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Santam agriculture

A world in flux

By Wikus Grobler

The author John Connell is quoted as saying that "to be a farmer is to be a student forever, for each day brings something new". At the start of 2023, these words ring especially true as the global state of flux continues to impact agriculture and agri-businesses alike.

The uncertainties inherent in weather, yields, prices, government policies, global markets and political turmoil impact our daily activities, forcing us to consider alternatives and invest in innovative solutions to lessen the effects thereof.

The ongoing Russia-Ukraine war is set to further add to market volatility. This conflict continues to affect global agriculture markets, most directly in the areas of wheat, maize, sunflower and fertiliser.

New year, old challenges

On the home front, several factors are expected to come to the fore during the year. These include rising input costs, expansion of agricultural exports and export markets, the impact of deteriorating municipal service delivery, corruption in public offices, and failures in the network industries (i.e. roads, rail, water, electricity and ports).

A major point of concern is the prevalence of rolling blackouts, and the pressure is mounting on producers and businesses to invest in solar power or alternative energy to keep their operations afloat.

The new year was rung in with a considerable drop in fuel prices, but it had little, if any, effect on the planting season since most producers had already concluded their summer crop planting operations. Although the price of diesel was also reduced, producers continue to bear a heavy cost burden since they need to run their generators for longer periods given the current load shedding schedule.

Grain and oilseeds markets

In terms of wheat production, more wheat was planted during the course of the past two years, mainly in reaction to better prices and uncertainty with regard to barley and the various bans on alcohol sales. According to estimates made by the Bureau for Food and Agricultural Policy (BFAP), less wheat will be planted during 2023, especially if market prices continue to decline.

The national Crop Estimates Committee (CEC), in its December 2022 report, indicates that the area under wheat has stabilised in the Free State, following years of decline. The province will contribute around 21,3% (480 000 tons) to the national wheat harvest.

This year marks the third consecutive La Niña year for South Africa – an occurrence that has only taken place twice in the last 50 years – and as a result 2023 started off wet. This meant that planting was delayed in some areas due to the wet conditions.

Many producers opted to increase their soya bean hectares at the expense of white maize hectares because of higher input costs, and the fact that soya beans handle wet conditions better than maize.

The CEC estimates an increase of 149 700 hectares of soya beans in 2022 according to their 2023 *Intentions to Plant Report*. This represents a 16,2% increase year-on-year. They also estimated a decrease in white maize hectares by 73 000 to 1 502 000 and sunflower by 90 200 to 580 500. This continues to exert pressure on white maize ending stock, as well as already tight sunflower ending stocks.

The way forward

I believe the start of each new year provides us with the opportunity to reflect and realise the infinite opportunities ahead of us.

Wikus Grobler.

Over the course of the past few years, we faced unparalleled challenges and had to adapt at an astonishing pace. However, we managed to overcome these (on our own terms), which bears testament to our resilience and strength as a sector.

In order for us to continue to thrive in 2023, it is important to re-examine our strategies through a new lens, and a different set of drivers. We need to be certain of our strengths, about what we want to achieve, the direction we want to move in, and ultimately reimagine our future. Agbiz Grain wishes our clients in the grain value chain every success on the way forward.

As Brenda Schoepp says: "My grandfather used to say that once in your life you need a doctor, a lawyer, a policeman and a preacher but every day, three times a day, you need a farmer."

For any enquiries, send an email to Wikus Grobler at Wikus.Grobler@senwes.co.za.

EDITORIAL COMMITTEE

Editor
Wessel Lemmer
071 354 2948
wessel@agbizgrain.co.za

Agbiz Grain Steering Committee
012 807 3002
annelien@agbizgrain.co.za

Publisher
Plaas Media (Pty) Ltd
217 Clifton Ave, Lyttelton, Centurion
Private Bag X2010, Lyttelton, 0140
Tel: 012 664 4793
www.plaasmedia.com

Chief executive officer
Lynette Louw
084 580 5120
lynette@plaasmedia.co.za

Deputy editor
Jayne du Plooy
jayne@plaasmedia.co.za

Layout & design
Annemie Visser
annemie@plaasmedia.co.za

Sales manager & accounts
Marné Anderson
072 639 1805
marne@plaasmedia.co.za

Advertisement sales
Karin Changuion-Duffy
082 376 6396
karin@plaasmedia.co.za

Susan Steyn
082 657 1262
susan@plaasmedia.co.za

Zona Haasbroek
082 960 7988
zona@plaasmedia.co.za

Subscriptions
Beauty Mthombeni
064 890 6941
beauty@plaasmedia.co.za

Published on behalf of
Agbiz Grain
012 807 3002
1st floor, Grain Building,
477 Witherite Road,
The Willows, Pretoria
Email: annelien@agbizgrain.co.za
www.agbizgrain.co.za

On the cover:
Photograph courtesy of Senwes.

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AGBIZ GRAIN GAZETTE

Iraq builds more grain storage for big wheat crop

The state-run grain board of Iraq approved a plan to build a 100 000-ton grain silo in the central province of Wasit, as it prepares to harvest a bumper wheat crop, said Haider Nouri, director general of the board.

The new storage facility will supplement two small existing silos in the province. The grain board plans to boost overall storage capacity in Iraq, which is estimated at 3 to 3,5 million tons.

Iraq is expected to produce 5 to 6 million tons of wheat this year, or enough to achieve self-sufficiency, following abundant and timely rains, according to the agriculture ministry. – *BNN Bloomberg*

Agbiz Grain to introduce injury frequency rates

Within the safety, health, environmental and quality (SHEQ) environment, performance is mainly measured in injury frequency rates. These rates tell how frequently an injury occurs for a certain number of hours worked.

Agbiz Grain intends to establish injury frequency rates for the grain handling and storage sector in 2023. This includes the total injury frequency rate (the rate at which all injuries occur), and the lost time injury frequency rate (the rate calculated for the number of hours lost due to employees being booked off work due to injuries that occurred).

The storage sector can subsequently measure whether it is efficient in exercising SHEQ practices or not, but doing so within the agricultural environment. Currently, the sector has to benchmark itself against the manufacturing industry, but inflexible requirements to comply with that may not apply to the storage sector.

Associate members highlight issues of concern

The associate membership category includes value chain stakeholders that render services or products directly to the handling and storage sector. Associated members do not only pay a membership fee, but also share information and make suggestions on how to improve certain aspects of the grain handling and storage sector business environment.

During the end-of-year meetings with our associate members, the following was suggested for consideration in 2023:

Santam Agri:

- Global underwriters' latest requirements and outlook for risk sharing (insurance) in the handling and storage of grain. Impact of load shedding on insurance premiums and claims due to damage to equipment.
- Auditing of the grain handling and storage sector by an independent third party demonstrating legal and regulatory compliance. This will highlight non-compliance by (other) stakeholders involved in commercial storage and limit uncompetitive opportunistic practices.
- With the impending carbon tax looming over the agricultural industry, it could be a great opportunity for the storage sector to either sell carbon credits to existing taxpayers (such as Afrimat) or to build up a bank and absorb these credits in an attempt to reduce carbon tax liabilities in future. A couple of projects qualify for carbon credits. The link showcases carbon credit projects that Nedbank South Africa supports by buying carbon credits in an attempt to lower the bank's carbon footprint.
- Insurers such as Santam Agri see value in investigating the possible implications of the sustainable development goal benchmarks relating to the grain handling and storage value chain, in collaboration with Agbiz Grain.

Henchem:

- The company has already signed up and successfully guided 24 fumigation companies through the Profume stewardship process during the past 24 months and will present the product to our steering committee members before the next steering committee meeting in February this year. The new Profume fumigant's implementation in South Africa has increased drastically during 2022.
- Henchem completed stewardship training for more than 24 companies last year (37 in total). More than 20 000 000 tons of maize, wheat, rice, dried fruit, legumes and various other commodities have been successfully fumigated since. This includes short-term road and rail cart fumigation (as low as 12 hours) as well as long-term (seven-day) fumigations. Various trials have been completed or is in process with customers such as Senwes, OVK, Kaap Agri Pride Milling, and raisin and dry fruit producers. Henchem will make a technical presentation focussing on the scientific data from Profume jobs to the Agbiz Grain steering committee members before the next steering committee meeting.

AE Solutions:

- AE Solutions shared their view on the expansion of their client base involved in on-farm and commercial storage operations. In principle, all commercial storage operators must be members of Agbiz Grain, be FBO registered, and comply with regulations in a tough competitive storage business environment. Agbiz Grain members handle and store around 70% of the grain and oilseeds delivered to storage structures in South Africa, rendering Agbiz Grain a powerful mouthpiece for the sector. If you are a commercial storage operator and not a member of Agbiz Grain, do consider signing up.

JSE procedures around storage operator failures

According to recent JSE *Market Notices,* after a meeting with clearing members, financiers and fund managers, the JSE is committed to considering the following improvements to JSE-defined processes:

- Introducing a specific time frame for the buyer to either access JSE stock or confirm with the storage operator that good delivery was made; after this period, the 'risk' of good delivery passes from the short- to the long-position holder.
- Guaranteeing all JSE silo receipts and no longer look to each storage operator to guarantee the receipts they issue. This could be solved by the JSE establishing a fund that will underwrite all JSE silo receipts issued.
- If there is no turnover of stock in a particular silo, the JSE requires additional product or financial guarantees from the storage operator to ensure they can continue looking after the stock and have sufficient resources to replace the stock, which will experience natural quality deterioration over time.

Furthermore, that the following improvements were agreed to in the *Agricultural Detailed Contract Specifications*:

- Clarifying in the detailed contract specifications the circumstances surrounding alternate delivery and issuing receipts when quality and quantity are accessible (i.e. should not issue a JSE receipt if the required grade can only be met after screening or drying the product).
- Including a reference to storage operators placed under business rescue (most likely including this under the existing liquidation clauses).

The JSE is requested to consult sufficiently with the storage sector before making commitments or finalising agreements that concerns the storage sector.

The *Market Notices* can be accessed at the following links:

- ***Market Notice 580A/2022 JSE Procedures around a failure by a Storage Operator.***
- ***Market Notice 580B/2022 Exploring the JSE Procedures around a failure by the Storage Operator.***

Regulation amendments under the magnifying glass

The Department of Agriculture, Land Reform and Rural Development (DALRRD) received a request to amend the maize grading regulations. Industry representatives such as Grain SA, Agbiz Grain, the NCM, Sacota and Afma were invited to submit comments on the proposed amendments by the end of November 2022.

A meeting between the department and stakeholders took place in January this year. No consensus could be reached as there is uncertainty as to whether the research conducted is sufficient to support the proposed amendments – the lack of consensus influenced the DALRRD's decision.

