Sunflower Quality Report

BFAP
DATA DRIVEN INSIGHT

Funded by the Oilseeds Advisory Committee

August 2020

Abstract

In 2014, the Bureau for Food and Agricultural Policy (BFAP) undertook a comprehensive sunflower value chain analysis for the Oilseed Advisory Committee (OAC). In the report, the importance of the oil content of the seed to ensure the economic sustainability of the industry was clearly articulated. Reference was also made to international markets, where price premiums are paid for sunflower seed with a higher oil content. Over the past season, the drastic decline in the oil content of sunflower seed has had a major adverse impact on the industry. Whereas the industry norm was typically the delivery of sunflower seed with an oil content of approximately 36% and higher, the oil content has dropped significantly, putting crushing margins and the overall competitiveness of the industry under pressure. In the light of this, BFAP has undertaken a study to provide a deeper understanding of the key drivers affecting sunflower seed quality, the impact of varying (lower) oil content on the industry, and potential interventions to achieve an upgraded state of the value chain.

In South Africa, yields and oil yield (t/ha) per hectare have been relatively stagnant over the past decade, managing to increase by an average annual growth of only 1% compared to maize yields, which have increased by an average annual growth of 2.5% over the same period. However, the oil content (%) of the seed simultaneously has decreased by an average annual growth of -0.6%. The oil content of sunflower seed produced in South Africa is also significantly lower than that produced in Argentina or the Balkan countries. Furthermore, cultivar trial data from international seed breeders shows that the same cultivar planted in South Africa yields a lower oil content than when planted under optimal conditions in Argentina. This research has clearly illustrated that seed yield and oil content are complex and quantitative traits that are not only controlled by many genes, but are also influenced to a great extent by environmental conditions, and both additive and non-additive genetic effects play an important role in the inheritance of seed yield and oil content.

Ample evidence exists that planting dates that are too early or too late have a negative effect on both the yield and oil content of sunflower seed, and the late plantings common in South Africa, where sunflower is mostly planted after the maize crop, may negatively influence the sunflower seed's oil production potential. The 2018 sunflower crop seems to be a typical illustration of this phenomenon, where exceptionally late plantings (in some cases as late as the first week in February) coincided with a sharp drop in the oil content of the delivered crop. In fact, all of the past five production season, except for 2017, had a late start, with the majority of plantings only commencing in late December and January in the major sunflower production areas. Sunflower seed production is the predominant cash crop in Argentina and the Balkan countries, whilst in South Africa it is maize. In South Africa, sunflower is often planted as a "catch crop" and preference is not given to the timing of production, such as optimal planting date, fertiliser applications, soil analysis or much of the required pest weed or disease programmes required for optimal production.

Thus, to achieve both high yields and a sufficiently high oil content as inherent in the genetic potential of the sunflower seed, the crop should be planted in areas with suitable climatic conditions (temperature and water stress) with optimal crop management (planting date, planting density, fertilisation). Currently, South African producers have a choice of 199 different sunflower seed varieties. Of these, 113 are classified as high oil hybrids with the potential of achieving higher than 40% oil content. All the 113 cultivars are GMO free, but some have speciality trials such as specific herbicide resistance (e.g. Clearfield or Clearfield Plus) or have specific fatty acid compositions (e.g. High Oleic).

From a seed breeding and plant sciences theoretical perspective, there should be a negative correlation between yield potential and oil content. However, based on a range of analyses undertaken on available data (the national cultivar trial database), this study could not find conclusive evidence that there was a negative correlation between yields and oil content. To some extent, these results could have been anticipated, given the wide range of external influences like the planting date and weather, which have a significant influence on both yields and oil content. Despite these inconclusive results, the fact remains that both higher yields (in the case of producers) and higher oil content (in the case of processors) are critical to boost the overall competitiveness of the industry. To this end, data from a recent pilot study undertaken by Syngenta and CEOCO was incorporated into this report. The pilot study, which involved the latest commercially sold high oil content variety, produced encouraging results, with sunflower seed being delivered to the crushing plant with an oil content well over 40% and average yields above 2 t/ha (in the 2020 season). During industry consultations, seed companies seemed to be confident that, with the correct cultivar selection, the average oil content of the South African sunflower crop could be improved significantly without compromising on yields in a meaningful way.

