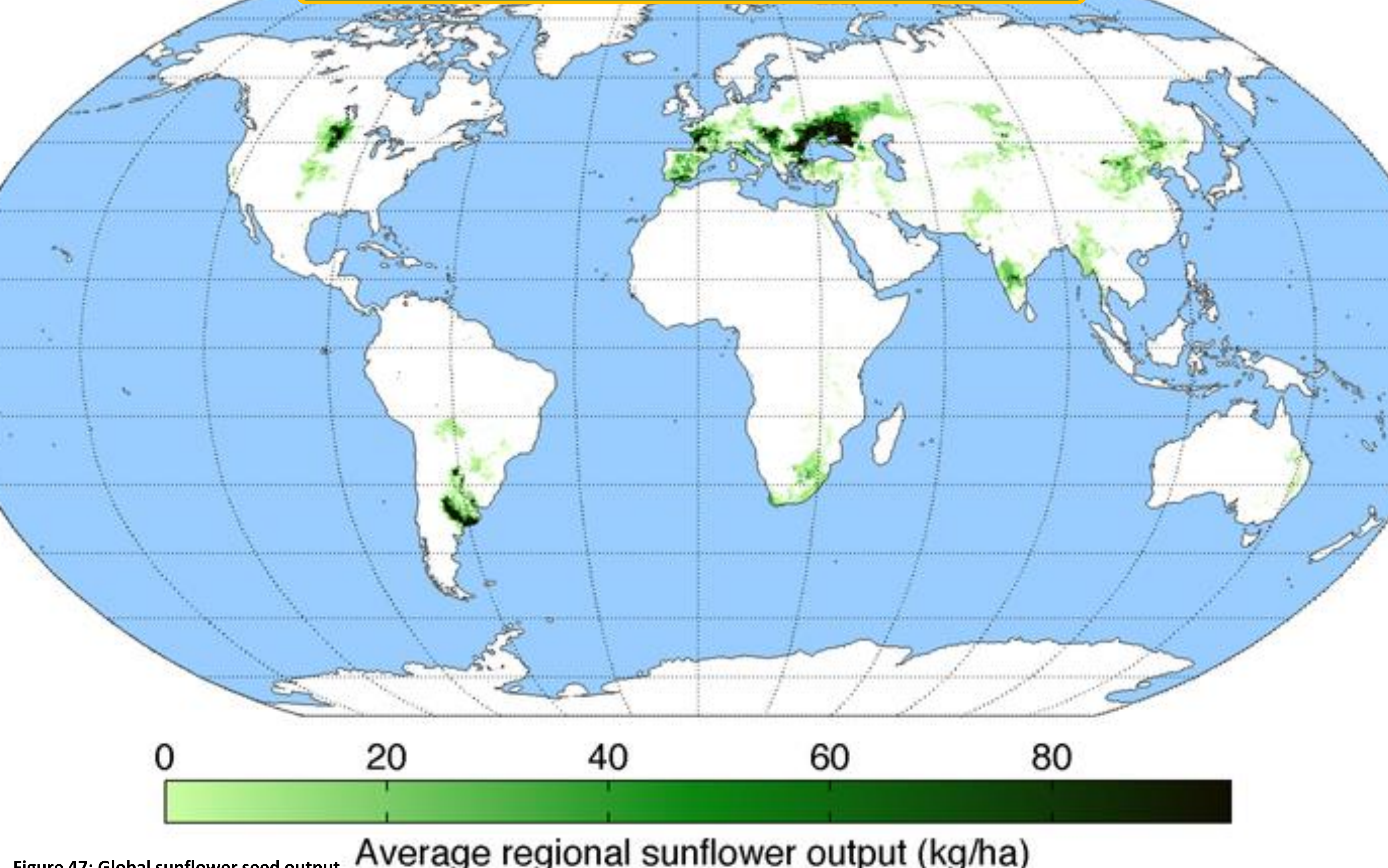


Figure 47: Global sunflower seed output

Source: Wikipedia (2013)

Global Oilseed Overview

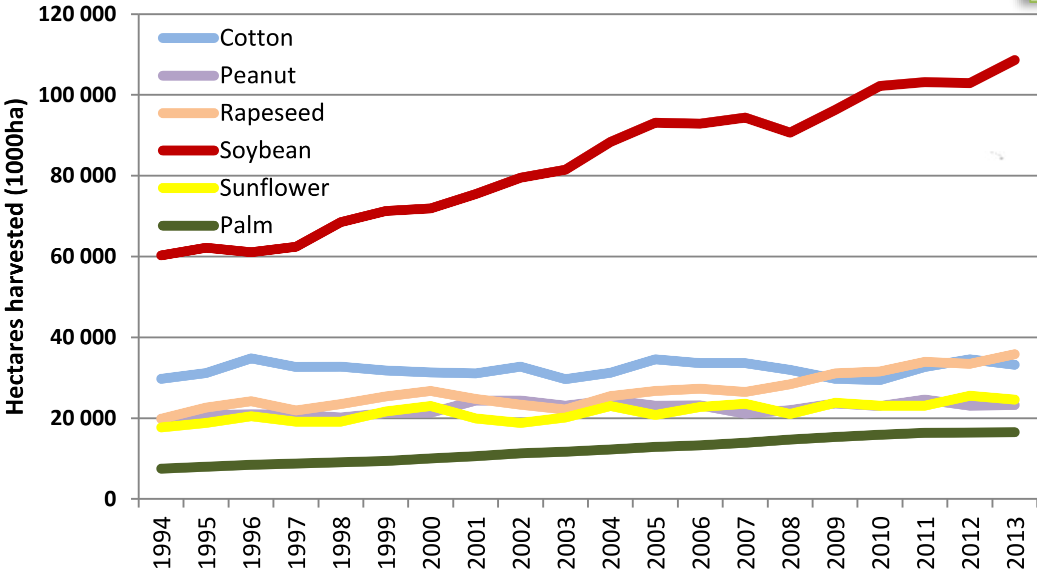


Figure 62: Global area harvested for major oilseeds
Source: USDA (2013), FAO (2013)

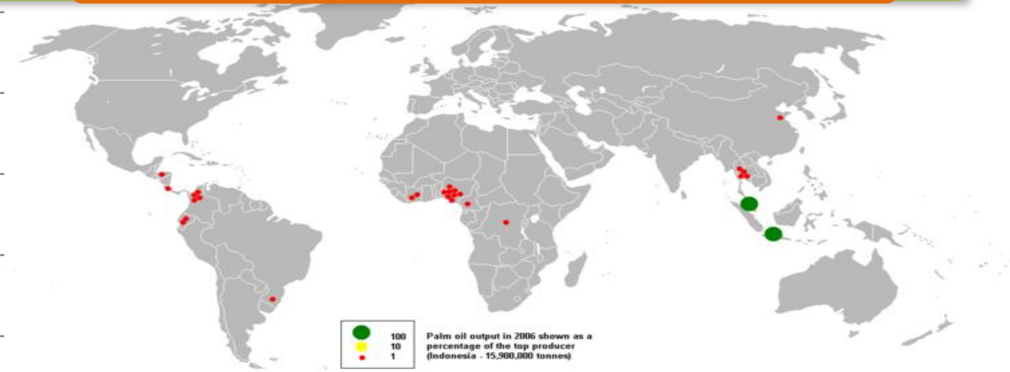


Figure 64: Global Palm Producer Areas and intensity
Source: Wikipedia (2013)

Internationally, the area cultivated under soybeans has spread and grown significantly over the past 20 years (Figure 62 and Figure 63), with the USA, Brazil and Argentina accounting for the majority of this growth, whilst the lower band of oilseed hectares remains fairly stable. Although the overall area planted to palm is small compared to soybeans, the area planted to palm has increased rapidly over the same period (Figure 62 and 63) and the oil yield per hectare exceeds that of sunflowers and soybeans by a significant margin. Figure 64 illustrates the most intensive palm production as taking place in Indonesia and Malaysia, supplemented by some production in Africa and South America.

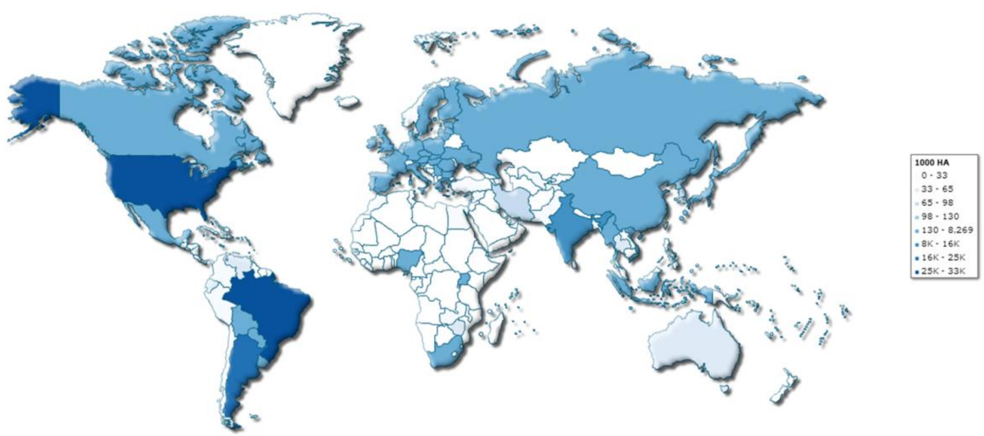


Figure 63: Global soybean producer areas and intensity
Source: Index Mundi (2013))

Table 21: Average change in area harvested for 6 major oilseeds

	Average change 1994-2004	Average change 2004-2013	Average change 1994-2013
Cotton	5%	7%	12%
Peanut	23%	-5%	17%
Rapeseed	28%	41%	81%
Soybean	47%	23%	80%
Sunflower	30%	7%	39%
Palm	63%	34%	119%

Source: FAO (2013)

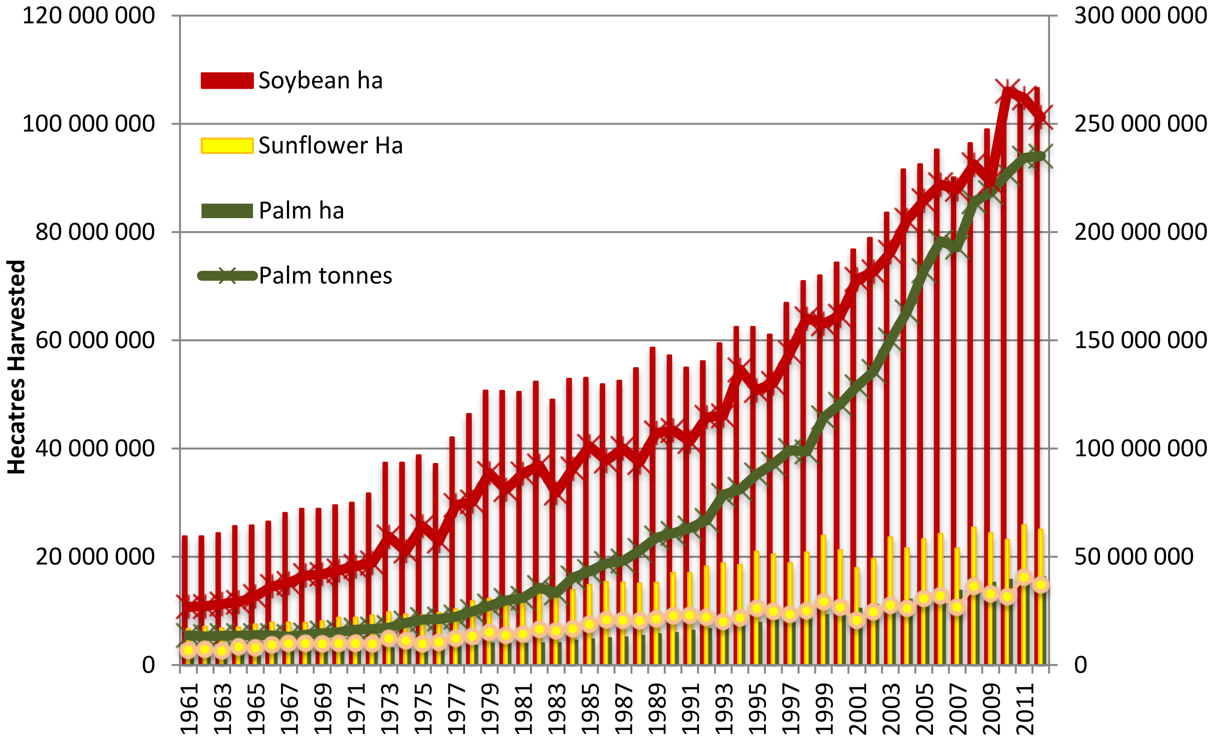


Figure 65: Global production and area planted

Source: FAO (2013) & Palm Oil World (2013)

As stated previously, the global growth giants in the oilseed game remain soybeans and palm, with an ever-increasing demand from China and India. For the period 1961-2012, the expansion in soybean area harvested is calculated at 348% in total growth, while palm area harvested grew by 353% over the same period. Of more importance, however, is the yield or output per hectare planted. Looking at Figure 65, the area planted to palm seems almost insignificant at roughly 16 500 000 ha for 2013, compared to the much larger area planted to soybeans (108 000 000 ha). Considering a scenario of doing more with less, it is the palm industry that comes out on top. While soybean area increased by 348%, its total production output over the same period increased by 842%, whereas palm area increased by 353% but with a total production output increase of 1624%

Production statistics alone are not sufficient to draw conclusions regarding production intensity; however, palm production trials also support the notion of high output per hectare. Figure 66 points to Malaysia's current average yield of 3.9 tons per hectare, but yields as high as 8.6 tons per hectare have been achieved on experimental plots. In this case it might be that some palm areas harvested are unaccounted for in the FAO database, as production data is more accessible than hectares harvested. The fact remains, however, that palm production has incredible potential to improve, and the production of palm is growing at a much higher rate than any other oilseed in the world.