During the meeting, legislation prioritising food safety for consumers was emphasised. In this regard, any proposed modifications to a grading factor that may increase the occurrence of mycotoxins needs to be scrutinised. The storage sector submitted comments on the proposed amendments regarding defective kernels, water-damaged kernels, kernels infected with fungi, discoloured kernels and frost-damaged kernels.

The process of attempting to amend the grading regulations has again highlighted the importance of research. In-depth research and thoroughly conducted investigations, the results of which value chain stakeholders cannot dispute, are vital to support the search for consensus. The DALRRD will not approve amendments to the grading regulations until each sector's respective representatives have reached consensus.

Development of protocol to boost competition in malting barley sector

Certainty is needed regarding the requirements concerning the handling and storage of malting barley. Agbiz Grain obtained a legal opinion to ensure that collaborative discussions within the value chain complies with the *Competition Act, 1998 (Act 89 of 1998).*

The purpose of the discussions is to increase competition in the handling and storage of malting barley, and to prevent the unreasonable transfer of risks or costs, which may have a detrimental impact on the production and storage of malting barley.

The inputs received will be to agree on industry standards. This may lead to the finalisation of a malting barley storage protocol for acceptance by involved stakeholders in 2023. In compliance with the *Competition Act,* Agbiz Grain will ensure that the discussion to reach industry standards will be inclusive of the relevant stakeholders.

If you have an interest in the handling and storage of malting barley, register your contact details by emailing annelien@agbizgrain.co.za.

2023 Agbiz Grain EVENTS CALENDAR

FEBRUARY 23
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Online
MORE INFORMATION

FEBRUARY 25-28
GEAPS Exchange 2023
Convention Center
Kansas City | Missouri
MORE INFORMATION

MARCH 14-16
Africa Agri Tech Conference and Exhibition
Sun Arena
Menlyn Maine | Pretoria
MORE INFORMATION

MARCH 15
GEAPS Webinar: Preventing dust explosions
Online
MORE INFORMATION

MARCH 15-16
GOSA Symposium
Diaz Hotel | Mossel Bay
MORE INFORMATION

MARCH 30-31
Pulses and Special Crops International Summit
Parana | Brazil
MORE INFORMATION

JUNE 5-7
ISF World Seed Congress 2023
Cape Town International Convention Centre
MORE INFORMATION

SEPTEMBER 4-7
Agbiz Grain Symposium
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SEPTEMBER 26
Wheat Forum Meeting
Grain Building Auditorium
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Grain Building Auditorium
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OCTOBER 27
Maize Forum Meeting
Grain Building Auditorium
Pretoria
MORE INFORMATION

‘World’s largest grain storage’ scheme for food security soon

Several schemes are to be merged to develop the “world’s largest grain storage” scheme amid global food disruptions in the wake of the war in Ukraine and the Covid-19 pandemic. Schemes under ministries, including the ministry of agriculture and farmers welfare, consumer affairs, food and public distribution and food processing, will soon be merged, a report by *Mint* stated.

The disruptions in food supply and high prices have increased food security concerns in several countries. Ukraine and Russia are among the world’s largest suppliers of wheat, barley and fertilisers. India, despite having large arable land, suffers from low productivity.

“The most important thing in the storage plan will be to see if it’s going to be modern storage or if the old system will be followed, where each man carries a sack and builds a storage pyramid. A mechanised system is far more transparent and much more modern.

“We don’t even have two million tons of storage in silos. The storage plan has been in the works for a long time, and it’s only now the government is trying to implement it,” Ashok Gulati, agricultural economist and former chairman of the Commission for Agricultural Costs and Prices, told *Mint*.

India’s cereal stocks, held by the Food Corporation of India (FCI), fell to a five-year low in 2022. The storage capacity varied from 75 to 85 million tons in 2022. The Centre also extended its free food-grain scheme, Pradhan Mantri Garib Kalyan Anna Yojana, until 31 December. – *Business Standard*

DALRRD aims to introduce inspection services

The Department of Agriculture, Land Reform and Rural Development (DALRRD) shared their expectation in a letter dated 6 December 2022 on how the process will unfold to finally introduce inspection services by August 2023. *The Agricultural Product Standards Act, 1990 (Act 119 of 1990)* requires that grain, oilseeds and grain products, which are sold in South Africa, must be inspected.

August is a realistic target date given that the DALRRD and assignee consult with involved stakeholders in March. Thereafter, the DALRRD should publish the proposals in April to receive feedback in May. The comments can be updated in June. However, this presupposes that the department keeps to the timeline and does not fail to sustain the necessary consultations or the period to receive public comments.

The DALRRD confirmed that inspection rates will be determined on a cost-recovery basis and that an independent study will determine the frequency of inspections. They also undertook to follow a proper PAJA consultation process and will conduct prior consultations with all stakeholders involved (consultations will take place from March until August).

Inspection rates will only be introduced after an agreement with stakeholders has been reached. Agbiz Grain is of the opinion that a volume-based levy approach will have the lowest cost implication for stakeholders in the inspection of raw commodities. However, the rest of the value chain disagrees.

Agbiz has been facilitating the consultation process between the DALRRD, assignee and grain and oilseeds industry. A hybrid approach to raising levies on a volume basis to fund the inspection services, but invoiced for remuneration on a duty-delivered paid basis, should not be ruled out as an optimum solution to keep unnecessary inspection costs on the required individual reporting of inspections as low as possible.

Zimbabwe expanding its grain storage capacity

The government of Zimbabwe said it plans to spend more than $275 million over the next three years to build new Grain Marketing Board (GMB) silos and renovate and modernise older silos to serve increased grain production, which is anticipated to reach three million tons in 2022/23.

There are proposals for the construction of four 56 400-ton silo complexes at the Mvurwi, Kwekwe, Timber Mills and Mhangura depots. Upgrading and automating existing facilities at Banket and Lion’s Den are also under consideration. In a separate proposal, four silo locations of the same capacity will be built at the Masvingo, Lupane, Raffingora and Bindura depots.

The Strategic Grain Reserve (SGR) has a storage capacity of 500 000 tons, and the government intends to raise it to 1,5 million tons. Zimbabwe currently has 12 silo plant sites with a total holding capacity of 751 000 tons.

Read the full report here: ***https://www.zimbabwesituation.com/news/zimbabwe-expanding-grain-storage-capacity/***

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Agbiz Grain Symposium 2023: Watch this storage space!

By Wessel Lemmer, general manager, Agbiz Grain

The 2023 Agbiz Grain Symposium will take place over four days in September this year. Each day will be limited to a two-hour virtual panel discussion to allow for maximum attendance by those involved in the grain handling and storage sector, as well as their clients. With this flexible approach, the symposium will also serve as a client-appreciation event.

For the next nine months, in the run-up to the event in September, we have approved projects that will allow for thought leadership in addressing issues related to the grain handling and storage sector, as the industry needs to openly address those issues facing our clients.

The members of Agbiz Grain handle and store on average around 70% of all the grain and oilseeds produced in South Africa. Our clients include producers who deliver grain and oilseeds at our facilities. Buyers include processors of products destined for animal feed and human consumption, while traders link sellers and buyers.

In the next nine months we will therefore be focussing on three areas of concern, namely the market, quality and food safety, and the economy of grain storage.

Market-related concerns

Storage operators play a key role in the functioning of the market. It is important for our clients to have access to stock for outloading and to ensure price convergence between the cash price and the futures price upon expiry. Agbiz Grain is continuously collaborating with the JSE to find practical, cost-effective solutions to a problem facing all market participants.

In addition, Agbiz Grain has also embarked on an initiative to address the unintended impact of market power that stifles the competitive environment of the storage sector (watch this space to see how this initiative unfolds in 2023).

We did our homework by calling in the help of experts in competition law and we are ready to address this concern in a bid to keep productivity high and increase competition relating to the handling and storage of grains. During the symposium in September, we aim to host a panel discussion that will share the outcomes of these initiatives to improve the market environment.

Quality and food safety

Storage operators ensure that the commodities serving as the basis of staple food for our nation are in fact being stored safely. Agbiz Grain implemented a food safety conduct as part of our members' contracts. This assures the consumer that members do comply with all relevant legislation to ensure not only the efficient trade of commodities, but also safe storage.

To improve the trading environment and limit disputes, Agbiz Grain is conducting research to identify and evaluate an appropriate sampling apparatus that will meet the need of all stakeholders involved in grain sampling in the value chain – from producer to processor – to settle disputes satisfactorily. We are in the process of developing a standard operating procedure for the handling of the instruments to be evaluated.

Next, the apparatus needs to be certified and comply with global standards. The independent research into and development of a suitable instrument for use in dispute resolution will be a first for the sector. The outcome and impact of these initiatives on value chain participants and consumers will be visible come the symposium in September.

The economy of grain storage

Other than the aspects relating to grain quality and trade, we are also going to focus on the economy of the grain storage sector to improve competitiveness and the productivity of our silo complexes. This raises the question as to how we are going to achieve this within the ambit of competition legislation? It is precisely this piece of legislation that will guide our projects to improve the competitiveness of storage operators.

The producer price index (PPI) is a leading indicator of the year-on-year changes in JSE storage rates, and this serves as an indicator of storage rates in the physical market. However, the storage sector operates in the rural economy that has unique cost factors and service delivery challenges.

The basket of storage costs is unique and not comparable to the basket of items making up the PPI. Agbiz Grain will be measuring and benchmarking costs through third-party research to understand where productivity gains are to improve the sustainability of the sector. It is in the interest of all market participants that we address those concerns limiting investment in silo infrastructure on the one hand, and driving up costs on the other.

Agbiz Grain invites you to keep an eye on this space for the thought leadership content we will be sharing, along with more details regarding the 2023 Agbiz Grain Symposium programme.

For enquiries, contact Agbiz Grain on 012 807 3002 or visit www.agbizgrain.co.za.

Photograph supplied by Senwes.

New grain depot manager course: Separating the grain from the chaff

By Koos du Pisanie

Competent grain depot managers who possess in-depth knowledge of the entire industry and are trusted by grain producers in South Africa are becoming fewer by the day.

The average age of depot managers is reportedly around 55 and there aren't many potential candidates who can fill these shoes. Nor can just any person step into this position, as the tasks involved are extensive and have many facets. The knowledge necessary to manage a depot is not something you'll necessarily learn at tertiary institutions. However, managers still need to know what they're doing because they are responsible for millions of rand worth of grain and equipment.

Lizelle Jacobs of MindAlive has in the last five years assisted Agbiz Grain in successfully developing and implementing the newly registered occupational qualification for grain depot managers. She says potential managers are indeed identified and trained by agricultural companies, but the grain industry identified the need for the standardisation of training to ensure that depot managers are equipped with relevant, industry-approved knowledge and skills. This will ensure that valuable institutional knowledge is transferred in a structured, practical and quality-assured manner.