Consequently, this study explored the principles of an incentive system that rewards farmers for adopting high oil content seed that maximises oil yield per hectare, rather than just yields per hectare. This is not a new concept and is a sunflower contracting norm in international markets. To speed up the adoption of high oil content seed by producers, an incentive structure that stimulates uptake would be important to consider, especially if there might be a perception of a negative correlation between yields and oil content. Therefore, at the farm level, the incentive will translate into a gross margin trade-off between producing "high yield - lower oil content seed" and "low yield – high oil content seed". A summary of various international and domestic quality-based pricing models highlighted two options for the sunflower industry: a) Oil content-based price premium or oil content-based grading and b) Back-payment structure, by which the farmer gets to share in high quality-driven (high oil content) advantages at the crushing level.

The pilot study suggested the feasibility of a 1.5% premium, which would offer farmers a 0.24 t/ha "potential yield loss flexibility". In other words, this premium would be sufficient for farmers to achieve improved returns per hectare, up to a 0.24 t/ha yield loss (where the farmer would achieve returns equivalent to the average sunflower SAFEX price without yield loss). This study shows that the "potential yield loss flexibility" offered by such a price premium structure varies significantly with respect to yield, oil content and price premium level. The adoption of the high oil-yielding varieties would therefore also depend on the extent and likelihood of farmers consistently producing average oil content beyond 38%, which could be particularly difficult under the circumstances of shifting seasonal patterns. While the desire for crushers to procure higher oil content seed is well placed,[1] the uptake of new high oil-yielding seed varieties will also depend on the processors' appetite for and willingness to pay premiums that could compensate farmers for "potential yield sacrifices for high oil content seed". Again, this study has not found conclusive evidence of a negative correlation between yield and oil content.

Overall, it comes down to the farmers' willingness to adopt new high oil content seed and targeted agronomic practices to produce seed that consistently exceeds the threshold of 38%, preferably in excess of 40%, oil content, and the wherewithal of processors to pay premiums

[1] At a 0% "incentive added on the price", the five-year average crushing margin increases by R145 for each 1% increase in sunflower seed oil content.

that will sustainably stimulate high levels of high oil-yielding seed production, while competing with crude oil imports.[2]

Investigating the feasibility of testing the sunflower seed's oil content at silo level revealed that, firstly, the current sunflower seed-grading system does not explicitly define what constitutes a high or low oil content. Secondly, there is no standardised moisture content at which both yield and oil content are presented, i.e. representation at 9% moisture, which is mostly taken as the norm. Thirdly, although some silo depots have equipment to measure secondary quality characteristics (viz. NIR machines) and use it for measurements for grading purposes, this does not include the measuring of the oil content of sunflower seeds. In principle, oil content could be a measurement monitored at the silo level. However, since this currently is not a grading requirement and essentially a nice-to-have, it is consequently not measured, and machines are not necessarily calibrated for this. In addition, the roll-out of such a requirement will also require significant investment in order to make the equipment available at all silo depots.

The near-infrared reflectance (NIR) testing methodology could be the analysis of choice at both silo level and crushing plants due to the speed of the test, the ease of testing and its relative accuracy. However, not all silo depots currently have NIR machines available and, where they are available, a calibration for sunflower seed oil content would need to be purchased. Ring tests, however, as advocated by Agbiz Grain and SAGL, could go a long way to ensuring that oil content is measured accurately at all value chain nodes (silos, crushers, etc.), and some investment would be required to ensure that this type of testing equipment becomes more widely available.

Overall, one needs to also take cognisance of the fact that these relationships (pricing structures, profitability and farmer decisions) are by no means clearly defined cause-and-effect relationships when it comes to sunflower seed production in South Africa, as the causal relationships behind the performance of yield and oil content are not clear-cut, and the positioning of sunflower seed in the typical South African crop mix creates additional complexities.

[2] At a local oil content of 34.3% (five-year average), the cost to produce one tonne of crude oil from local seeds will be equivalent to the cost of imported crude oil.