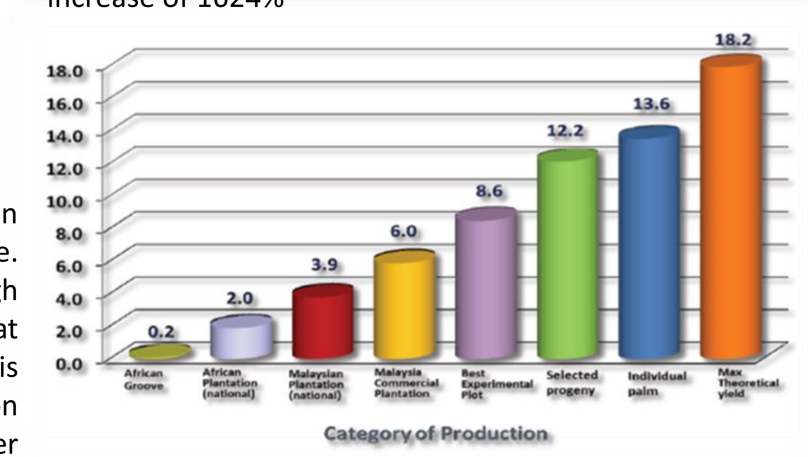


Figure 66: Palm crop yield potential

Source: Picture from www.palmoilworld.org

Global Oilseed Overview

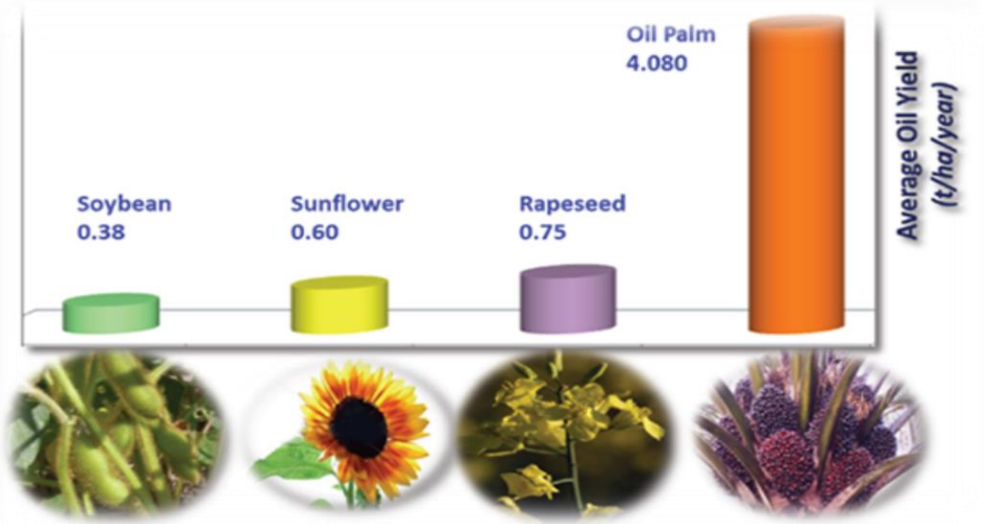


Figure 67: Palm oil output per hectare
Source: Picture from www.palmoilworld.org

The global oil arena is changing rapidly, with constant advances in the production of palm oil. FAPRI (2011) forecasts that global palm oil production in 2025/26 will be around 70 Mt. Considering the rapid expansion still taking place in Indonesia, Malaysia and Africa as well as advances in yields, this figure could be closer to 140 Mt by 2030. It is evident that while the production of both soybean oil and palm oil has increased, sunflower oil production has remained constant, meaning that in relative terms, sunflower oil has lost its global importance.

From Figures 67 and 68 it is clear that apart from the fact that the palm crop produces more seed per hectare, it also produces produces 10 times more oil per hectare than soybeans and 7 times more oil than sunflower (Palmoilworld, 2013).

Table 22: Global Oilseed Growth Rates

	5 Decades Growth (1961-2012)		Previous Decade Growth (2002-2012)	
	Total Growth **(1961-2012)**	Compounded Annual Growth Rate (CAGR) **(1961-2012)**	Total Growth **(2002-2012)**	Compounded Annual Growth Rate (CAGR) **(2002-2012)**
Soybean ha	348%	**3.0%**	35%	**3.0%**
Sunflower Ha	275%	**2.6%**	27%	**2.4%**
Palm ha	353%	**3.0%**	45%	**3.8%**
Soybean tonnes	842%	**4.5%**	39%	**3.4%**
Sunflower tonnes	444%	**3.4%**	50%	**4.2%**
Palm tonnes	1624%	**5.7%**	73%	**5.7%**
Soybean t/ha	110%	**1.5%**	3%	**0.3%**
Sunflower t/ha	45%	**0.7%**	18%	**1.7%**
Palm t/ha	280%	**2.7%**	20%	**1.8%**

Source: FAO (2013), complied by BFAP (2013)

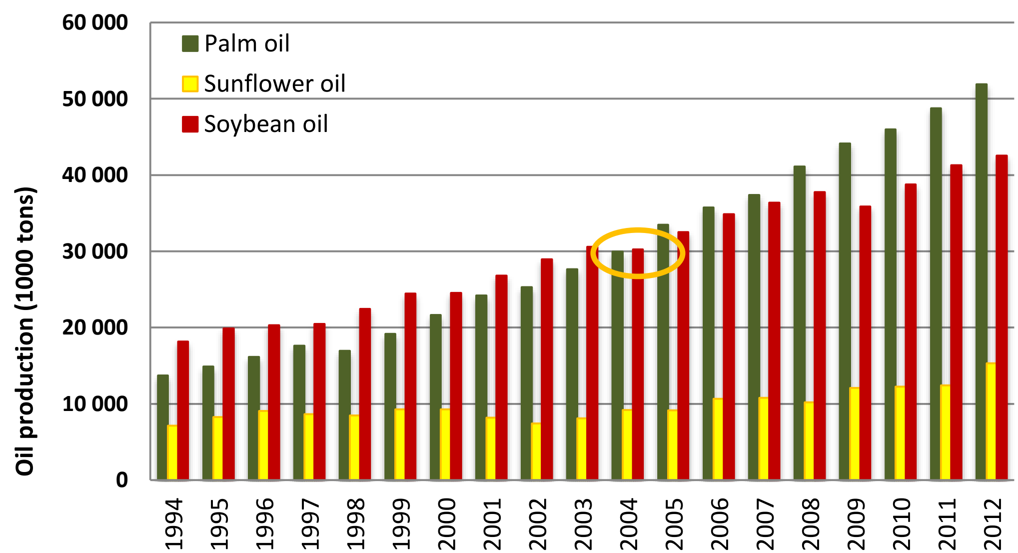


Figure 68: Global vegetable oil production
Source: USDA (2013), FAO (2013) & Palm oil world (2013)

International Oilseed Overview

- Global Oilseed Production
- Global Oilseed Processing
- Global Oilseed Consumption – Vegetable Oil

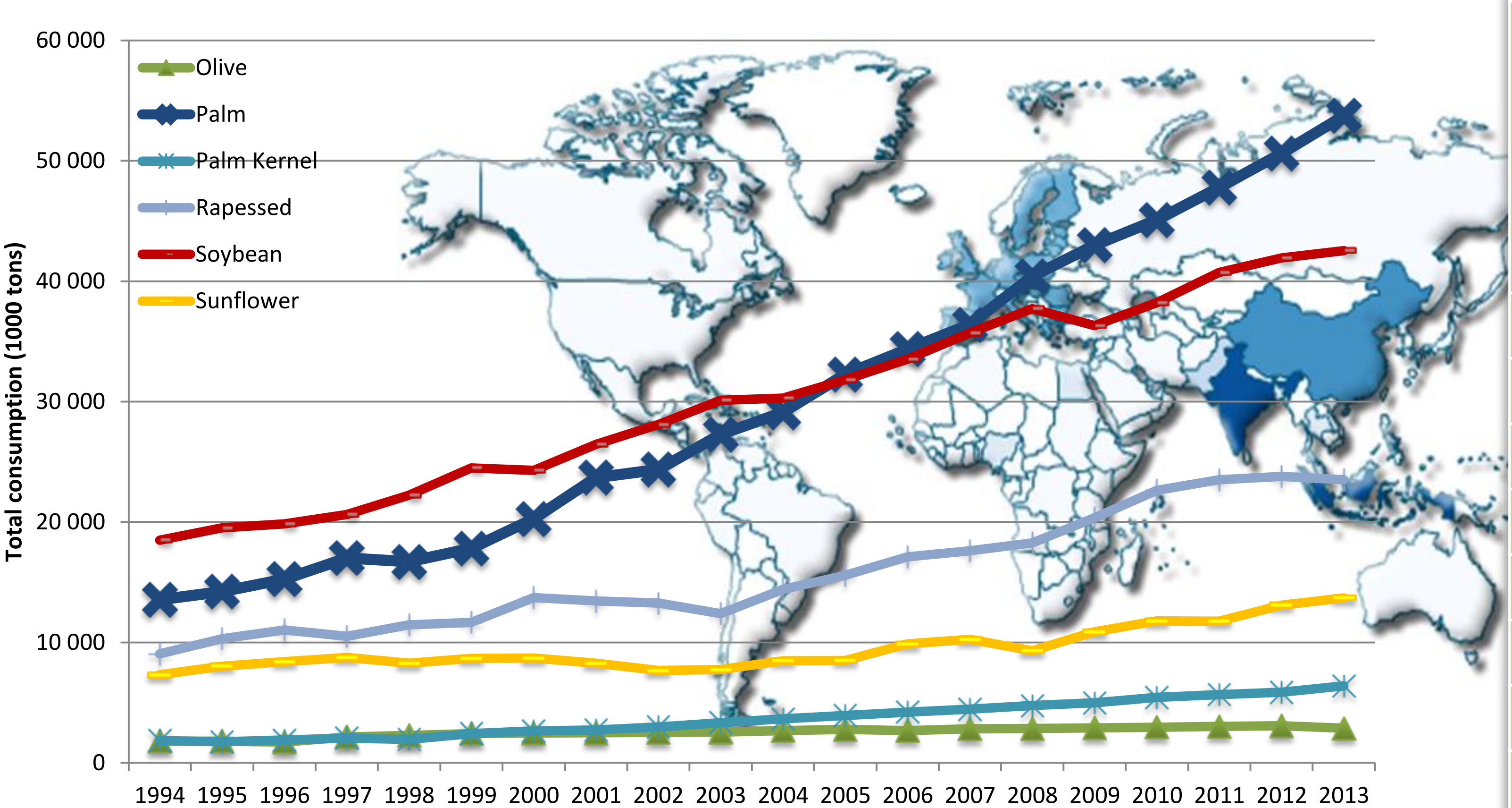


Figure 69: Global vegetable oil consumption
Source: FAO (2013) & Index Mundi (2013) compiled from USDA 2013

Compounded Annual Growth Rate (CAGR) **Consumption of vegetable oils (2003-2013)**	
Coconut	**2%**
Cottonseed	**3%**
Olive	**1%**
Palm	**7%**
Palm Kernel	**7%**
Peanut	**1%**
Rapeseed	**7%**
Soybean	**4%**
Sunflower	**6%**

In the period from 1994 to 2013, total global consumption of the two major oil seeds (soybean and palm) increased by 130% & 296% respectively. The rate of growth for palm oil consumption has outpaced most other vegetable oils. Considering the map in Figure 69, which illustrates **consumption intensity per country consuming palm oil;** India and China are the most important consumers, whilst the EU has always been a large consumer of palm oil. Through the same period global sunflower oil consumption increased by 87% and rapeseed by 160%.