The best course for the job

"The tasks of a grain depot manager should never be underestimated. Millions of rand worth of grain are stored in silos every year and customers who are going to store their harvest must have confidence in the person who accepts responsibility for managing the depot.

"The core competencies of grain operatives have been defined as the basic understanding and practical application of the management of grain quality and grain handling equipment, as well as the management of operational technology, facility operations and human resources. It must also be an individual who understands the importance of efficient grain storage and the role they play in the agricultural business sphere," Lizelle says.

Because a grain depot manager must carry a responsibility of this magnitude, he or she needs to be properly trained in all aspects of managing the facility. For the sake of the bigger picture of sustainable agriculture, food security and stability, it is necessary to set a standard the depot manager must meet. She adds that most agricultural companies have already bought into the idea of offering standardised training for all grain depot managers.

"We've made some significant strides in terms of the structure and implementation

of the course. The content thereof has already been prepared and we've had feedback from several training providers interested in becoming involved in the training of prospective depot managers. The Agricultural Sector Education Training Authority (AgriSETA) and the Quality Council for Trades and Occupations (QCTO) are responsible for overseeing the successful implementation of this qualification.

> "Millions of rand worth of grain are stored in silos every year and producers who are going to store their harvest must have confidence in the person who accepts responsibility for managing the depot."

"The QCTO will oversee the registration and certification of students, and will also be responsible for the accreditation of prospective training providers. AgriSETA will assist the QCTO in the accreditation of assessment centres and the management of the standardised national examination, called the external integrated summative assessment," she explains.

Course content

Lizelle gives the assurance that the curriculum for this qualification was benchmarked against international standards. In addition, the grain industry was continuously invited to provide inputs and list their requirements for such a qualification. The qualification will consist of different modules divided into knowledge, practical skills and work experience.

The knowledge module focusses on the following theoretical aspects that are critical to grain management processes:

- Principles of effective grain handling.
- Industry standards and practices to safely store the various commodities produced in South Africa.
- The requirements for storage practices such as concrete and steel silos, bunkers and silo bags.
- The various legislative requirements that must be adhered to in terms of food health and safety, and health and safety in general.
- Grain grading is a very important part of this qualification and can also be achieved as a partial qualification.

In the practical modules, the student will gain practical experience in the day-to-day management of a silo or depot complex. This includes operational planning processes, managing customer relationships, performance management of employees, communicating effectively with various stakeholders, ensuring that grain storage practices are in line with legislative requirements, and ensuring that all health and safety protocols are adhered to.

Gaining first-hand experience

The work experience aspect is the most important part of an occupational qualification. This is what education and training are all about – preparing students to be employable in that specific field of study. They will have to complete several tasks as prescribed in a real work environment and will be overseen by a workplace coach.

All aspects of grain handling and storage will be covered as part of their workplace experience. From managing personnel and resources to dealing with difficult customers, making sure grain is correctly sampled and ensuring that all equipment is in good working order (the list of tasks is extensive and comprehensive).

Lizelle says the qualification also includes aspects such as leadership, self-development, and general management in order to prepare the student for the task that awaits him or her.

"A qualified student will be able to manage and control the achievement of operational targets, lead and manage employees to ensure smooth business operations, manage and control the utilisation of operational resources, achieve grain handling and storage efficiency and quality standards by controlling unit operations, as well as conduct grain and oilseed grading processes."

Admission to the course

To be admitted to the course, prospective students must have at least a matric certificate. This is an NQF level five qualification. Students will complete the knowledge, practical and workplace modules over a period of time and then, when they are ready for it, register for the national examination.

Lizelle emphasises that course participants only receive a certificate of competency once they have passed the national exam, and not a certificate as proof that they have completed each module.

Screening of training centres

Several training institutions have indicated that they want to get involved in this project. Lizelle explains that it is the training provider's responsibility to make sure the student has successfully completed all modules and achieved the outcomes of each one.

Students will be assessed after each module to determine whether they have achieved the outcomes – this applies to the academic as well as practical modules. The training provided must also include records of students' results.

Agbiz Grain has developed learning material in line with the requirements of the curriculum (training providers can access this on their website). They are also free to update the material with new, relevant information to provide the students with a broader and better understanding of the role of a grain depot manager. Added to each module is a list of outcomes students must achieve.

Training centres must follow strict measures in order to provide a safe learning environment. Factors such as health, hygiene, lighting, ventilation, enough furniture and so on must receive attention. Student safety is also a priority and for this, fire safety and security must be in place.

The new direction that is being taken to provide standardised training for managers in the grain industry paves the way for enhanced service and effectiveness, which will elevate grain production and the marketing of grain to a new level. The feedback she receives from current depot managers about the training is encouraging, says Lizelle, and she is excited about the future of the next generation of grain depot managers.

For more information, contact Lizelle Jacobs on 082 877 4461 or info@mindalive.co.za. You can also contact Annelien Collins of Agbiz Grain on 012 807 3002 or annelien@agbizgrain.co.za.

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PowerCore™-eienskaptegnologie

PowerCore™-tegnologie is 'n nuwe hoë-prestasie, onkruiddoderbestande saadeienskap wat help om gewasse doeltreffend teen skadelike bogrondse insekte, soos die mieliestamruspe en Chilo-boorder, te beskerm.

PowerCore™-tegnologie bied omvattende beheer van bogrondse lepidoptera-peste

PowerCore™-tegnologie kombineer veelvuldige werkswyses om primêre en sekondêre peste te bestry wat aansienlike oesskade en meegaande produksieverliese kan veroorsaak. Die eienskap bestaan uit drie verskillende *Bacillus thuringiensis* (Bt)-proteïene, wat elk insekte op 'n unieke manier teiken, terwyl dit help om die langslewendheid van die tegnologie te verleng. Die veelvuldige werkswyses verseker ook breëspektrum beskerming teen bogrondse peste.

Insekspektrum

Daar is verskeie lepidoptera-peste wat mielies in Afrika aanval. Hierdie peste veroorsaak erge skade aan mielies, en oesverliese kan wissel na gelang van die tyd en vlak van stamboorderbesmetting.

Mieliestamruspe (*Busseola fusca*)

Hierdie is die mees skadelike stamboorder in mielies in Suid-Afrika en kom voor by hoogtes wat wissel van seevlak tot 2 000 m bo seespieël. Dit kom wydverspreid voor in Suid-Afrika se mielieproduksiedriehoek.

Chilo-boorder (*Chilo partellus*)

Hierdie is 'n stamboorderinsek wat 'n ernstige pes in mielies, manna en sorghum is. Die Chilo-boorderruspes beskadig hierdie gewasse deur binne-in die plantstingels in te boor of te tonnel.

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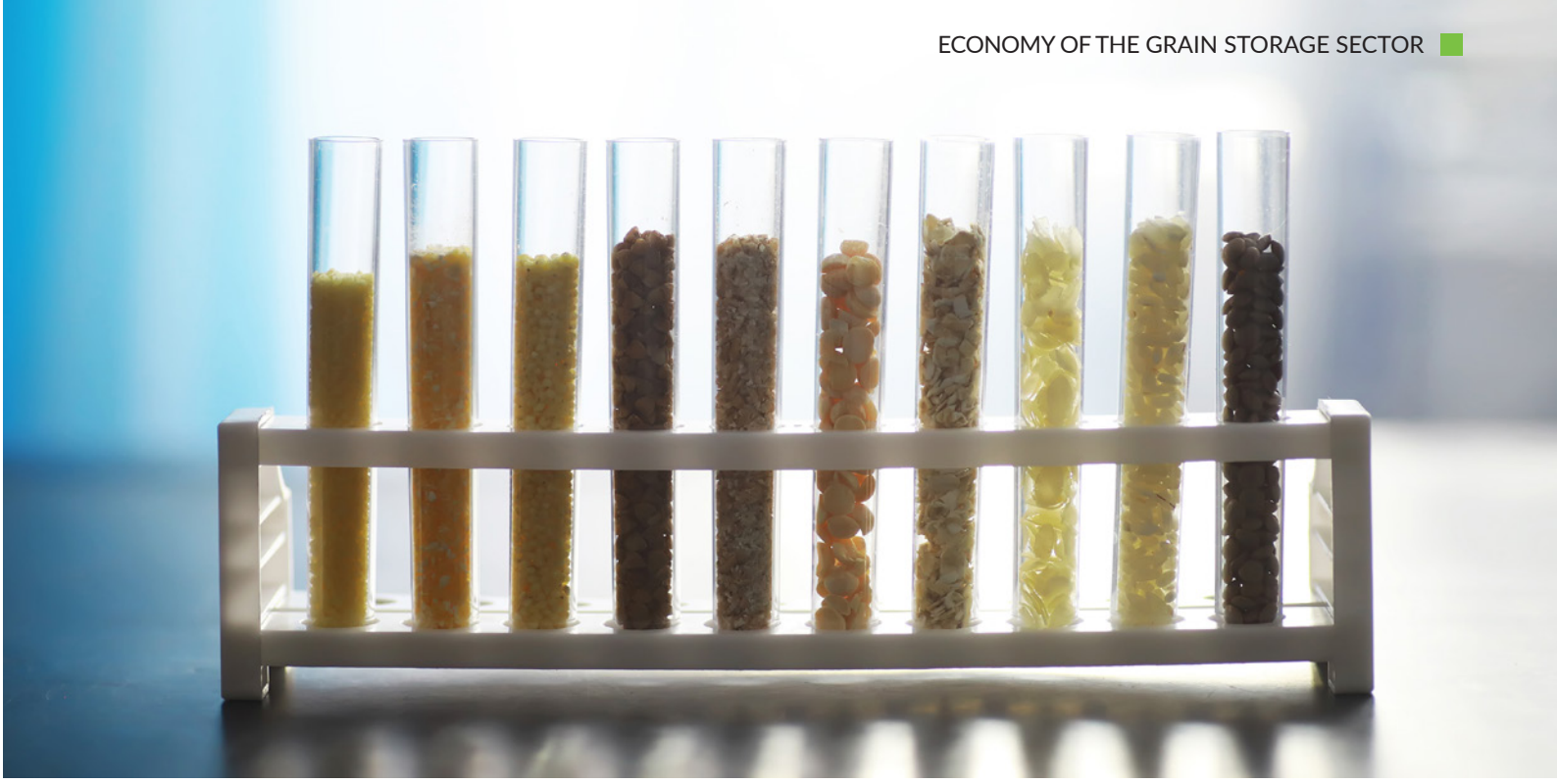


New breeding technology:
Nature, opportunities and regulation

By Izak Hofmeyr

New breeding technologies have opened the door to mind-boggling opportunities in both plant and animal breeding. With this explosion of possibilities, however, it is becoming increasingly important to adapt the regulatory framework for these technologies to ensure sustainable innovation, as well as mitigate the possible risks.

It all started with the search for answers to specific problems in agricultural production. One of the first commercial breakthroughs came in the early 1990s when molecular biologists succeeded in transplanting a gene from a bacterium into maize. The result was a genetically modified maize cultivar that was resistant to stalk borer.

However, in addition to the tremendous excitement about the possibilities this technology offered, concerns were also raised as to the possible negative effects of genetic modification (GM). A new term was born – genetically modified organism (GMO), which refers to an organism whose genetic material has been altered by introducing one or more genes from a different species. Different countries formulated different sets of regulations to manage this new technology and in a few countries, it was even rejected altogether.

A shortcut to advanced breeding

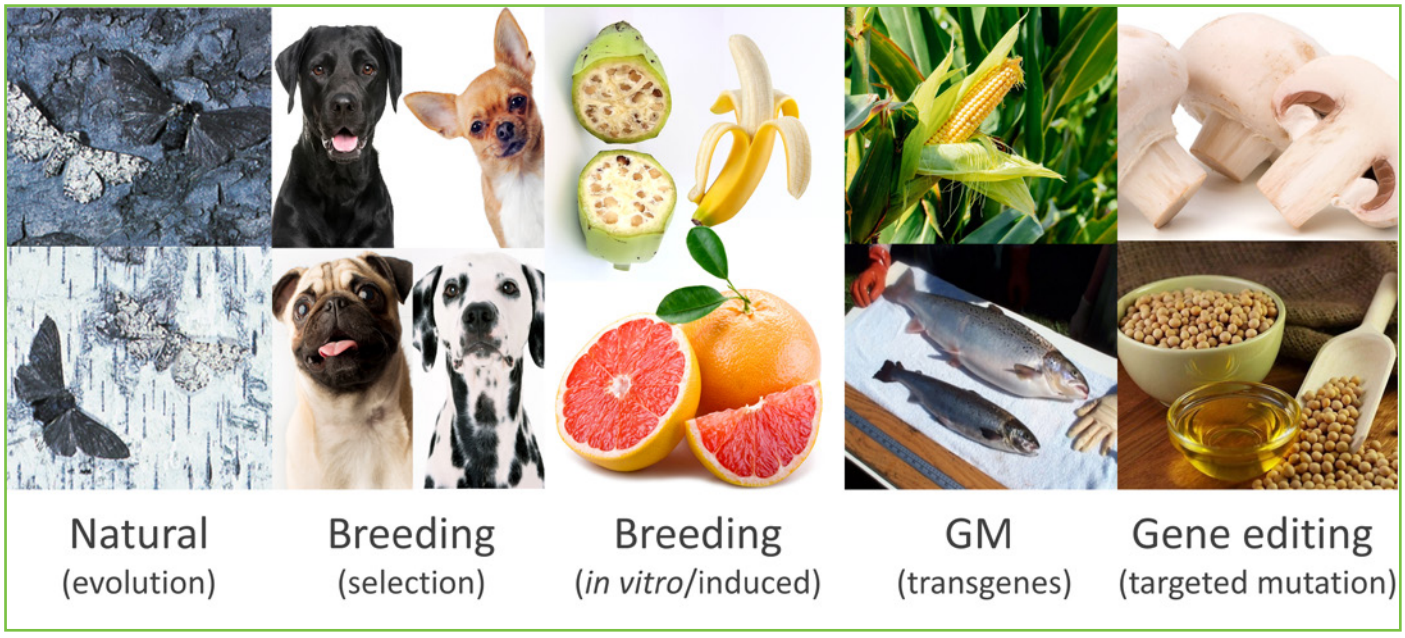
Genome editing was eventually developed, where the genome of a specific organism is altered without introducing the genetic material from a different species. This technology opened the door for scientists to better understand the genes of various species, which meant they could pinpoint the exact location of the genes that regulated specific traits and alter those genes to achieve a specific outcome. (It is important to highlight that there is a fundamental difference between merging genes from different species and altering existing genes within a species.)

"Genetic variation," explains Dr Hennie Groenewald, executive manager of Biosafety South Africa, "forms the basis of any structured breeding programme. Ever since mankind realised that it was possible to select for certain traits, male and female lines have been selected and put together to achieve specific trait combinations. This is a very long process, requiring multiple generations.

> "Because it is so accurate and relatively easy to apply compared to GMOs, genome editing has created a huge surge in bio-innovation productivity."

"With these new technologies, a quick and effective shortcut was created to achieve the desired results. These potential benefits will, however, be lost should the strict

Figure 1: Genetic variation as the basis for phenotypic variation.



regulations, and associated long timelines and high development costs that apply to GMOs also be applied to gene-edited products, which have a fundamentally different risk profile."

The point of departure should be to define exactly what a GMO is, why and how it should be regulated, and how this relates to the new techniques and products associated with induced genetic variation through genome editing (*Figure 1*).

Genome editing in practice

There are three components to the genome-editing process, Dr Groenewald explains. The first is the ability to identify a very specific target sequence in the complete genome. This is probably the main difference between genetic manipulation and genome editing. In the latter, a very specific gene is targeted for editing, while in GM a completely new gene is added.

The second step is to 'cut' the DNA at the exact site on the genome that has been identified. Thereafter the endogenous mechanism of the cell takes over to repair the cut DNA. It is during this third and final repair step that a mutation may be introduced – just like mutations occur naturally and give rise to biodiversity.

An apt metaphor for this process is the editing of an article. It is possible to zoom in on a specific letter and change it. For example, you can change the meaning of an expression by replacing the letter 'r' with 't' in the sentence 'the car is white' – as opposed to 'the cat is white'. Hence the term 'genome editing'. Scientists use a specific template to induce a specific mutation at a very specific site on the genome, which is a shortcut to selecting for the same mutation over many generations of breeding.

An example of a genome edited product, says Dr Groenewald, is the non-browning mushrooms commercialised in the United States. By using genome editing technology, the polyphenol oxidase gene, which causes the browning effect in mushrooms and fruit, was disabled. Less browning means easier production, a higher quality product, longer shelf life, and less waste.

A few other examples include:

- High-oleic soya beans. These soya beans have a fatty acid profile that contains 80% heart-healthy oleic acid.
- Low gluten and coeliac-safe wheat. Some specific digestion-stable fragments of wheat gluten are recognised by immune cells, ultimately resulting in a variety of symptoms ranging in severity. Genome editing enables the production of wheat lines that have a strongly reduced coeliac immunogenicity.
- Biofortified tomatoes to address vitamin D deficiency. Most food contains little vitamin D and plants are very poor sources. Genome editing enabled the modification of a duplicated section of plants' endogenous phytosterol biosynthesis, to provide biofortified food.
- Polled cattle. Horn growth is determined by a specific gene mutation and through genome editing, it is now possible for any cattle breed to be polled.

Less money, more benefits

Genome editing is already being used worldwide in a wide range of applications, such as improved food/feed quality, increased plant yield and growth, biotic stress tolerance, industrial utilisation, herbicide tolerance, abiotic stress tolerance, product colour/flavour and storage performance.

Because it is so accurate and relatively easy to apply compared to GMOs, genome editing has created a huge surge in bio-innovation productivity. Furthermore, due to it being cheaper and more effective, it is within reach of small companies, entrepreneurs, and public research and development institutions.

"To produce a single GMO line could cost more than R1 billion and could take 16 years. Genome editing is much cheaper and faster, which means relatively small players are now able to enter the market. Even developing countries can now develop context-relevant products for their own benefit, contributing at the same time to global food security, productivity and diversity. Finally, and most importantly, it

enables us to react more effectively and faster to climate change challenges," says Dr Groenewald.

A need for regulation

With all the potential benefits this technology offers, the issue of regulation becomes increasingly important. "The key concept here is 'sustainable bio-innovation'. A central aspect of sustainable innovation is the proactive integration of all biosafety and viability requirements, ensuring a balance is drawn between innovation and safety."

The first issue to understand, he adds, is that the basic assumptions regarding GMO risk and regulation are not necessarily applicable to all possible products of genome editing and other new breeding technologies. "Genome editing is starkly different from the original definition of GMO, which is the transfer of genes from one species to another. This is exactly why such strict regulations are necessary for the application of GMO technology."

The aim of some genome editing processes, on the other hand, is to induce mutations that could potentially occur naturally in the genome of that organism.

"In this context, the risk is no more and no less than what could potentially have occurred naturally. This does not imply that there is no risk, because there is. But we conventionally manage that risk via conventional legislation. The risk, however, is not the same as that which can occur in GMOs. It therefore follows logically that the regulatory framework for genome editing should be different from that of GMOs."

Another reason why a distinction should be drawn between genome-edited and GMO products, is to separate genome-edited products that are equivalent to naturally occurring ones from the inaccurate, negative perceptions still associated with GMOs – these products are fundamentally different.

"Our view is that an oversight system should be introduced, according to which products should be assessed on a case-by-case basis to determine whether they should be regarded as GMO or not," says Dr Groenewald. "This will ensure that broad oversight remains in place without an undue impact on bio-innovation or unnecessarily attaching the GMO connotation to products when this is not warranted."

Unfortunately, South Africa and New Zealand are at present the only countries in the world that have decided genome editing should be regulated in the same way as GMOs, he points out. In the European Union, where gene-edited products are currently regarded as GMOs under a court ruling, the regulatory framework is under review, and the rest of the world has adopted a much more nuanced approach to the issue.

For more information, contact Dr Hennie Groenewald on 083 288 1271.

BKB GRAIN STORAGE

BKB GrainCo:
Enabling flow in the grain value chain

The production of grain and oilseeds has increased over the past two decades, and with it the outloading rate at certain locations has become more challenging and concentrated over time. This poses various challenges, which is why role-players in the grain value chain need to partner with professional service providers with proven experience in the handling of grain.

BKB GrainCo is a member of the PakHouse Brands Group. BKB GrainCo offers storage that is effective, both in cost and time, while offering adaptable solutions for all types of grain producers. When it comes to grain storage, we believe that the key is having a solution focussed business, where the client experiences a team of people who not only want to deliver a great service, but will find solutions along with their clients to enable business growth.

Experience and innovation have allowed us to offer our clients the benefit of:

- **Multiple locations:** Through investments over the last few years, we now have storage depots in most of the major grain producing regions in South Africa.
- **Professional staff:** Our depot managers and regional managers strive to deliver professional solutions when it comes to your storage needs.
- **Adaptable and effective:** We believe in technology, and because we are modern and effective, the producer's delivery and collection experience is quick and easy.