Ranked (2013)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Country	India	China	EU-27	Pakistan	Other	Malaysia	Egypt	Bangladesh	United States	Singapore	Iran	Russia	Vietnam	Japan	Kenya	Myanmar	Nigeria	United Arab Emirates	Turkey	Mexico
Imports (1000 t)	9000	6600	5800	2450	1775	1675	1200	1100	1066	850	640	635	625	620	570	550	500	500	475	435

Figure 70: International Palm Oil Imports – Intensity of Imports

Source: Index Mundi (2013))

Global Oilseed Overview

- Global Oilseed Production
- Global Oilseed Processing
- Global Oilseed Consumption - Meal

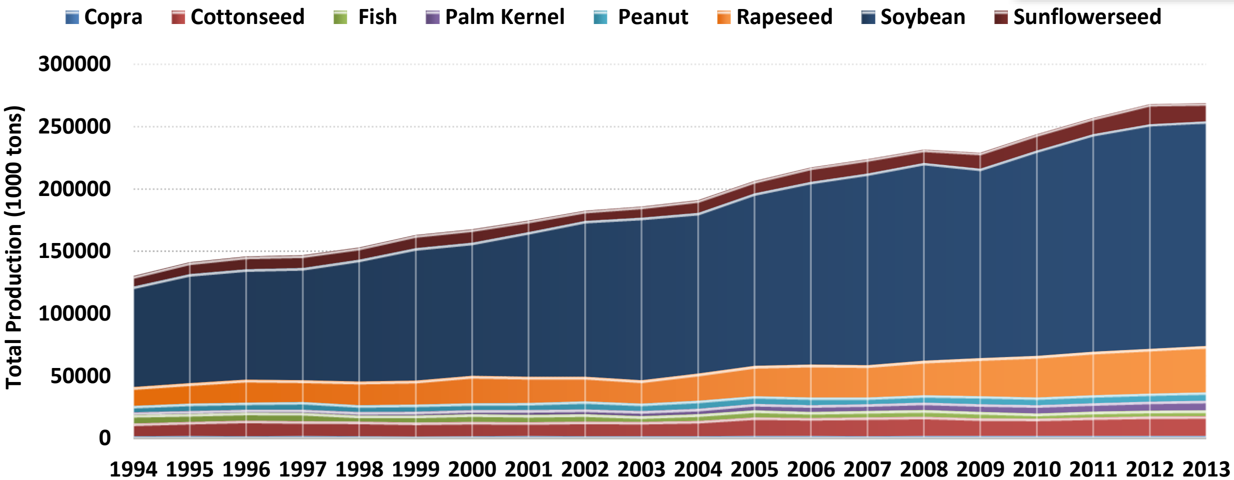


Figure 71: Global meal production
Source: USDA (2013)

Table 23: Global meal production

	Production		
	CAGR (1994-2004)	CAGR (2004-2013)	CAGR (1994-2013)
Copra	1%	2%	1%
Cottonseed	2%	3%	2%
Fish	-3%	-1%	-2%
Palm Kernel	7%	6%	7%
Peanut	2%	1%	1%
Rapeseed	4%	6%	5%
Soybean	5%	4%	4%
Sunflower seed	2%	4%	3%

Source: USDA (2013)

International meal production is confined to the largest producers or crushers of the different vegetable oilseeds. Soybeans remain the market leader, with a total growth in consumption of 119% from 1994 to 2013.

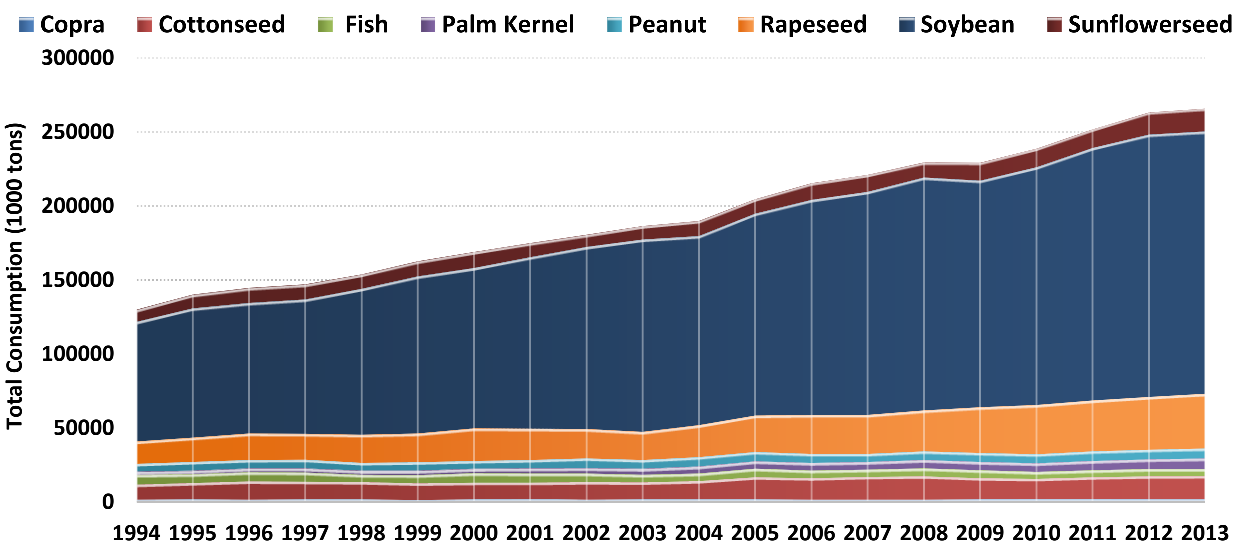


Figure 72: Global meal consumption
Source: USDA (2013)

Table 24: Global meal consumption

	Consumption		
	CAGR (1994-2004)	CAGR (2004-2013)	CAGR (1994-2013)
Copra	1%	1%	1%
Cottonseed	2%	3%	2%
Fish	-2%	-1%	-2%
Palm Kernel	7%	5%	6%
Peanut	2%	1%	2%
Rapeseed	4%	6%	5%
Soybean	5%	4%	4%
Sunflower seed	2%	5%	3%

Source: USDA (2013)

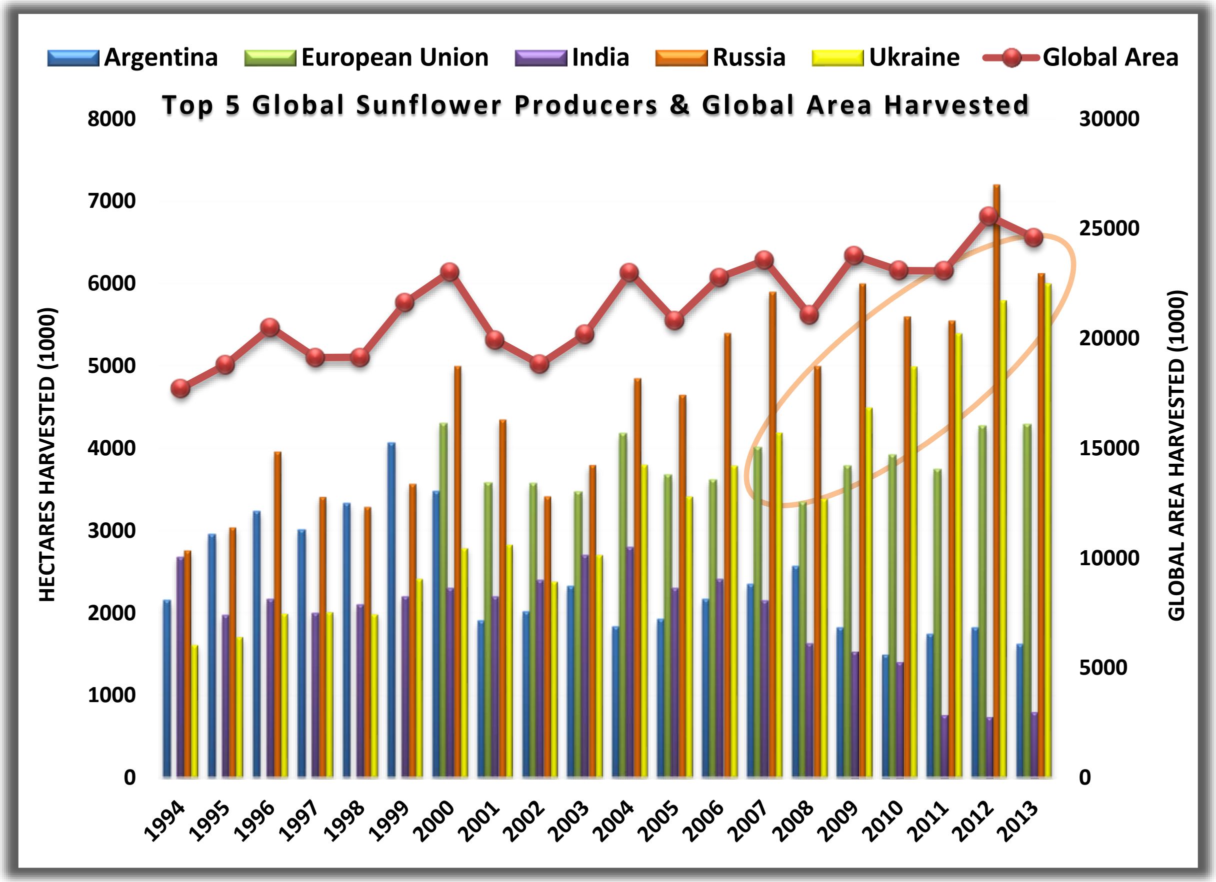


Figure 46: Top 5 global sunflower producers and global area harvested
Source: FAO (2013)

Expansion in Ukraine and Russia: According to the FAO (2002) sunflower remains the Ukrainian crop of choice under conditions of low-input farming, with sunflower having more yield resilience and being considered the most probable risk-adverse crop.

Though old, the FAO report from 2002 stating that low-input farming conditions are common in the Ukraine and Russia remains relevant, based on personal correspondence (BFAP-Agri Benchmark, 2013). The FAO argued that as producers' access to inputs increase over time and farming methods intensify, other crops like maize are likely to respond more competitively than sunflower, and margin differentials are likely to be eroded (FAO, 2002). Based on the statistics shown in Figure 46, Ukrainian and Russian sunflower production is likely to remain profitable in rotation, being a low-input crop with high resilience.

The intensification of farming methods, such as rotations with soybeans, may reduce the relative profitability of sunflower and lower the frequency of replanting, as described above.

The scenario exists under which more producers move from a maize-sunflower rotation into the preferable maize-soybean rotation. Over the past 6 years, soybean production has taken off rapidly in these countries, but not at the expense of sunflower hectares. During the period 1994-2013, the soybean area harvested increased by 149%, whilst sunflower increased by 76% and maize by 152% over the same period. Despite the possible erosion of the relative profitability of sunflower production in the future, it is highly likely that the sunflower crop will remain profitable for growers in the foreseeable future, with multi-national companies making significant investments in seed trials and cultivar breeding in these countries.

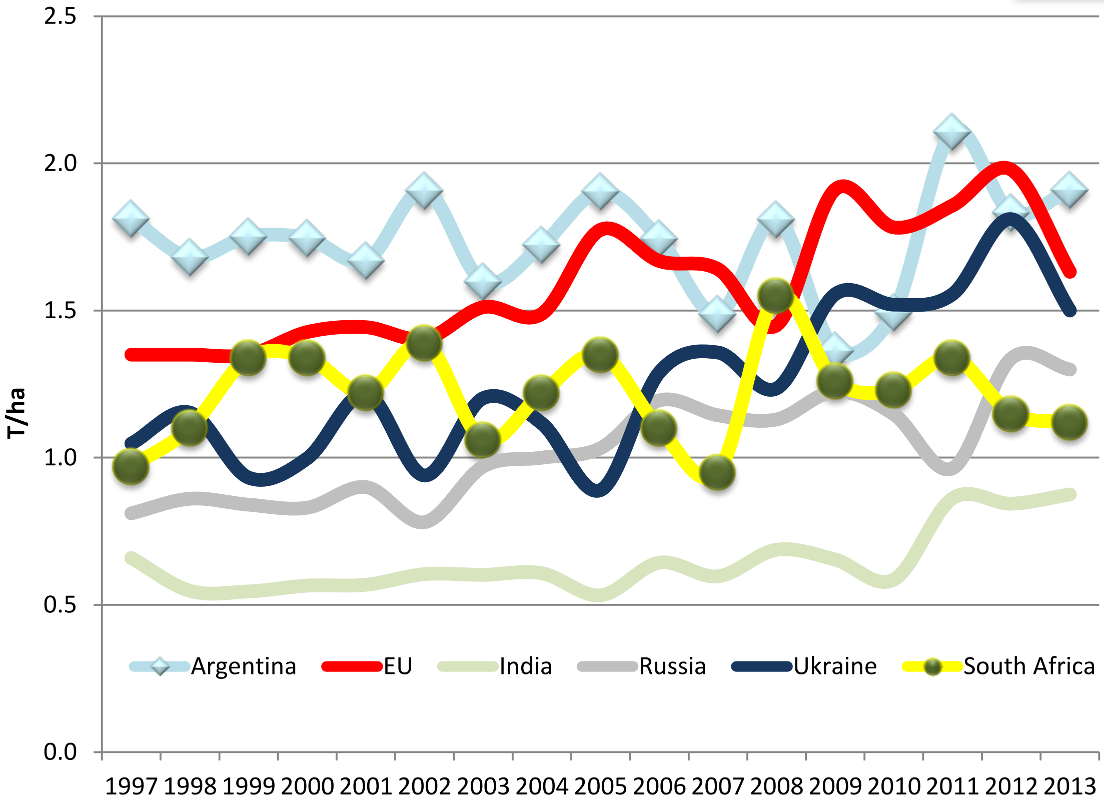


Figure 48: Average yield of the top 5 sunflower-producing countries and South Africa

Source: FAO (2013) & USDA (2013)

Centrangolo *et al.* (2002)further points out Argentina's comparative advantage is derived from the full utilisation of the country's natural resources and production conditions, which is key to their competitiveness. The result is the highest yield per hectare in the world. Primary production costs in Argentina are 25% lower than in the United States and 20% lower than in Brazil, making that country's sunflower industry one of the most efficient in the world. Argentina has some of the best technology available and is constantly striving to advance that technology even further, thus contributing greatly to their success.