BKB GrainCo has dedicated and skilled staff to service clients at depots throughout South Africa's summer and winter grain producing areas. We store and manage more than 500 000 tons of grain and lucerne annually. Over many years, the company has gained invaluable experience and expertise in the practical management and handling of grain.

The BKB GrainCo process can be explained in three easy steps:

- Find and contact your nearest storage depot to indicate that you have grain to store.
- Transport grain to the depot where we will test and grade your produce to ensure what you deliver is what you collect.
- We place your grain in a silo bag or use other alternative storage methods.

Contact us at email bkb@bkb.co.za or visit *www.gs.bkb.co.za*.

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A partnership with BKB Grain Storage, which has depots throughout South Africa's summer and winter grain growing regions, ensures cost-effective grain flow from the farm to the customer.

This is why at BKB Grain Storage, we realise how valuable it is to combine experience and innovation to offer you practical management and handling solutions for your grain.

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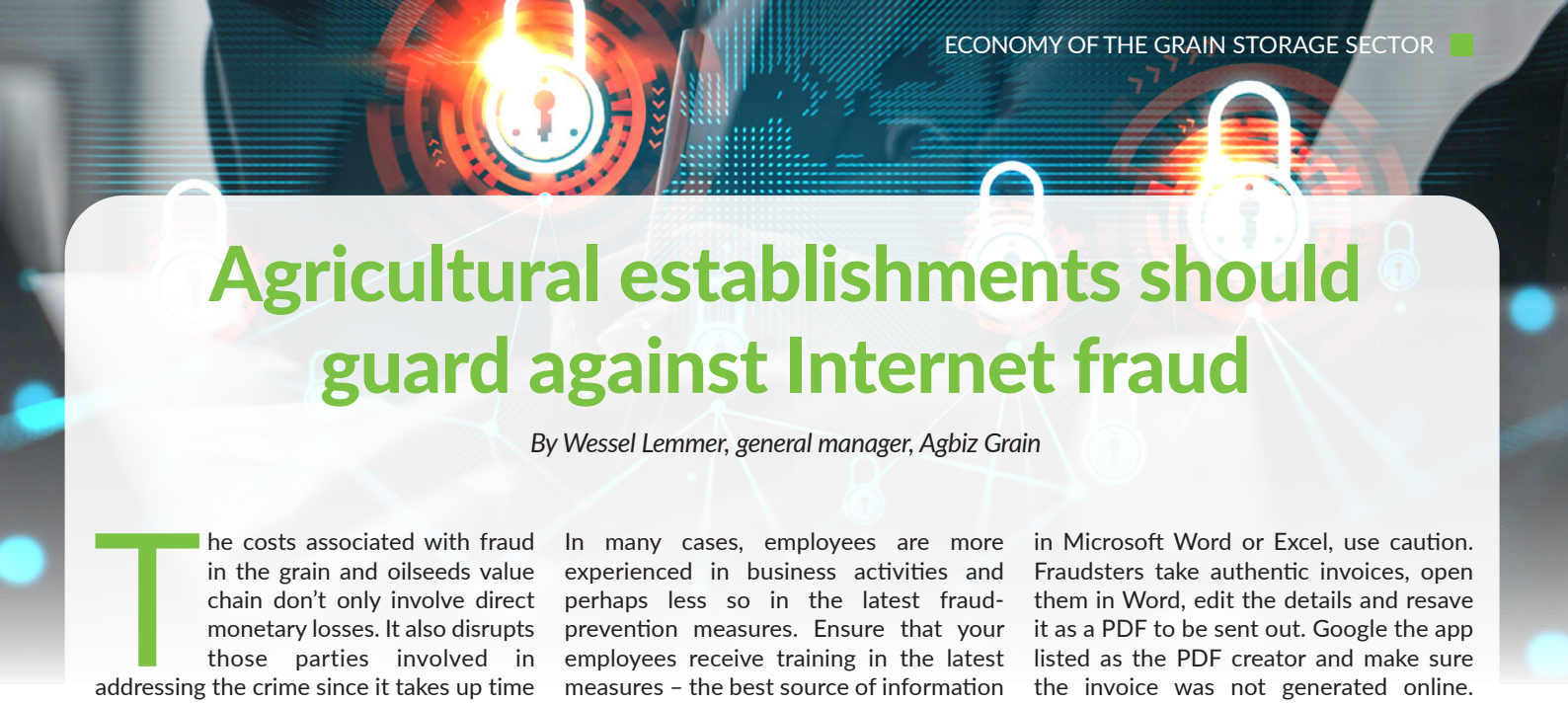

Agricultural establishments should guard against Internet fraud

By Wessel Lemmer, general manager, Agbiz Grain

The costs associated with fraud in the grain and oilseeds value chain don't only involve direct monetary losses. It also disrupts those parties involved in addressing the crime since it takes up time that could have been invested in business operations. Moreover, businesses are not always equipped or informed to deal with this type of issue.

Don't get caught off guard

Instances of fraud must always be reported to the police, and a case number obtained before financial institutions that might be affected (e.g. insurance companies) can take action. The impact of Internet fraud is extensive, and if you are not vigilant it is only a matter of time before your business will become a target.

Details regarding crime fighting are not always shared freely because when addressing the crime, it is imperative to keep criminals from accessing this information to improve their tactics. However, sometimes a wave of crime will force us, and the companies we do business with, to be more aware of this reality so we can continue doing business uninterrupted.

It is said that crime and fraud are so commonplace that it isn't newsworthy anymore. That might be the case, but it is still necessary to brush up on our knowledge. This applies especially to employees who handle invoices and payments, as they need to exercise caution with every transaction – no matter how big or small. (Fraudsters are persuasive and can create convincing documents featuring forged signatures that seem genuine.)

Internet fraud is an unfortunate reality and a profitable criminal enterprise. Defrauding people and businesses are not new, but the way in which victims are being targeted has become ever more sophisticated.

In many cases, employees are more experienced in business activities and perhaps less so in the latest fraud-prevention measures. Ensure that your employees receive training in the latest measures – the best source of information in this regard is your financial institution as it can provide you with the necessary references or documentation.

Safeguarding your business

Businesses should pay attention to certain key points. Strongly consider integrating an account verification system into the payment system for current suppliers, creditors and third parties. An account verification system used by large banks, among others, effectively tests whether the name of the beneficiary and the account number match.

It is vital to verify every new beneficiary the business has to pay – whether once-off or not – using an account verification system. Any change in banking details must be confirmed immediately and directly with the creditor and supplier.

This cannot be done via email since it is often not secure. Make a direct phone call to the creditor's senior accountant by using the phone number listed on the creditor's website. It is also recommended to double-check an individual's phone number in the Telkom White Pages.

If the number for a creditor and/or supplier on a business' system has been used in the past and is credible, that number can be used. Under no circumstances should the contact number provided on the invoice be used. Fraudsters change this number so that transactional enquiries can be directed to them.

Check PDF invoices in a PDF reader programme. If there are any indications that the invoice was prepared and printed in Microsoft Word or Excel, use caution. Fraudsters take authentic invoices, open them in Word, edit the details and resave it as a PDF to be sent out. Google the app listed as the PDF creator and make sure the invoice was not generated online. If invoices can be generated online via a PDF programme, you should use caution to ensure your business is not exposed to fraud.

South Africa's criminal justice system unfortunately cannot handle Internet fraud in a fast and effective manner. By the time the information ends up in law enforcement's hands, the perpetrators would already have transferred the stolen funds via various mechanisms and the money likely spent.

A final thought

The best defence against Internet fraud is prevention. The necessity of having an account verification system cannot be overstated and it must form part of a business' established processes.

If negative feedback is obtained via an account verification system, it must be investigated immediately. Contact the supplier or creditor on the phone number listed on their website. Attach the feedback and printout from the account verification system as proof that the new supplier's details were verified before their contact details were captured on your system. Also, do this before making a once-off payment.

Without these systems in place, you will be exposing your business to Internet fraud.

For more information, email the author at wessel@agbizgrain.co.za.

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RIVIERSONDEREND, WESTERN CAPE PROVINCE

PROPERTY

By Special Power of Attorney: Number 1 Van Riebeeck Avenue, Riviersonderend (ERF NUMBER 1716 RIVIERSONDEREND, DISTRICT OF THE THEEWATERSKLOOF LOCAL MUNICIPALITY– MEASURING 83.6491 HECTARES), CALEDON DISTRICT WESTERN CAPE PROVINCE. Large Industrial Property, estimated GLA 4 472 Square Metres, comprising Grain Mill Warehouse, Ancillary offices, Staff Ablution facilities, Weight Bridge office, Security office, Manufacturing and Storage Warehouses, Grain Storage Silos, Workshop and Compressor Room and, duly instructed by the Joint Liquidators, together as one Lot with;

PLANT, MACHINERY, EQUIPMENT & OFFICE FURNITURE

- Intake Hooper with auger feeder, bucket elevator, Cyclone, 6 x Portioning Bins, Final Portioning Bins, Premix Bins, 1.5 Ton Ribbon Mixer
- Sprout Pellet Press, Cooler and Cyclone
- Distribution Hoppe, Bagging Feeding Hopper, Weighing and Bagging Stitching Machine
- Graveyard Debagger, Ureas Sifter and Bins
- Ward Turret Lathe, Plate Rollers, 20 Ton Press, Plate Folder, Thermamax CO^2 Welder, Belt drive Bench drill
- Molasses Pump, Primary Mill and Bucket Elevator, 140 000 Litre Molasses Tank
- 30 Ton Bulk Auger Tanker Tr-Axle Trailer
- Assorted Office Furniture & Equipment including Desks, Chairs, Tables , Filing Cabinets, Printers, Bookcases, Credenzas, Shelving, etc.

Separate from, or together with;

By instruction from the Joint Liquidators: Four (4) Vacant Stands - Muller Street, Riviersonderend being ERF NUMBER 1228 (MEASURING 1 047 Square Metres), ERF NUMBER 1229 (MEASURING 1 060 Square Metres), ERF NUMBER 1230 (MEASURING 1 060 Square Metres) and ERF NUMBER 1231 (MEASURING 1 060 Square Metres) RIVIERSONDEREND, DISTRICT OF THE THEEWATERSKLOOF LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE

VIEWING: BY APPOINTMENT: 6 - 10 FEBRUARY, 2023
FROM 09:00 – 15:00

PANFONTEIN / VEREENIGING, GAUTENG PROVINCE

PROPERTY

By Special Power of Attorney: Portion 10 of the Farm Panfontein, Vischgat Road, Vereeniging (RE OF PORTION 10 OF THE FARM PANFONTEIN NO. 437, IR, DISTRICT OF THE MIDVAAL LOCAL MUNICIPALITY,– MEASURING 83.6491 HECTARES), VEREENIGING, GAUTENG PROVINCE. Large Industrial Property, estimated GLA 9 032 Square Metres, comprising Main Office Building, Ancillary offices, Staff Ablution facilities, Canteen, Laboratory, Weight Bridge office, Security office, Manufacturing and Storage Warehouses, Grain Storage Silos, Workshop, Compressor Room, undercover Staff Parking and Two (2) Residential Dwellings and, duly instructed by the Joint Liquidators, together as one Lot with;

PLANT, MACHINERY, EQUIPMENT & OFFICE FURNITURE

- Raw Material Storage Bins with discharge auger, Bucket elevator, Hopper with Hammer Mill, Ground Product Bucket Elevator, Dump Hopper and Auger, Portioning Holding Hoppers, Portioning Loadcell Scales & mixing Hopper with feed auger, bulk loading chutes
- Pella Din 16 ES Pellet Press, Supply Bins with auger, Crumbler Hopper with Feed Auger
- Bagging Machinery, 20 Ton Bins and Bag Stitcher
- Cyclotherm 250KG Boiler
- Kaeser SK 22 Comressor
- Ford 6610 Tracto, 20 Ton Tipper Trailer, 10 Ton drawbar trailer, Manitou Telehandler
- Assorted Office Furniture & Equipment including Desks, Chairs, Tables , Filing Cabinets, Printers, Bookcases, Credenzas, Shelving, etc.

VIEWING: BY APPOINTMENT: 6 - 10 FEBRUARY, 2023
FROM 09:00 – 15:00

VRYBURG, NORTH-WEST PROVINCE

PROPERTY

By Special Power of Attorney: Number 5 Industria Street (ERF 2493 AND ERF 883 VRYBURG, DISTRICT OF THE NALEDI LOCAL MUNICIPALITY, NORTH-WEST PROVINCE – TOGETHER MEASURING 2.5389 HECTARES), VRYBURG, NORTH-WEST PROVINCE. Large Industrial Property, estimated GLA 9 285 Square Metres, comprising Main Office Building, Ancillary offices, Staff Ablution facilities, Canteen, Weight Bridge office, Grain Mill warehouse and Grain Storage Silos, storage warehouses, workshop, lean-to shed undercover Staff Parking and access to a railway reserve and, duly instructed by the Joint Liquidators, together as one Lot with;

OFFICE FURNITURE & EQUIPMENT

Assorted Office Furniture & Equipment including Desks, Chairs, Tables , Filing Cabinets, Printers, Bookcases, Credenzas, Shelving, etc.

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10% Deposit on submission of the offer and balance within 30 days of confirmation. **TERMS:** Sale Agreement as well as specifications available on our website or from **PARK VILLAGE AUCTIONS (011) 789-4375 (B). OFFERS TO BE SUBMITTED TO PARK VILLAGE AUCTIONS HEAD OFFICE, UNIT 10, FERNDALE MEWS NORTH, 355 OAK AVENUE, FERNDALE, RANDBURG OR E-MAILED TO auctions@parkvillage.co.za BY NO LATER THAN 14:00 ON FRIDAY 17 FEBRUARY 2023.**

NOTE: The Joint Liquidators reserves the right not to accept the highest or any other offer.

All of the above is subject to change without prior notice.

5297

Introducing soya differentials with multiple reference points

The JSE's primary objective remains to provide a premier platform for price discovery and price risk management, announcing on 24 January that they will begin a two-year trial from 1 March 2024 in which the JSE will amend the soya contract specifications and move away from a single reference point model in favour of a multiple reference point model. The JSE will be identifying a series of processing points when determining the JSE location differential, should soya beans be delivered in conclusion of a futures contract.

The purpose of this new model is to evaluate whether the concept of recognising multiple points of demand allows for a vibrant and effective derivatives contract. The concept of location differentials remains, but it now considers the supply available to each point of consumption and models it on a linear basis.

Implementation period

The March 2024 soya expiry will be available for trading next month. The pilot will run for a minimum of two years, overlapping for a further year as the success of the pilot will only be considered after the full two-year period. (The soya pilot will run from 1 March 2024 to 28 February 2026, and remaining 2026 expiries up until 28 Feb 2027.)

The JSE will also publish indicative location differentials for the 2024 marketing season, relying on 2023 data as an example of the impact the various reference points will have on location differentials under the new model. In addition, each year, the JSE will publish a list of the reference points that will be included in the model, as well as the soya bean stock levels per registered JSE silo that was used as a source of supply data in the model.

Evaluation of the model's success

The JSE will evaluate the performance of the derivatives contract at the end of each marketing season, evaluating its price convergence and effective hedging capabilities. It will decide whether to continue with the implementation of the model at the end of the two-year period, implying that the model will be used for a period of three years.

Outcomes on the following criteria will eventually determine the success of this initiative:

- There should be no excess build-up of physical stock in delivery points inside the zero-differential areas. The multiple reference point model strives to be more inclusive considering processing points and so the JSE would hope to see movement of such stock before the outer points become active supply points.
- Redelivery of JSE silo receipts will be carefully monitored to establish if there is a major area of concern. This could either be due to the calculation of the location differential or simply clients receiving stock in sites that do not meet their requirements.

Should the pilot not be considered a success, the soya contract will revert to a single reference point as from the 1 March 2027 marketing season.

The following video gives an explanation of the concept:

For enquiries, visit *www.jse.co.za*.

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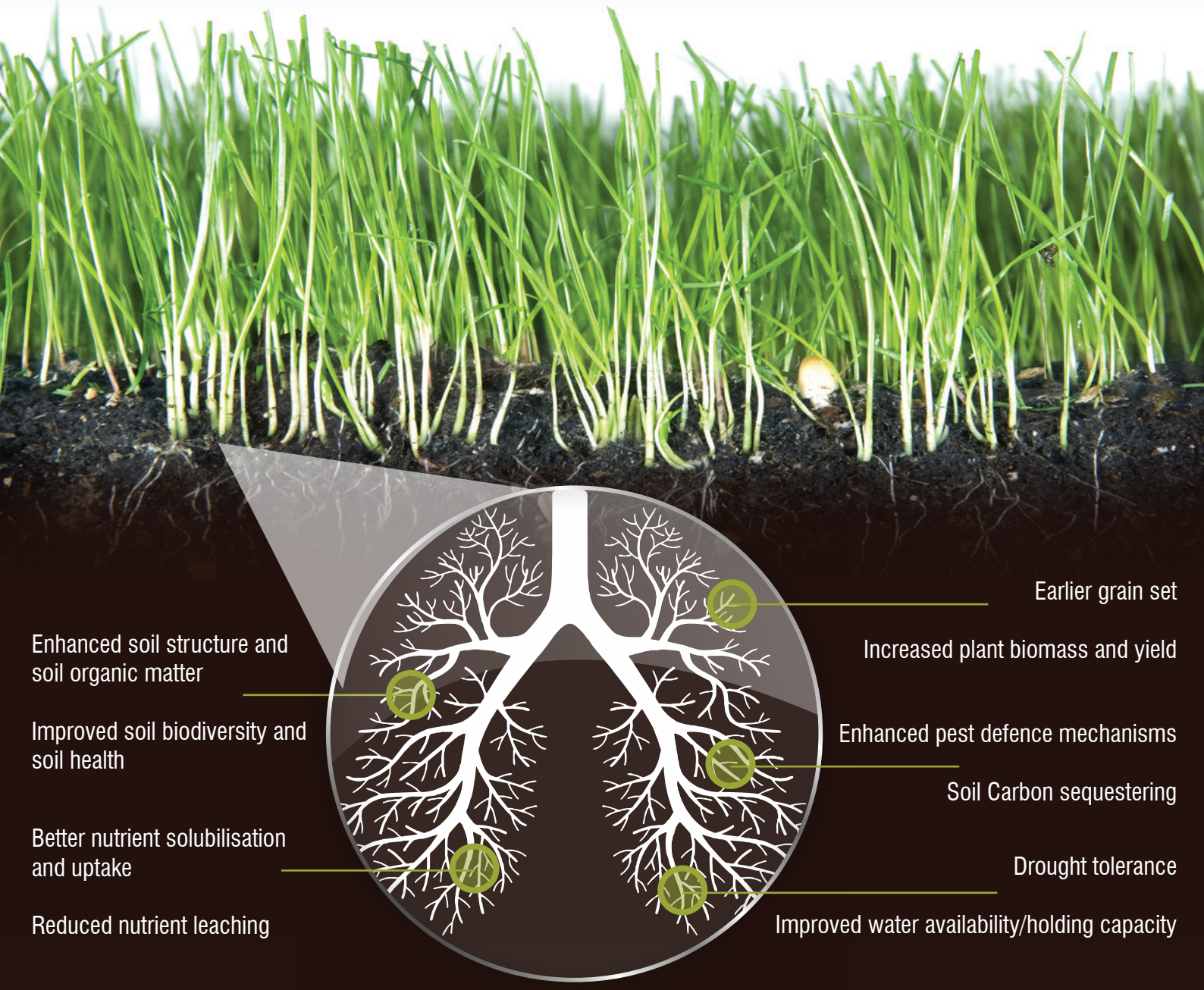

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Milling quality and yield: *Why maize hardness is key*

By Mariana Purnell

Maize hardness is an indication of breakage susceptibility. It is important in food processing performance, influencing the extraction yield, final product quality and end-use value, as well as power usage and dust formation during processing.

Apart from milling efficiency, it also impacts other areas of the value chain, such as storage and handling, due to breakage during post-harvest activities.

Both physical and biochemical aspects determine maize hardness, and methods to measure it have been developed to improve processing efficiency, as well as possibly providing a quality specification for maize growers, which could attract a premium.

Much to the dismay of the industry, these tests, which are part of the annual maize crop surveys performed by the Southern African Grain Laboratory (SAGL) over the last 25 years, point to a gradual decrease in kernel hardness. Over the last ten years, milling index has dropped from an average of almost 90 to just above 70. Extractions of WM meal have decreased by 3% with chop increasing by almost 4%, while test weight has dropped and stress cracks have almost tripled.

The SAGL also found differences in total clean grit yield, in starch present in the chop and in the hard endosperm. This trend is of concern to the various industry role-players.

Interplay between protein:starch

Maize hardness and density, which is controlled by the balance between the hard and soft endosperm within a single kernel (*Figure 1*), influences post-harvest resistance to pests and micro-organisms, and the rate of starch digestibility. The ratio of starch to protein is around 11:1 in soft endosperm and 6:1 in hard endosperm.

Although protein content comprises a lower proportion of total kernel composition compared to starch, it appears to play a significant role in influencing hardness. SAGL research indicated that the quantity of protein in maize is less important than the quality (type) thereof. It is now known that the composition of two storage protein classes (zeins) have a strong influence on kernel hardness.