Figure 49 shows how production output differs internationally. Production output is highest in Argentina, Ukraine and the EU-27 countries. This is further illustrated in Figure 48, showing the countries characterised by higher average yields per hectare. It goes without saying that the countries with the highest yields are also those with the greatest share in global area harvested under sunflower.

According to Centrangolo *et al.* (2002), Argentinian farmers produce sunflower in areas with lower productivity conditions, leaving the better soils for maize and soybean production. From their literature it became apparent that some of these areas are very similar to the South African provinces of the Free State and North West (400-600mm rain & similar altitudes (Figure 47).

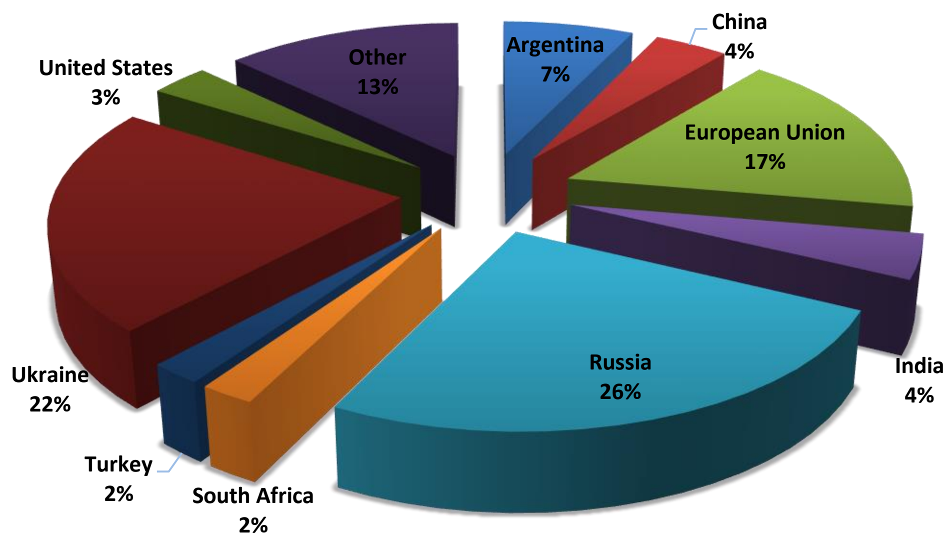


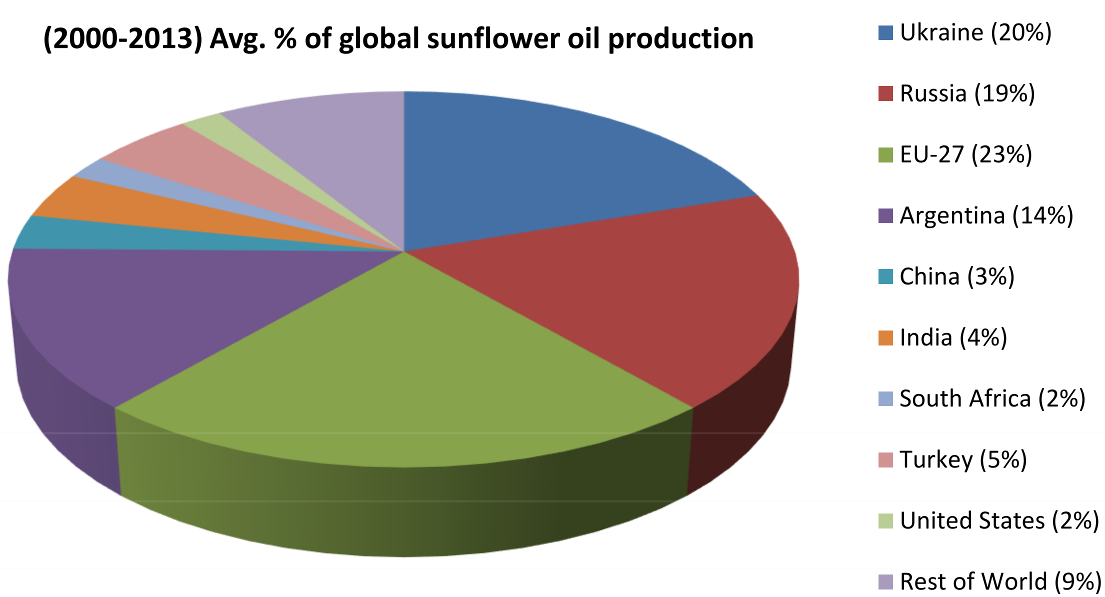
Figure 49: Average share of global sunflower area harvested (2009-2013)

Source: FAO (2013) & USDA (2013)

The Global Sunflower Complex

- Global Sunflower Seed
- Global Sunflower Oil - Production
- Global Sunflower Oilcake

(2000-2013) Avg. % of global sunflower oil production



75% of oil production

The major players in the global sunflower oil game are Ukraine, Russia, the European Union and Argentina – jointly producing 75% of the world's sunflower oil.

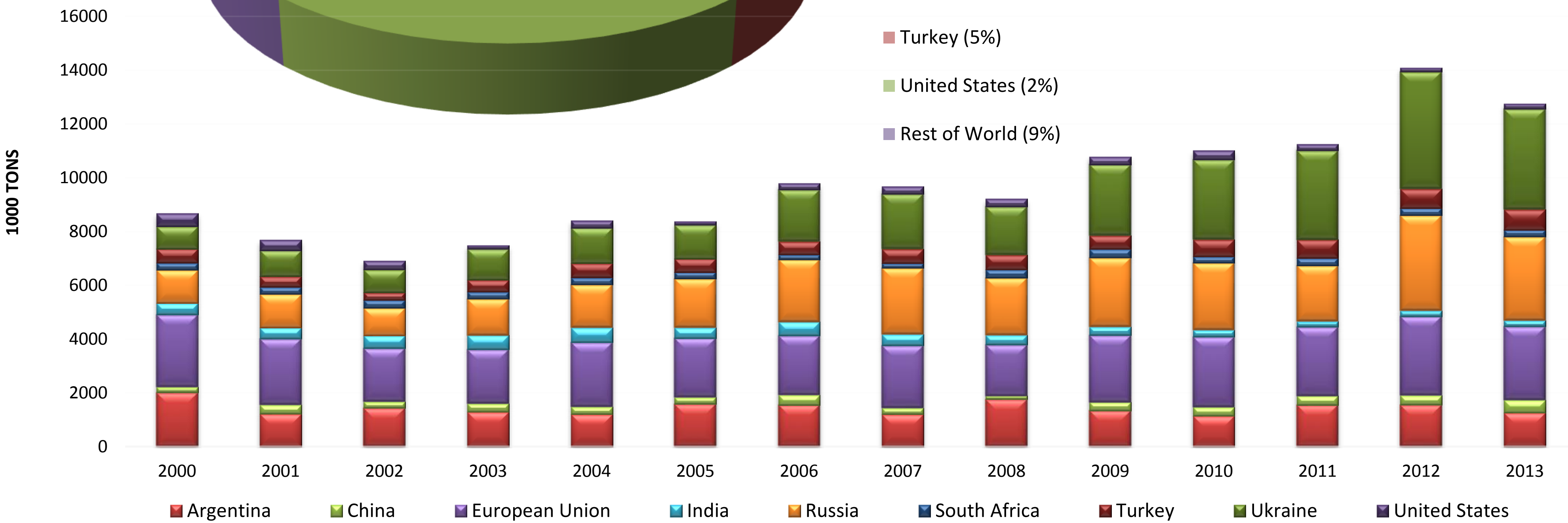


Figure 50: Sunflower oil production per country

Source: Index Mundi 2013 & USDA 2013

The Global Sunflower Complex

Global Sunflower Seed

Global Sunflower Oil - Consumption

Global Sunflower Oilcake

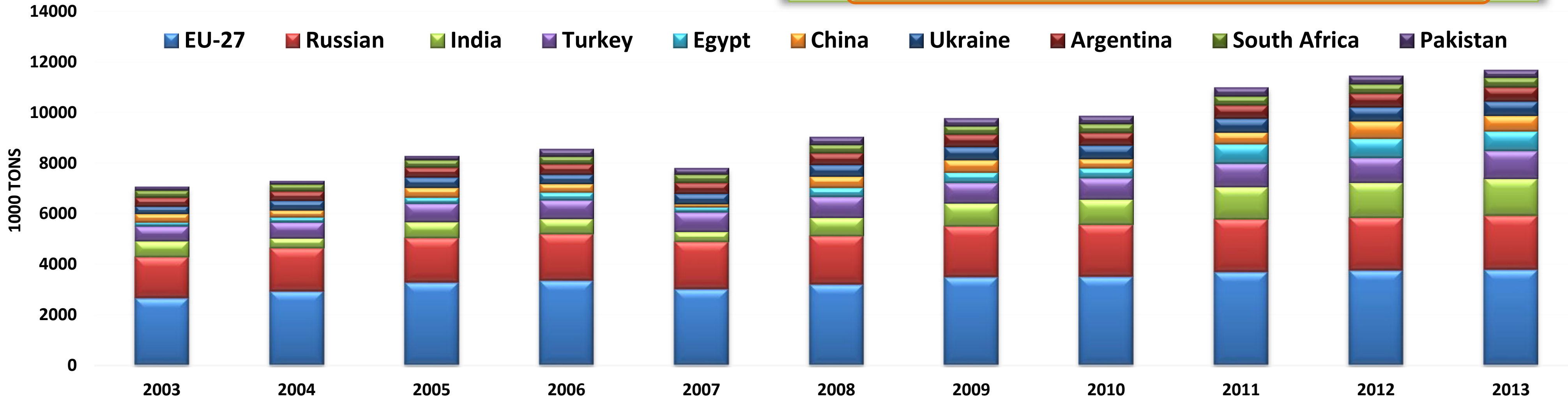


Figure 51: Sunflower oil consumption – Top 10 consuming countries

Source: Index Mundi 2013, compiled by BFAP (2013

The (2003-2013) **The 2013 Compounded Annual Growth Rate (CAGR)** for the**top 10** sunflower oil consuming countries stood at **8%**, whilst the **total international** CAGR for sunflower oil stood at **6%** over the same period. International consumption growth for sunflower oil was higher than for its major competitor, soybean oil (4%). The competitiveness of cheaper alternative oils, such as palm oil, is causing higher-value oils to be pushed aside. Demand growth is evident for healthier oil alternatives such as high-oleic oils from Asia, India and Africa (see appendix).