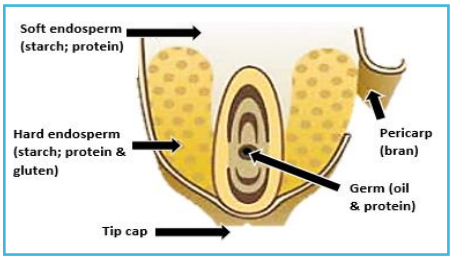
Some argue that maize breeding aimed at improving crop yields and agronomic performance over the last 50 years has not considered kernel quality aspects, leading to substantial changes in kernel composition and reductions in kernel hardness. Over this period, reduced protein and increased starch and amylose concentrations have impacted negatively on kernel endosperm hardness.

Significant genotype differences in the amylose to starch ratio were originally not correlated to hardness, but it is now recognised that yield improvement has indirectly changed kernel composition in new hybrid releases, thus affecting starch fractions during processing.

Impact of the environment

While endosperm hardness of maize hybrids is greatly dependent on genetic background, the protein formation that occurs at critical stages during the growth phase can also be hampered by drought and soil conditions, resulting in poor quality maize that will break too quickly when milled.

Figure 1: Endosperm of a maize kernel.



Although both the growing environment and genotype of maize affect hardness due to its influence on final protein and starch content, and to a lesser extent composition, datamining of the SAGL crop quality information gathered over 25 years shows that the environment plays a more important role than cultivar. Weather patterns may thus also directly influence kernel quality changes and water absorption.

Due to regional differences in climate and soil conditions, locality affects kernel size and thousand-kernel weight (TKW), but there is little variation in TKW of cultivars within and across localities, and test weights of cultivars are not significantly different within each locality. However, in some cases genotype has had a more profound effect on grain hardness parameters than environmental conditions, growing seasons and cultivation practices. Higher test weight has been associated with a high ratio of hard to soft endosperm, milling energies and resistance time to grinding.

Studies related to breakage susceptibility and stress cracking during transportation and handling have yielded conflicting results. In some, locality appears to affect maize grain quality parameters more than cultivar and cultivar x locality interactions, except for kernel size.

Experience has shown that even hybrids specifically developed for hardness could shatter on impact in the silo bin when grown under environmental conditions (e.g. La Niña phase) that are very different from the breeding and development cycle that occurred during an extended El Niño phase.

While endosperm hardness is generally genetically predisposed and is influenced

Determining the percentage of maize kernels with stress cracks on a light viewing box in the grain laboratory.

by environment, the impact may go unnoticed until other post-harvest handling actions, such as transportation, drying, transfer during fumigation and other storage processes, lead to a loss of maize taken in as WM1. Due to excessive breakage, such maize then results in an extraordinary proportion of WM2 stock as has been reflected in the recent data from the South African Grain Information Service (SAGIS).

Appearance of stress cracks

Overall percentage stress crack values imply that while stress cracking is not a major problem when maize is field dried, artificial drying greatly increases it. Multiple stress cracks weaken the kernel, making it more susceptible to breakage during transportation and handling, thus also decreasing the yield of large flaking grits. However, stress cracking is seen as a secondary factor in hard maize because severely stress-cracked hard maize still produces better milling quality than soft maize.

Stress cracking is significantly correlated with grain length, thickness and roundness. Size and shape of the kernel and germ are thus interrelated and linked to breakage from impact and grinding. Kernel size is an important factor in milling due to the requirement of grain uniformity to reduce rejected kernels through roller sieves, which would result in reduced milling yields. Removing small and round grains could reduce stress cracking by up to 50%.

Since stress crack characteristics are independent of the kernel variety, it was concluded that the differences in mechanical properties for the individual maize kernel were not caused by the mechanical differences of its tissues, but by tissue proportions.

Moisture, drying and breakage

Drying is essential for maize harvested at a high moisture content. However, it leads to aggravated breakage after drying if the grain drying equipment is not calibrated correctly, because high-temperature dried maize is more susceptible to breakage during grain-on-grain impact than low-temperature dried maize.

The mechanical behaviour of kernel tissues is strongly dependent on moisture content. Deformation of germ and soft endosperm is higher than hard endosperm due to the differences in structure and composition. When moisture content decreases, the friction coefficient increases and cracks increase.

Significant correlation for kernel breakage rate has also been shown between maize cultivars and kernel moisture. Breakage susceptibility varies notably among genotypes and is also meaningfully correlated with kernel size, shape and structure characteristics, as well as kernel hardness properties.

Kernel breakage is further exacerbated as the drop height of depositing maize into a silo bin increases and moisture level decreases. Such mechanical damage predisposes the stored maize to insect and fungal attacks, as well as subsequent mycotoxin development, thus reducing market value.

Going forward

Optimum quality and yield during the milling process can only be achieved if maize of appropriate hardness is used as raw material.

To adapt commercial maize varieties according to their end uses and to breed new hybrids, the following objectives can be considered by industry:

- **Provide guidelines for test weight or other hardness factors.** At present no quality criteria are universally recognised by maize kernel end users. In South Africa, grading regulations only stipulate permissible defects and foreign matter.
- **Determine a widely accepted test for hardness evaluation.** It will be necessary to establish a simple, rapid and reliable test as milling behaviour standard for maize kernels, to explain maize hardness measurements in relation to end-use value. It could be used on intake to differentiate on hardness.
- **Benchmark hardness of new varieties.** Determine milling performance of new maize varieties for the dry milling industry prior to release. Hardness is a highly heritable trait and when a desirable level of hardness is finally agreed upon, maize breeders should be able to produce varieties with the hardness levels required by the industry.
- **Determine kernel breakage rates of new varieties.** Because high moisture content and high temperature drying leads to greater sensitivity, the breakage of different maize cultivars as a function of moisture content and drying will facilitate the breeding and screening of breakage-resistant maize.
- **Minimise grain breakage.** The storage industry needs to focus on adequate temperature and moisture control, regularly monitoring stock and investing in the right grain handling equipment to reduce mechanical damage and maintain grain quality during handling and storage. Future design and development of equipment for handling should focus on devices that reduce mechanical damage during harvest and post-harvest handling operations in the silo.

For references, email the author at mariana.purnell@egrain.co.za.

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RESEARCH & TECHNOLOGY

A codex for aflatoxins in the spotlight

By Anine Schoevers, regulatory affairs manager, PepsiCo

The Latin term *Codex Alimentarius* means 'food code' and is a collection of internationally recognised standards, guidelines and codes of practice adopted by the Codex Alimentarius Commission (CAC). The commission is the central part of the joint Food and Agriculture Organization (FAO) of the United Nations and World Health Organization (WHO) Food Standards Programme and was established in 1963 to protect consumer health and promote fair practices in international food trade.

The CAC is based in Rome and co-ordinates input from 188 members (countries), negotiating science-based recommendations from independent international risk assessment bodies or *ad hoc* consultations organised by the FAO and WHO.

South Africa is an active Codex member and is represented by the National Department of Health and/or Department of Agriculture, Land Reform and Rural Development, which work closely with local stakeholders to develop suitable positions.

Scope of the *Codex*

The *Codex Alimentarius* includes standards for all principal food, whether processed, semi-processed or raw, for distribution to the consumer. Materials for further processing into food should be included as necessary to achieve the purposes of the *Codex*.

The scope also includes provisions in respect of food hygiene, food additives, pesticides and veterinary drugs, contaminants, labelling and presentation, methods of analysis and sampling, and import and export inspection and certification.

Standards and related texts are voluntary and need to be translated into national legislation or regulations to be enforceable. However, the reference made to *Codex* food safety standards in the World Trade Organization's (WTO) Agreement on Sanitary and Phytosanitary measures (SPS agreement) means the *Codex* has far-reaching implications for resolving trade disputes and barriers to trade.

Threat of aflatoxins

Aflatoxins are an important naturally occurring group of mycotoxins in the world's food supply, primarily produced by toxigenic strains of fungi of the genus *Aspergillus* (most commonly *Aspergillus flavus* and the closely related species *A. parasiticus*).

Aflatoxins can occur in food such as groundnuts, tree nuts, maize, rice, figs and other dried food, spices, crude vegetable oils and cocoa beans, as a result of fungal contamination before and after harvest. Aflatoxin M1 is a major metabolite of aflatoxin B1 in humans and animals, which

may be present in milk from animals fed aflatoxin B1 contaminated feed.

The four main aflatoxins found in contaminated plant products are B1, B2, G1 and G2. Aflatoxin B1 is a human carcinogen and is associated with an increased risk of liver cancer particularly in individuals infected with hepatitis B. It is an important dietary risk factor for the development of cancer in certain regions of the world and so it is important to reduce the level ingested from the diet.

Codex and aflatoxins

The *Codex* currently includes limits for aflatoxin total (sum of B1, B2, G1 and G2) for peanuts, various tree nuts and dried figs, as well as aflatoxin M1 for milk, in the *General Standard for Contaminants and Toxins in Food and Feed* (*CXS 193-1995*, amended 2019).

Rice, maize and sorghum contribute significantly to aflatoxin exposure in some parts of the world, where these cereals are consumed as staple food. Currently no maximum aflatoxin levels for these products are listed in the *Codex*.

During 2022, the Codex Committee on Contaminants in Foods (CCCF) focussed, among others, on developing maximum levels (MLs) for total aflatoxins for certain cereals and cereal-based products, including food for infants and young children (*Table 1*).

Discussions were also held to reduce the ML for total aflatoxin in ready-to-eat peanuts and to set MLs for total aflatoxin and ochratoxin A in nutmeg, dried chilli and paprika, ginger, pepper and turmeric. These discussions are, however, in preliminary stages and not included here.

Areas of particular interest

The following two areas received particular attention:

ML for maize grain, destined for further processing – 20 µg/kg proposed: This point led to divergent views. Delegations opposed to the proposed ML expressed that aflatoxin was a potent carcinogen and reduced exposure to this mycotoxin was an important public health goal; and that MLs should be established as low as reasonably achievable by applying good practices to prevent contamination.

Some stated that maize was a staple in their countries and that at the level of 20 µg/kg, public health protection would not be achieved. Proposals were made for MLs of 10 µg/kg and 5 µg/kg, stating that:

- Difficulty to distinguish between maize destined for human consumption and feed in some of their countries.
- Dry milling was used to further process the maize grain, which did not necessarily lead to a significant reduction in aflatoxin.
- An ML of 10 µg/kg was already implemented at country or regional level.

Delegations supporting the proposed ML reminded the CCCF that the ML was for grain destined for further processing and not for direct consumption by the consumer, noting that further processing would result in significant aflatoxin reduction. They also proposed adding a note explaining 'destined for further processing' as done for other MLs for cereal grains (e.g. DON).