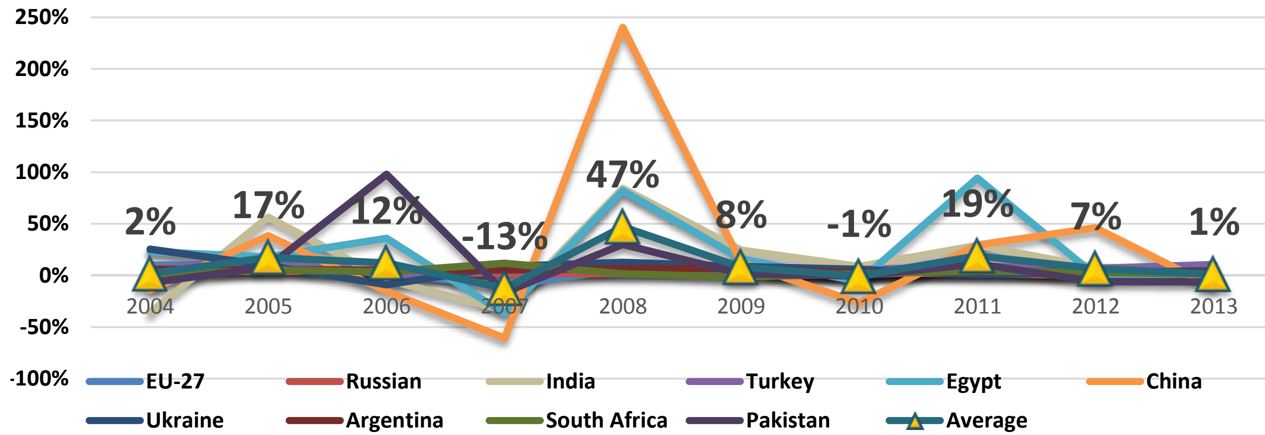


Figure 52: Sunflower oil consumption growth rates (2003-2013) – based on top 10 consumers (2013)

Source: Index Mundi 2013, compiled by BFAP (2013

Table16: Sunflower oil consumption by country

Ranked Consumption (2013)	1	2	3	4	5	6	7	8	9	10
Country	EU-27	Russia	India	Turkey	Egypt	China	Ukraine	Argentina	South Africa	Pakistan
Domestic Consumption (1000 t)	3 788	2 140	1 475	1 100	772	608	580	557	370	300

Source: Index Mundi (2013), compiled by BFAP (2013)

The Global Sunflower Complex

Global Sunflower Seed

Global Sunflower Oil – Trade

Global Sunflower Oilcake

Figure 53: Sunflower oil import intensity per country
Source: Index Mundi (2013))

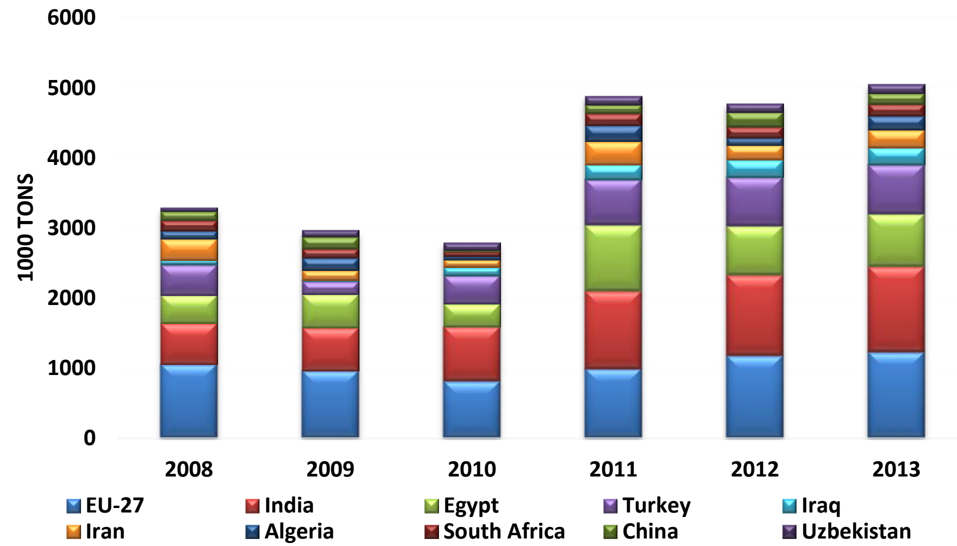


Figure 55: Sunflower oil imports – top 10 importers
Source: Index Mundi (2013))

Figure 54: Sunflower oil export intensity per country
Source: Index Mundi (2013))

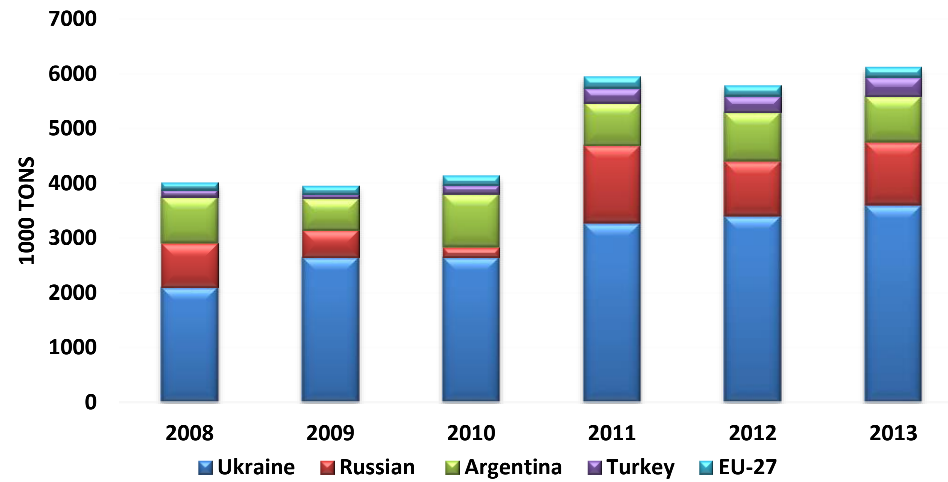


Figure 56: Sunflower oil exports – top 5 exporters
Source: Index Mundi (2013))

The Global Sunflower Complex

Table 17: Sunflower Oilcake Production

Top 10 Sunflower Oilcake Producers (2013)		
Rank	Country	Production (1000 t)
1	Ukraine	4 147
2	EU-27	3 729
3	Russia	2 945
4	Argentina	1 470
5	Turkey	775
6	China	698
7	Pakistan	313
8	India	310
9	South Africa	255
10	United States	209

Source: Index Mundi 2013 & USDA 2013

Sunflower oilcake is an important component in animal feed. The European Union (EU) is by far the greatest consumer of this feed component, and despite being one of the 4 biggest producers, the EU imports just over half of its total sunflower oilcake consumption. Ukraine produces a significant surplus and is arguably the most important exporter.

Table 19: Sunflower Oilcake Trade

Top 10 Oilcake-Importing Countries (2013)		
Rank	Country	Imports (1000 t)
1	EU-27	3 985
2	Belarus	650
3	Turkey	600
4	Israel	260
5	Egypt	100
6	Uruguay	100
7	South Africa	90
8	Morocco	80
9	Iran	70
10	Macedonia	10

Source: Index Mundi 2013 & USDA 2013

Table 18: Sunflower Oilcake Consumption

Top 5 Oilcake-Consuming Countries (2013)		
Rank	Country	Domestic Consumption (1000 t)
1	EU-27	7 631
2	Russia	1 575
3	Turkey	1 375
4	Argentina	740
5	China	698

Source: Index Mundi 2013 & USDA 2013

Table 20: Growth in Sunflower Oilcake Consumption

Compounded Annual Growth Rate (CAGR) Global consumption of Sunflower Oilcake (2003-2013)	
Industrial Cons	-3.08%
Food Use	11.19%
Feed Use	5.41%

Source: Index Mundi 2013 & USDA 2013

Global Sunflower Commodity Outlook (2013 – 2022)

Global Sunflower Seed
Global Sunflower Oil
Global Sunflower Oilcake
Outlook

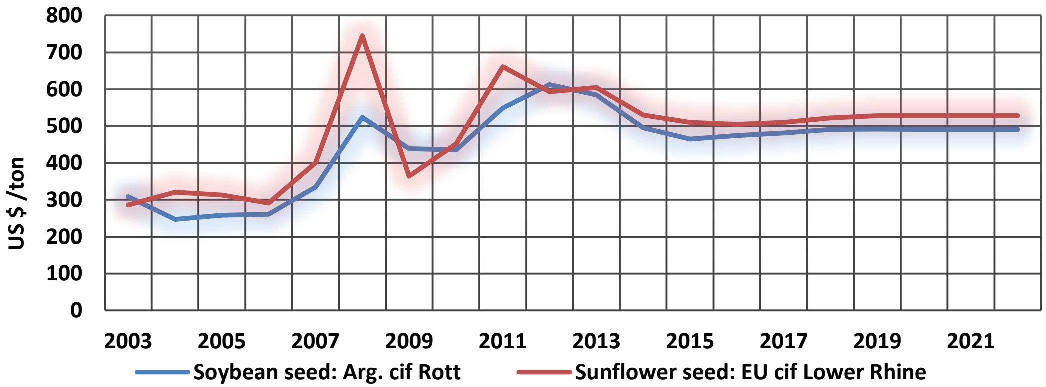


Figure 57: International oilseed price outlook

Source: FAPRI 2013 & International Grains Council (as cited in BFAP 2013) and BFAP 2013 Baseline Report

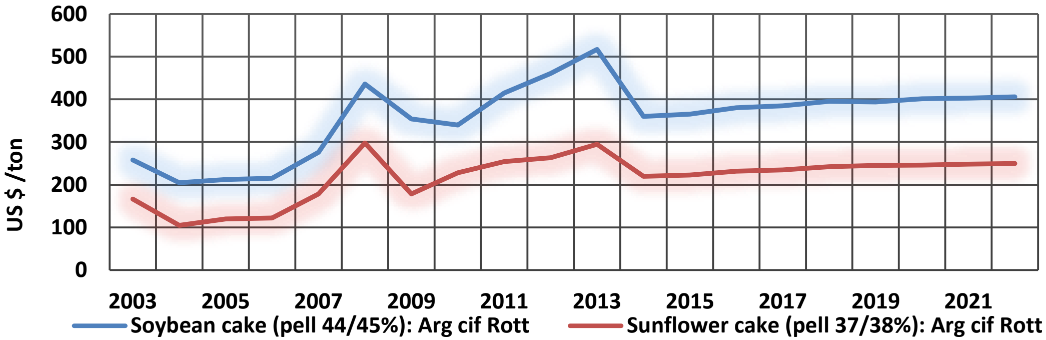


Figure 58: International oilcake price outlook

Source: FAPRI 2013 & International Grains Council (as cited in BFAP 2013) and BFAP 2013 Baseline Report

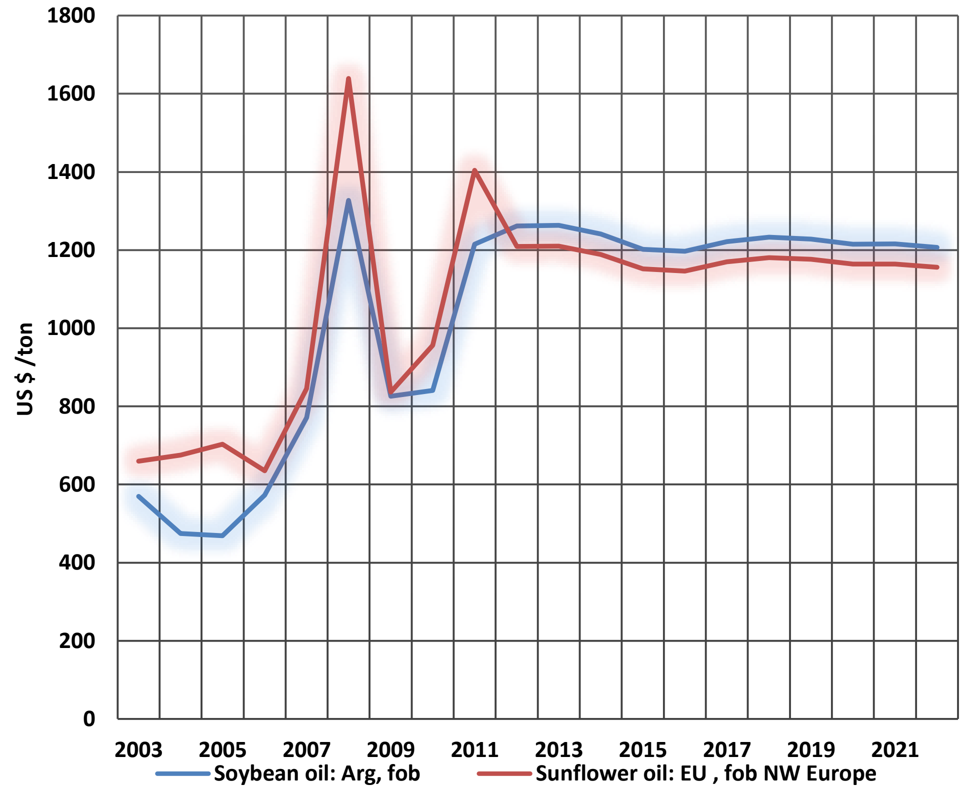


Figure 59: International oil price outlook

Source: FAPRI 2013 & International Grains Council (as cited in BFAP 2013) and BFAP 2013 Baseline Report

Global Sunflower Price Trends:

The leading international sunflower price is currently under pressure as a result of the spillover effect of the declining international soybean price. Projected increases in sunflower production in the EU, Russia, Ukraine and Turkey will add to the downward pressure on international sunflower prices. International oilseed prices are projected to continue their downward trend until 2015, before increasing slightly towards the end of the outlook period. As sunflower oilcake is produced and consumed on a much smaller scale in the international feed market compared to soybean cake, world sunflower oilcake prices take their cue from movements in international soybean prices. Although oilseed prices are projected to decline in the short term due to improved supplies, vegetable oil prices are expected to remain relatively stable in the short term. The continued growth in the use of vegetable oil in bio-diesel production is expected to lend support to international vegetable oil prices. The current use of sunflower oil for this purpose is minimal, however, and international sunflower oil prices might well decline to levels below soybean oil prices, as a result of greater projected supplies.

Opportunities

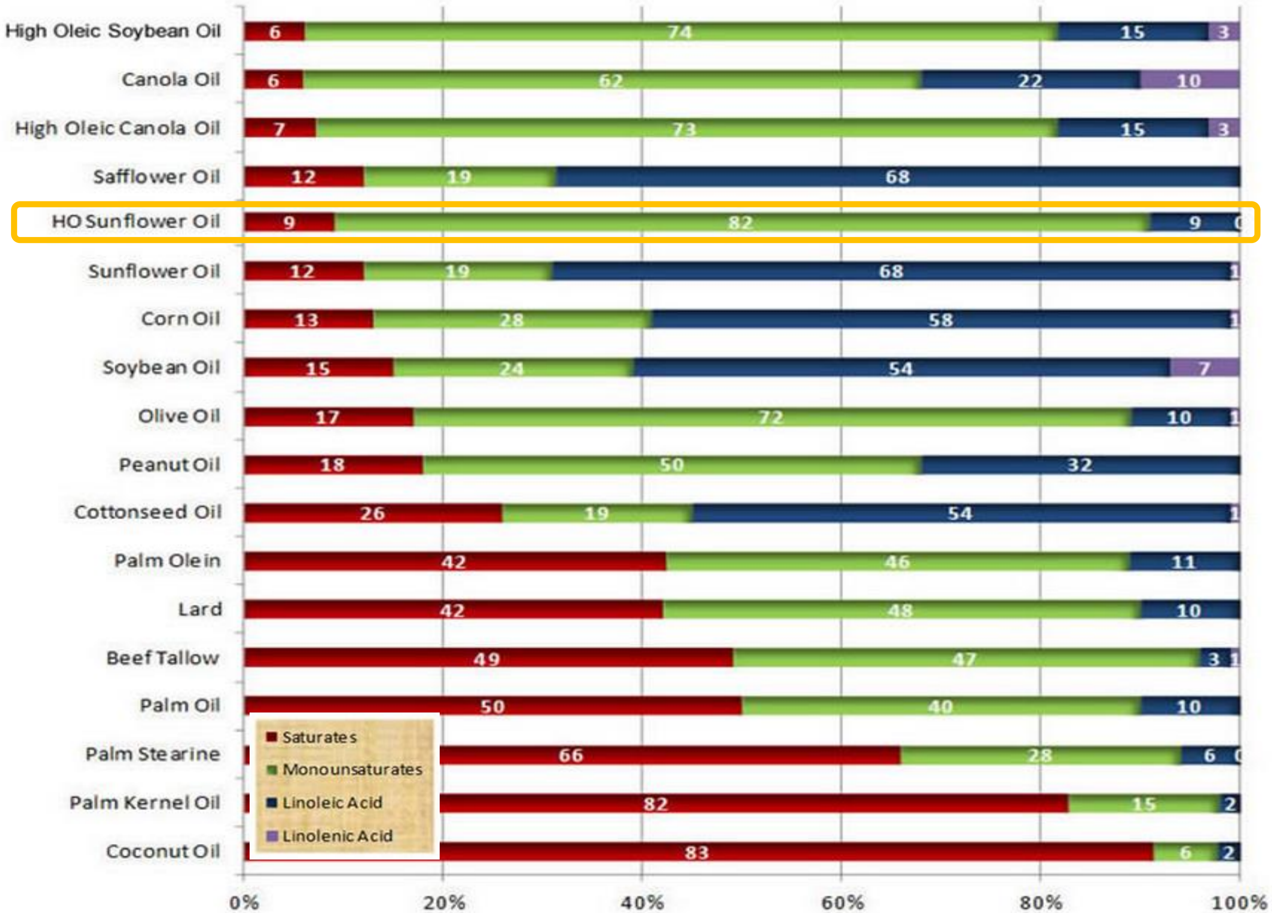


Figure 60: Vegetable oil properties

Source: Fit Frying (2013), as sourced from the Institute of Shortening and Edible Oils (ISEO) (2006).

What is high-oleic sunflower oil?

According to APK (2011), "High oleic sunflower oil is rich with the high content of oleic (monounsaturated) acid -oleic acid content is 80-90%); contains less than 10% saturated fats; does not need hydrogenation and therefore does not contain trans fats."

During the 2008/2009 season, high-oleic oil totalled about **5%** of world sunflower oil production, whilst in 2011/2012 it represented approximately **10%** of the global sunflower oil market (APK, 2011). High-oleic oil is considered a niche oil market, but is widely perceived as a rapidly growing one.

Traits of HO sunflower oil:

- High in monounsaturated fats
- Low levels of saturated fat
- Clean flavour profile
- Not genetically modified
- Not hydrogenated
- Excellent shelf-life
- Superior stability

According to Martinez (2006), HO sunflower oil "offers an excellent source of monounsaturated fatty acids (MUFA) in adapted milk formulae, since addition of 50% of the lipid fraction as high oleic sunflower oil gives the equivalent of the total quantity of MUFA in the mother's milk." Martinez (2006) further expresses the rising interest spurred by dietary recommendations favouring high monounsaturates, low saturates and stable alternatives to hydrogenated oils. Some uses of this oil include: dairy substitute, spray oil for fruits and cereals, and regular salad or frying oil (except with more health benefits).

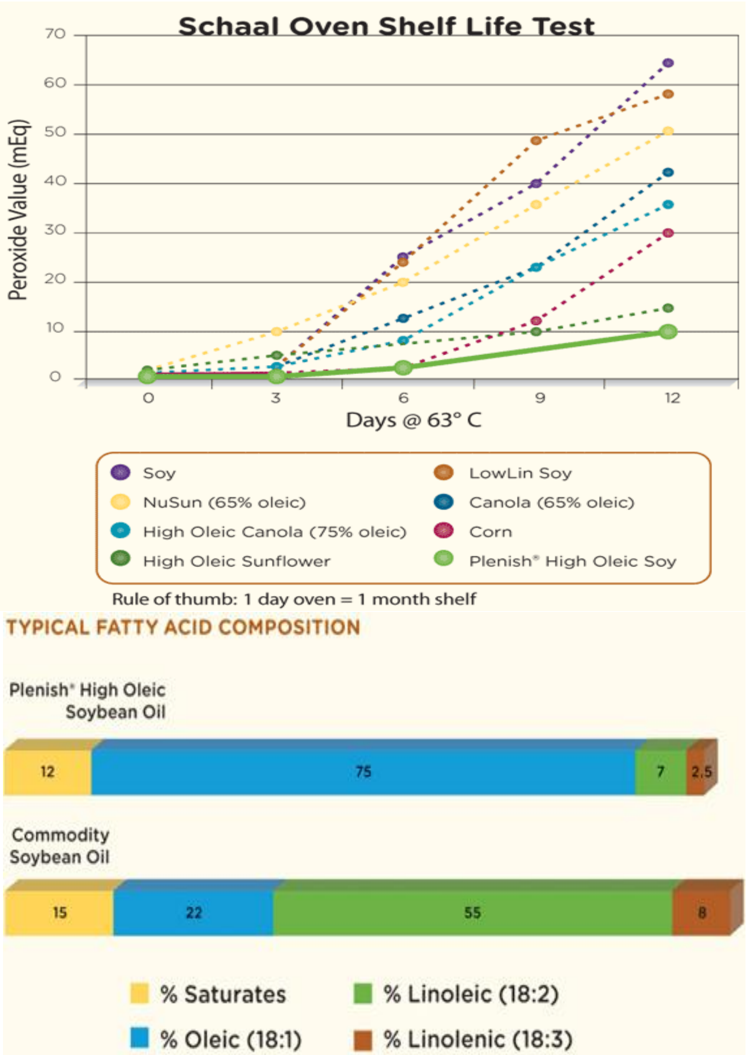


Figure 61: New HO soybean oil: Plenish
Source: Du Pont Pioneer (2013)

Possible threats to the "niche" HO sunflower oil market

According to Qualisoy (2013), "The next generation of soybean oils will give the food industry a cost-effective and healthier alternative to partially hydrogenated vegetable oils (HVOs) with flavour and stability that current alternatives cannot deliver."

Du Pont Pioneer (2013) - **The Plenish® high-oleic soybean oil profile**

"Plenish oil has an oleic content (Omega-9 monounsaturated fatty acid) of **more than 75%,** the highest of any soybean under commercial development, it has 20% less saturated fat than commodity soy and 75% less than palm oil." Du Pont Pioneer (2013) further indicates that "Plenish® high oleic soybeans are grown and marketed under identity preserved contracting programs. Growers will receive a processor-paid incentive for producing and segregating high oleic soybeans." Monsanto also entered the HO soybean race with their Vistive Gold. Both of these firms predict foods containing their new nutritionally enhanced but ultra-stable oils to be on the market by 2013/2014. Tests have indicated that businesses could expect significant cost savings, both due to its longer fry life but also owing to lower maintenance costs because of reduced polymer build-up in fryers.

According to Butler (2013), the production of high-oleic-acid soybean oil is set to rise 20-fold in fewer than 5 years. Butler (2013) adds that "Colombia is also seeking a Codex standard for a **high-oleic version of <u>regular palm oil</u>**. Production of the high oleic variety, called **OxG**, is forecast to reach 210,000 tons in Latin America alone by 2015, with 170,000 tons available for export."

The only remaining competitive edge for HO sunflower over HO soybean is that HO sunflower is still **GMO free**. This provides both HO and GMO-free oil in a single crop. But again, the palm oil industry poses a major threat to the market prices of "healthier" oil alternatives.

**Refer to appendix for additional HO sunflower oil reading.

References (A-)

AKK. 2013. HO Rapeseed and Sunflower. Aarhus Karlshamn. Sweden AB. Available: www.aak.com

APK-Inform. 2011. High-oleic sunflower: New opportunities for Russia and Ukraine. Available: www.apk-inform.com

ARC-GCI. 2011. Report of the National Sunflower Cultivar Trials 2010/2011. Potchefstroom.

BASF. 2012. Clearfield Plus: *Production System for Sunflowers.* Global Strategic Marketing: Herbicides. Available: www.agro.basf.com/agr/AP Internet/en/function/conversions:/publish/upload/2013_Broschure_international_Clearfield_Plus_Sunflower_TIB_final_lores.pdf (Accessed 2013-10-10).

Bureau for Food and Agricultural Policy (BFAP). 2013. Baseline Report. Available: www.bfap.co.za

Butler. J. 2013. *Olive oil's high-oleic rivals mounting*. Barcelona. Available: www.oliveoiltimes.com/olive-oil-business/olive-oils-high-oleic- rivals-mounting/32968

Cetrangolo, H.; Carlevaro, M. & Fernandez, S. 2002. Limitations for competitiveness in Argentinian sunflower agrifood chain. *New Medit*, 1(2): 34-40

Colquhoun, J.; Mallory-Smith, C. & Ball, D. 2003. Weed management in Clearfield wheat with Imazamox. Oregon State University. EM 8833

Berglund, D.R. & Ashley, R. 2007. N.D. Agricultural Experiment Station. Sunflower Production. North Dakota State University NDSU: Research Extension Center, A (1331): 18

DAFF. 2013. Personal correspondence and crop census data

Du Pont Pioneer. 2013. Plenish. Available: http://www.plenish.com/food/functionality_and_performance.aspx

FAO. 2010. *Sunflower Crude and Refined Oils Agribusiness Handbook*, pp. 18

FAO. 2013. Food and Agricultural Organisation. FAOSTAT. Available: http://faostat3.fao.org/faostat-gateway/go/to/download/Q/*/E

Fit frying. 2013. Select the right oil. Available: http://www.fitfrying.com/select-the-right-oil.html

Hulting, A.; Smith, C.M.; Jones, A.P. & Macnab, S. 2008. *All Things Clearfield Wheat.*

INDEX MUNDI. 2013. Agricultural Production, Supply, and Distribution. Available: http://www.indexmundi.com/agriculture/

Reference List (-M)

ITAC. 2006. Investigation into the alleged dumping of refined sunflower oil originating in or imported from the Argentine Republic and the Federative Republic of Brazil: Final Determination. Report 162.

Martínez, B. 2006. *Sunflower oil, high oleic.* TEXTRON TÉCNICA, S.L.

Nel, A.A. 2013. *Sunflower cultivar recommendations for 2013/2014*. ARC-GCI, Potchefstroom

Nel, A.A. 2012. *National Sunflower Cultivar Trials*. ARC-GRAIN CROPS INSTITUTE. Potchefstroom

Nel, A.A. & Loubser, H.L. 2004. *The impact of crop rotation on profitability and production risk in the Eastern and North Western Free State*. Agrekon, 43(1):1.

NSA. 2010. National Sunflower Association. Early planting and high oils. Available: https://www.sunflowernsa.com/Magazine/details.asp?ID=616&Cat=18&printable=1

NSA. 2011. National Sunflower Association. The recipe for high oils. Available https://www.sunflowernsa.com/Magazine/details.asp?ID=722&Cat=18&printable=1

Qualisoy. 2013. *Biotech's big guns gear up for battle of 'next-generation' soybean oils.*

SAGIS, 2013. South African Grain Information Service. Historical Data. Available: www.sagis.org.za

SAGL. 2013. The South African Sunflower Report. Quality Report 2012/2013. Available: http://www.sagl.co.za/Portals/0/Sunflower%202012%202013/Sunflower%20crop%20quality%20report%202012%202013.pdf.

Schulze, R.E. & Maharaj, M. 2007. Sunflower Seed Yield Estimation. *In:* R.E. Schulze (Ed.). 2007. **South African Atlas of Climatology and Agrohydrology**. Water Research Commission, Pretoria, RSA, WRC Report 1489/1/06, Section 16.5.

USDA, 2013. United States Department of Agriculture. *Foreign Agricultural Service: Production, Supply and Distribution (PS&D*). Available: http://www.fas.usda.gov/psdonline/psdquery.aspx (Accessed 2013-09-10).

Van Zyl, I.C.J. 2010. *Capturing the dynamics of the South African sunflower seed market in a partial equilibrium framework*. University of Pretoria. (MSC Dissertation).

APPENDIX

Publications related to Clearfield wheat and weed management with Imazamox:

- http://extension.oregonstate.edu/eesc/
- http://cru84.cahe.wsu.edu/cgibin/
- pubs/index.html?id=Bu5AtacD
- ORCF 101 CLEARFIELD* Soft White Winter Wheat OSU Extension and Experiment Station
- ORCF 102 CLEARFIELD* Soft White Winter Wheat OSU Extension and Experiment Station
- Weed Management in Clearfield Wheat with Imazamox. EM 8833
- Management strategies for preventing herbicide-resistant grass weeds in Clearfield wheat systems. PNW 572.
- Herbicide-resistant weeds and their management. PNW 437.

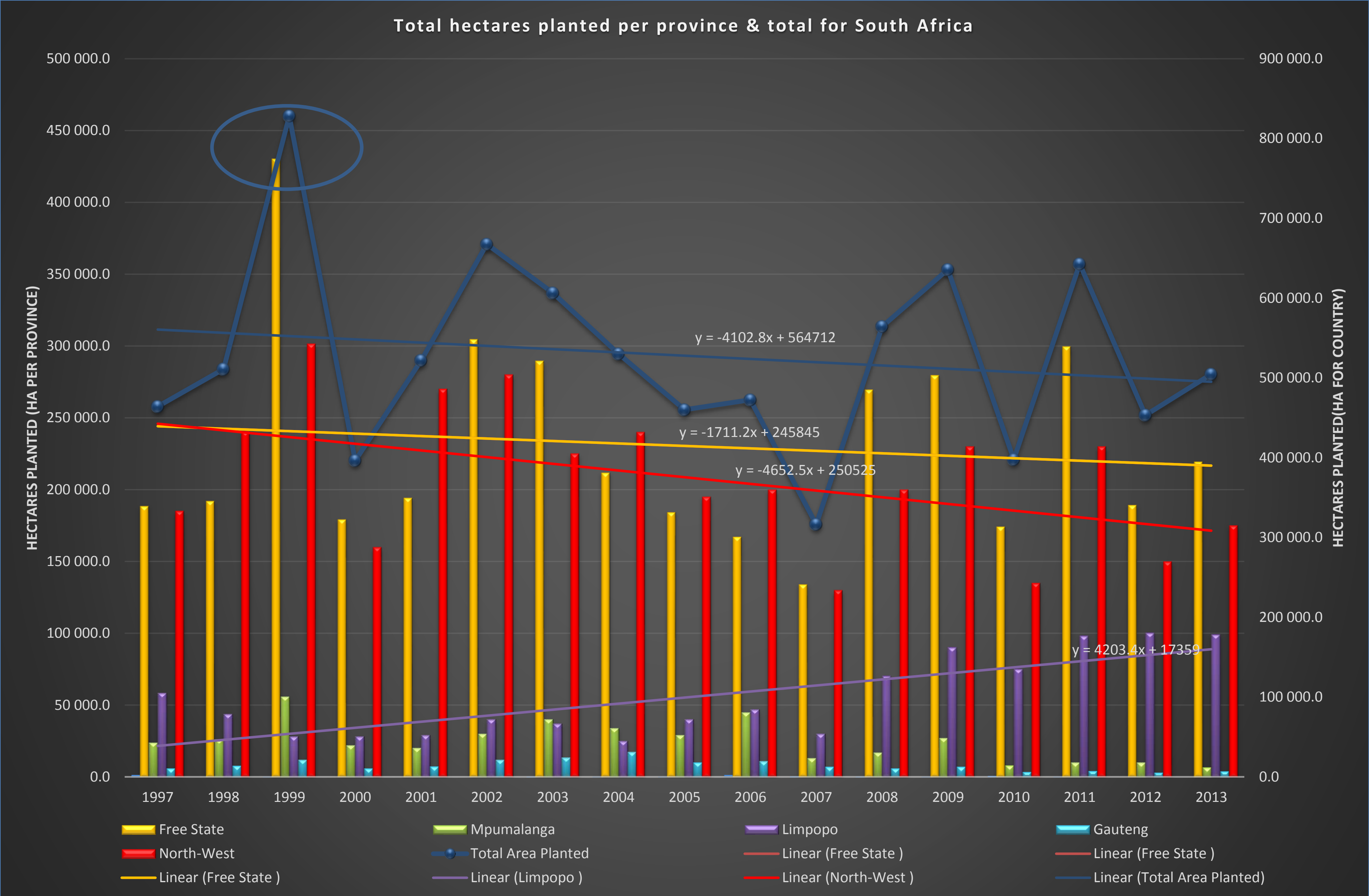
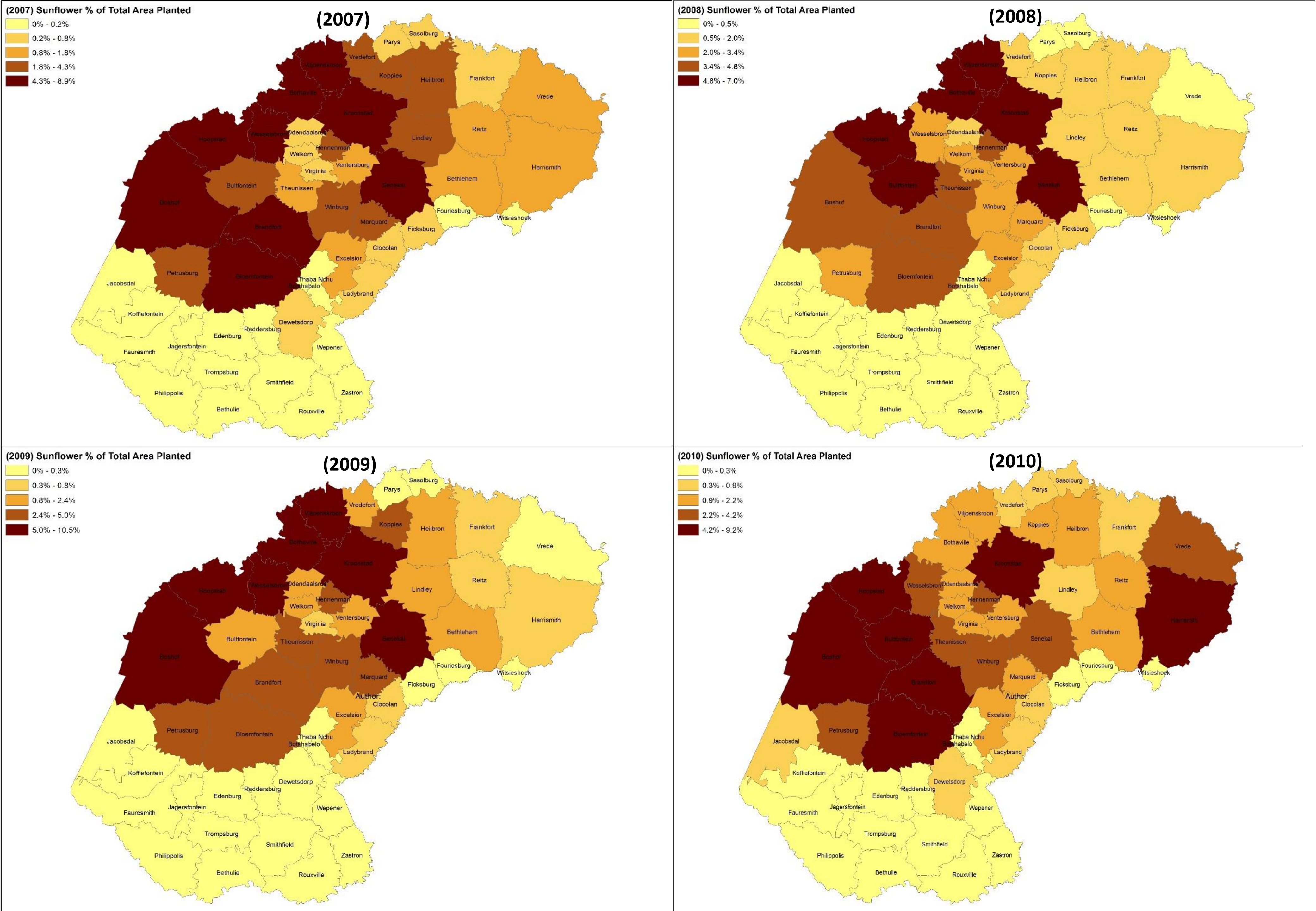
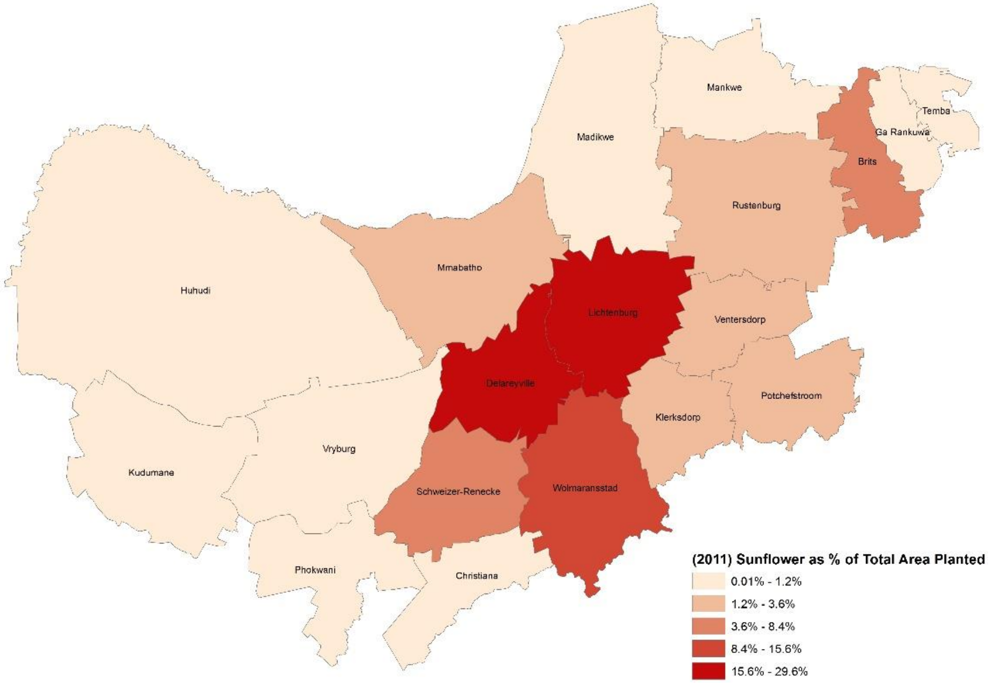
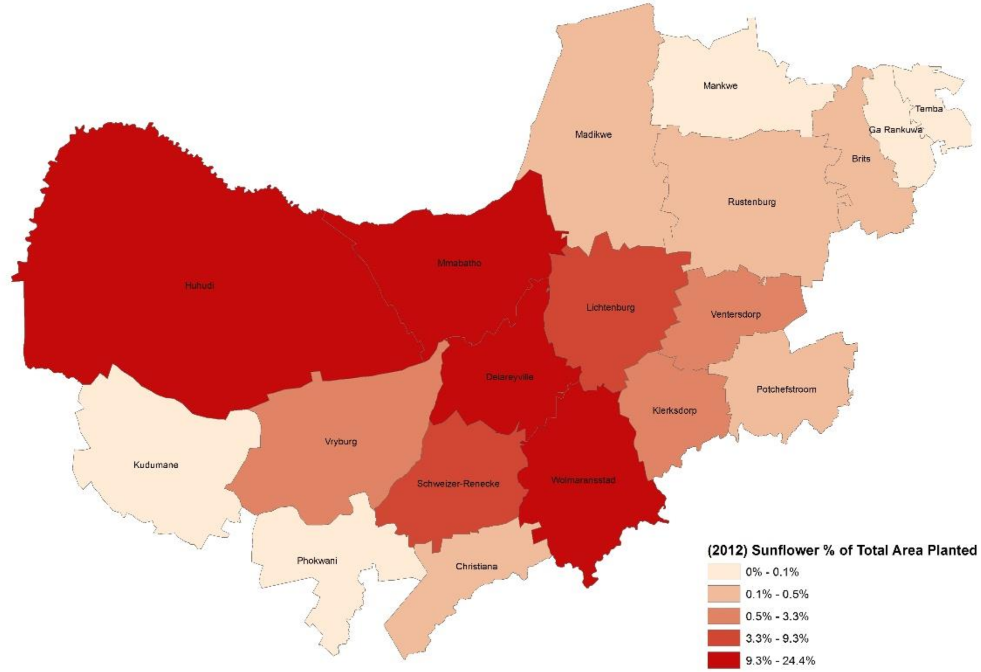


Figure A1: Provincial and national hectares planted in South Africa
Source: SAGIS (2013)


(2007) Sunflower % of Total Area Planted
0% - 0.2%
0.2% - 0.8%
0.8% - 1.8%
1.8% - 4.3%
4.3% - 8.9%
(2007)
Parys
Sasolburg
Vredefort
Viljoenskroon
Koppies
Heilbron
Frankfort
Vrede
Bothaville
Kroonstad
Hoopstad
Wesselsbron
Odendaalsrus
Lindley
Reitz
Hennenman
Welkom
Ventersburg
Virginia
Harrismith
Bultfontein
Theunissen
Senekal
Bethlehem
Boshof
Winburg
Fouriesburg
Marquard
Witsieshoek
Brandfort
Ficksburg
Clocolan
Excelsior
Petrusburg
Bloemfontein
Thaba Nchu
Botshabelo
Jacobsdal
Ladybrand
Koffiefontein
Dewetsdorp
Reddersburg
Edenburg
Wepener
Fauresmith
Jagersfontein
Trompsburg
Smithfield
Philippolis
Zastron
Bethulie
Rouxville
(2008) Sunflower % of Total Area Planted
0% - 0.5%
0.5% - 2.0%
2.0% - 3.4%
3.4% - 4.8%
4.8% - 7.0%
(2008)
(2009) Sunflower % of Total Area Planted
0% - 0.3%
0.3% - 0.8%
0.8% - 2.4%
2.4% - 5.0%
5.0% - 10.5%
(2009)
Author:
(2010) Sunflower % of Total Area Planted
0% - 0.3%
0.3% - 0.9%
0.9% - 2.2%
2.2% - 4.2%
4.2% - 9.2%
(2010)
Author:


Mankwe
Temba
Ga Rankuwa
Madikwe
Brits
Rustenburg
Mmabatho
Huhudi
Lichtenburg
Ventersdorp
Delareyville
Potchefstroom
Klerksdorp
Vryburg
Kudumane
Schweizer-Renecke
Wolmaransstad
Phokwani
Christiana
(2011) Sunflower as % of Total Area Planted
0.01% - 1.2%
1.2% - 3.6%
3.6% - 8.4%
8.4% - 15.6%
15.6% - 29.6%


Mankwe
Temba
Ga Rankuwa
Madikwe
Brits
Rustenburg
Huhudi
Mmabatho
Lichtenburg
Ventersdorp
Delareyville
Potchefstroom
Klerksdorp
Vryburg
Kudumane
Schweizer-Renecke
Wolmaransstad
Phokwani
Christiana
(2012) Sunflower % of Total Area Planted
0% - 0.1%
0.1% - 0.5%
0.5% - 3.3%
3.3% - 9.3%
9.3% - 24.4%

**The section was included as extra reading on the potential seen in the high-oleic sunflower industry, with leading countries taking the first steps. South Africa is in no way "behind" any of these countries, as cultivar developments are enhancing, with gaining yields in the HO-cultivars. The report below was sourced from AFK-Inform 2011.

High-oleic sunflower: New opportunities for Russia and Ukraine

Compiled by: **APK-Inform – July 2001 – View: www.apk-inform.com**

Common sunflower of linoleic type covers the main share of the world production of sunflower seeds. During the previous decade, many more countries started producing oilseed with a high oleic acid content in addition to the traditional types of sunflower seed. At the same time, the world market saw an increase in the consumption of high-oleic sunflower oil. What prospects and opportunities does this trend create for Russia and Ukraine?

The growth in the consumption of vegetable oils and protein meals in the food and industrial markets has led to the active development of the world production of oilseeds. According to USDA estimates, over the past decade (2000-2010), the world's oilseed production volume increased by 135 million tonnes (+43%), - to the level of 449 mln tonnes, the world vegetable oils production increased by 56 mln tonnes (+62%) - to 146 mln tonnes, meanwhile the consumption increased by 56.4 mln tonnes (+64%) - to 145 mln tonnes.

In addition to the increase in the consumption of palm, soybean and rapeseed oils, there is also active growth in the demand for sunflower oil. The following countries are the main producers of sunflower: EU-27, Ukraine, Russia and Argentina. Their share in the industry is about 82% of the world production of oilseeds. Moreover, EU-27 is the world's major consumer of sunflower oil. Sunflower oil is one of the most valuable by-products of sunflower seed, which is divided into 4 types, depending on the fatty acid content:

High-oleic sunflower was developed in accordance with the traditional methods of selection. Since the patent on the production of high-oleic sunflower seed and oil has expired, many more companies are now able to produce and promote these products. In terms of the standard fatty acid structure of sunflower oil, the genetic potential of oleic acid content is highest among the oilseeds (up to 94-95%), while the minimum level should be no lower than 80%, with linoleic acid at 9% and saturated fats at 9%.

NuSun® or **mid-oleic content sunflower** was developed in the USA in accordance with the traditional methods of selection. It remains the most popular sunflower type and is produced in the USA and Canada. There are sufficient volumes of NuSun sunflower oil on the market, and its price is competitive compared to other vegetable oils, which are alike in terms of their features. The standard fatty acid structure of this type of sunflower oil is given as 65% oleic acid, 26% linoleic acid, and 9% saturated fats.

High-linoleic sunflower is the traditional sunflower type that has been produced over many years. The standard fatty acid structure of sunflower oil is given as 69% linoleic acid, 20% oleic acid, and 11% saturated fats. North America has always produced this type of sunflower oil in small volumes only, due to its limited use in frying.

High-stearin sunflower is the newest type of sunflower, developed in the USA in accordance with the traditional methods of selection. There is currently an active patent in place for the production of this type of sunflower oil, under the brand name **Nutrisun™.** Its advantage lies in its functionality – particularly its use as a suitable alternative to partially hydrogenated oils and tropical oils.

The standard fatty acid structure of sunflower oil is given as 18% stearin acid, 72% oleic acid, 5% linoleic acid, and 5% other saturated fats.

The popularisation of health and nutrition in developed countries, along with the demands of the world's fats-and-oils industry in new types of oils, which have the necessary features, and which will be cheaper compared to oils with the same properties, became the major drivers of development of high- and mid-oleic sunflower oil industry production.

What is high-oleic sunflower oil?

- Is rich in monounsaturated fats, with a high oleic acid content of 80-90%;

- Contains less than 10% saturated fats;

- Does not require hydrogenation, leaving it free from trans fats;

- Has attractive physical properties, i.e. neutral taste, clear pale-yellow colour;

- Has been used mainly in the food industry over the past 10 years.

The major advantages of high-oleic and mid-oleic sunflower oil are that they have a high vitamin E content, they contain the natural antioxidant alfa tocopherol, they can be stored for long periods of time, have a neutral taste, and also presence of the features which are perfect for frying due to the high content of oleic oil and low content of saturated fats (less than 10%). Those sunflower oils with the highest content of poly- and mono-nonsaturated fats (linoleic and oleic acids), and also the smallest share of saturated and trans fats, have better assimilability and are most beneficial to human health.

Approximately 5 years ago, oleic oil had an approximate 5% share of the world production of sunflower oils; at present it is the niche segment of the oilseeds market, with an approximate 10% share of the world production of sunflower oils.

Different vegetable oils essentially have different qualitative properties, depending on their usage – household or commercial. One of the most important characteristics of the commodity oils is their resistance to high temperatures during frying, for a longer period of time. In order to increase resistance, many oils must be hydrogenated for further commercial usage – the process during which unhealthy trans fats are formed.

Traditionally, oils with a high content of saturated fats or oils, which are totally or partially hydrogenated, have been mostly used for commercial purposes, since they have a sufficient resistance level, as well as a corresponding taste feature and valid term; however these oils are not good for one's health. Cottonseed oil, for example, has a naturally high resistance level, and even without hydrogenation is approved for industrial usage, but at the same time it has an extremely high saturated fat content (25-27% of the overall volume of fats).

Olive oil is one of the healthiest oils available. It has a similar fatty acid structure to that of high-oleic sunflower oil, due to the high content of mono non-saturated fats. In addition, olive oil has a relatively high resistance level due to its low content of omega-3 fatty acids. On the other hand, according to the temperature of the beginning of smoke formation this oil essentially assets to other oils and is able to provide the specific taste and flavour for food.

High-oleic sunflower oil is the solution to one of the most significant problems in terms of the quality of vegetable oils – improving the oil's resistance to auto-oxidation so as to prevent the accumulation of toxins during the processing, storage and use thereof.

High-oleic sunflower oil is ideal for use in food production, including the spraying of snacks, crackers and dry breakfast cereals, frying, baby food products and for elderly people, and cases when it is necessary to use oil with heightened oxidation stability.

What factors have restrained growth in the acreage planted to high-oleic sunflower crops?

Existence of a patent for growing;

Low material interest;

First grades / hybrids were unstable and low-yielding, and also had a low tolerance to diseases and plant pests (Broomrape), significantly

Inferior to linoleic sunflower on the above parameters;

Lack of awareness about the benefits of high-oleic sunflower oil.

What has changed?

- Development of hybrids that are highly competitive with the classic hybrids in terms of yield, stability, and resistance to diseases and weeds;

- Increasing interest amongst large-scale crushers (EU-27);

- Promotion of healthy lifestyles in developed countries.

At present, the world's largest producers of oleic sunflower oils are the EU-27, in particular France, Spain and Hungary, as well as the United States.

Sunflower is the traditional oilseed, produced in Russia and in Ukraine. The growing demand in sunflower oil from the domestic and export markets for Russia and the export market for Ukraine formed the conditions for development of sunflower seeds production and processing industries in both countries.

During the past 5 seasons (period from 2006 to 2010) in Russia, sunflower sowing areas increased by 16% to the level of 7.15 million ha, while in Ukraine it increased by 15% to 4.57 million ha.

In both Russia and Ukraine, the traditional linoleic oilseed varieties and hybrids form the major share of sunflower production. At the same time, during recent years the high-oleic and confectionary varieties of sunflower took their own niche in the structure of sunflower production of the country.

According to data received during the preparation of the study, "High oleic sunflower market in Russia and Ukraine: current condition and potential", the share of high-oleic sunflower in the general production volumes of sunflower seed in Russia in 2010 totalled 1%, and 2.2% in Ukraine.

According to results of the polling, the majority of agricultural producers know nothing about the features of the modern hybrids of high-oleic sunflower seeds. This, despite the fact that, according to analysts of APK-Inform Agency, Russia and Ukraine have great potential to increase production volumes of high-oleic sunflower and sunflower oil, and the export trading of high-oleic sunflower oil.

© 2001-2011 APK-Inform Information Agency The above information can be used only with a clear reference to APK-Inform Information Agency, in electronic informational products - with a hyperlink to www.apk-inform.com