It was expressed that the ML of 10 µg/kg could be problematic, particularly when the climate is such that aflatoxin occurrence increases; and considering year-to-year variation, the revised ML of 20 µg/kg was preferred. This ML also results in significant health protection and lower MLs have minimal further impact on

Table 1: MLs established by the CCCF.

Commodity/ product name	Maximum level (µg/kg)	Portion of the commodity/product to which the ML applies	Notes/remarks
Maize grain, destined for further processing	15	Whole commodity	'Destined for further processing' means intended to undergo an additional processing/treatment that has proven to reduce levels of AFs before being used as an ingredient in foodstuffs, otherwise processed or offered for human consumption. Codex members may define the processes that have been shown to reduce levels. The ML does not apply to maize destined for animal feed or wet milling.
Flour, meal, semolina and flakes derived from maize	10	Whole commodity	
Husked rice	20	Whole commodity	
Polished rice	5	Whole commodity	
Sorghum grain, destined for further processing	10	Whole commodity	Same note as for maize grain, destined for further processing
Cereal-based food for infants and young children	5	Whole commodity as sold; not reconstituted or otherwise prepared for consumption.	Relevant *Codex* commodity standard is CXS 74-1981. The ML applies to all cereal-based food intended for infants (up to 12 months) and young children (12 to 36 months).
Cereal-based food for infants and young children	10	Whole commodity as sold; not reconstituted or otherwise prepared for consumption.	Relevant *Codex* commodity standard is CXS 74-1981. The ML applies to cereal-based food destined for food aid programmes intended for infants (six to 12 months) and young children (12 to 36 months).

reducing dietary exposure. Based on the rejection rates presented, an ML of 20 µg/kg would also appear to have the least impact on food security and trade.

Both the joint FAO/WHO Expert Committee on Food Additives (JECFA) and the WHO stated that although a lower ML is preferred in the interest of public health, an ML of 20 µg/kg is better than no ML.

The CCCF settled on an ML of 15 µg/kg with an explanation in the notes regarding 'destined for further processing'. The committee agreed to review the ML in five years' time. They also requested members to continue submitting data to the Global Environment Monitoring System (GEMS)/Food and continue to implement the *Code of Practice for the Prevention and Reduction of Mycotoxin Contamination in Cereals* (*CXC 51-2003*).

ML for sorghum grain, destined for further processing – 10 µg/kg proposed: The CCCF agreed to the ML of 10 µg/kg with the understanding that the ML would be reviewed in five years' time (data only provided from one country), and that the same description for 'destined for further processing' would be added as for maize grain. Members were encouraged to continue to submit data to the GEMS/Food.

Finalisation

The MLs as established by the CCCF (*Table 1*) were presented to the CAC in November 2022 and adopted as final after a lengthy debate, with the note that it would be re-assessed in three years (instead of the original five years). A further request was made for submission of data to the GEMS database. The updated *CXS 193-1995* will be published in 2023.

Implications for South Africa

South Africa already regulates total aflatoxin for all foodstuffs ready for human consumption at a maximum of 10 µg/kg. Given that the new *Codex* MLs are in most cases similar or higher, no major changes to South African legislation is expected in the short term, except for a possible amendment to include cereals intended for further processing, as well as polished rice.

The country's regulations for cereal-based food for infants and young children already refer to the *Codex*. Therefore, the new ML at 5 µg/kg will require good quality cereals to meet this requirement. Producers of maize, milled maize and sorghum should furthermore consider the new *Codex* MLs when exporting, as many countries adopt *Codex* requirements in their regulations.

For enquiries, email Anine Schoevers at anine.schoevers@pepsico.com.

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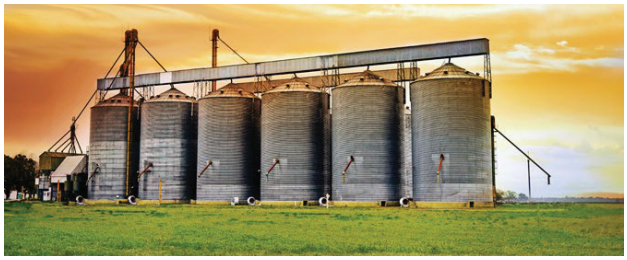

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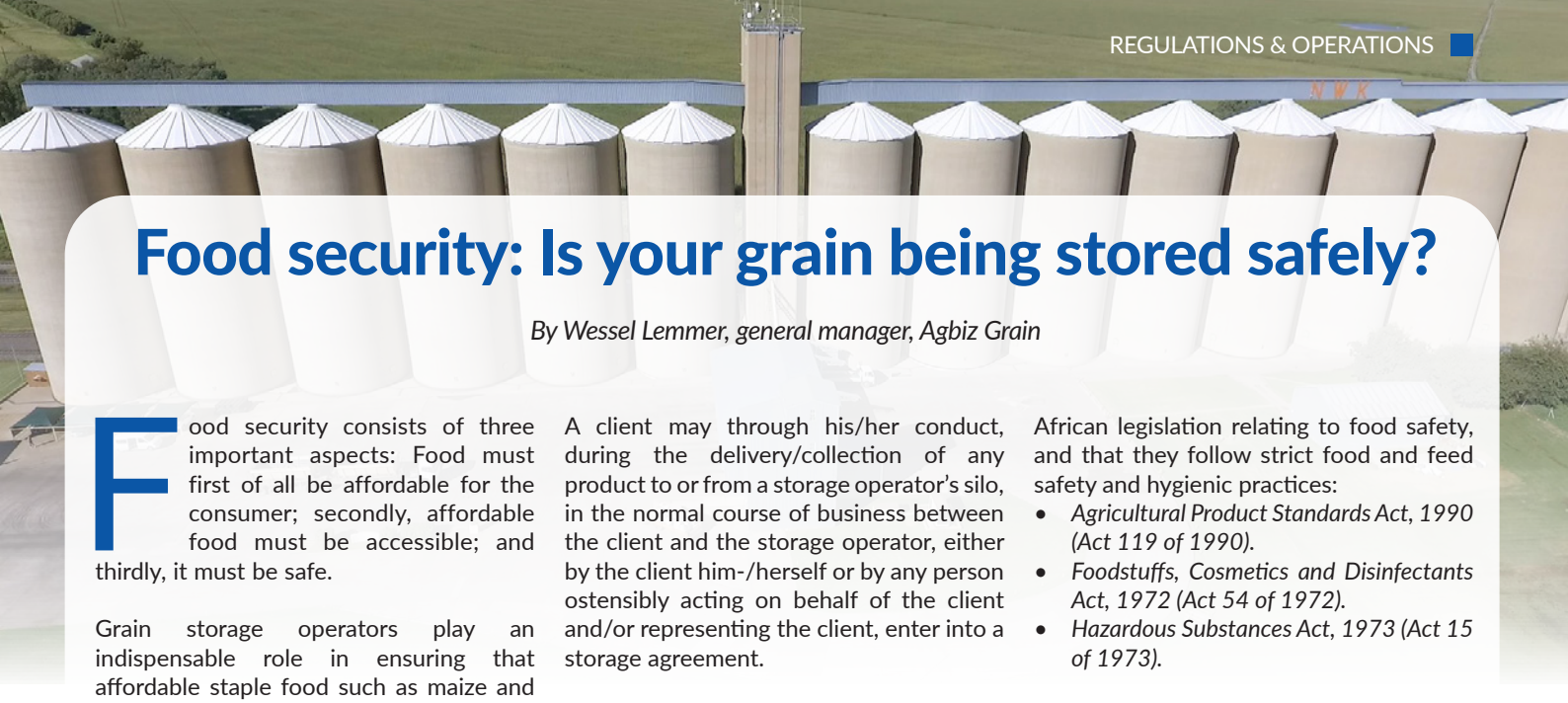

Food security: Is your grain being stored safely?

By Wessel Lemmer, general manager, Agbiz Grain

Food security consists of three important aspects: Food must first of all be affordable for the consumer; secondly, affordable food must be accessible; and thirdly, it must be safe.

Grain storage operators play an indispensable role in ensuring that affordable staple food such as maize and wheat are stored safely upon intake at the silo, and that storage of these commodities meets all legal food-safety requirements.

In 2022, Agbiz Grain finalised a code of conduct endorsed by its members. Those who subscribe to the code of conduct collectively store approximately 70% of the grain and oilseeds produced annually in the country.

The code of conduct dictates how storage operators manage and direct their activities to guarantee food safety. Agbiz Grain's code of conduct will henceforth be part of the storage agreements between Agbiz Grain's members and their clients.

The storage agreement

Clients include anyone who stores grain and oilseeds on a commercial basis at a storage facility. A storage operator's clients are not limited to producers alone, but can include traders, millers and animal feed manufacturers.

A storage agreement comes into effect when a client and storage operator enter into a storage contract. A storage contract can also come into effect when a client and storage operator enter into a credit agreement.

When a client signs a sales agreement or renews his/her membership with a storage operator, the client will enter into a storage agreement, if it is agreed upon. A client that accepts and signs documentation that forms part of the storage value chain can enter into a storage agreement if the documentation refers to the storage agreement and conditions.

A client may through his/her conduct, during the delivery/collection of any product to or from a storage operator's silo, in the normal course of business between the client and the storage operator, either by the client him-/herself or by any person ostensibly acting on behalf of the client and/or representing the client, enter into a storage agreement.

The client's declaration

The client declares that he/she kept the required records and that the product stored at the storage operator is legally compliant in terms of the use of chemical products. The client also declares that he/she complies with any additional legislation that may be applicable.

By signing the storage contract, the client declares that:

- The grain in storage was produced in strict compliance with the *Fertilizers, Farm feeds, Agricultural remedies and Stock remedies Act, 1947 (Act 36 of 1947)*.
- He/she is bound by the Agbiz Grain Food Safety Conduct.

Discrimination against supplies

A storage operator cannot refuse a grain delivery for storage from a client who has entered into a storage agreement if this client fails to present a declaration that his/her grain complies with *Act 36 of 1947*. Refusing to accept delivery may be in breach of competition legislation, because it may unlawfully discriminate against clients.

A producer's declaration at delivery is something the industry does on a voluntary basis and is not legally enforceable. No legal entity with an existing liability requirement can refuse the delivery of grain for storage. This includes stock for delivery on a JSE contract.

Food and animal feed safety

Storage operators that subscribe to the *Agbiz Grain Code of Conduct* declare that they comply with the following South African legislation relating to food safety, and that they follow strict food and feed safety and hygienic practices:

- *Agricultural Product Standards Act, 1990 (Act 119 of 1990).*
- *Foodstuffs, Cosmetics and Disinfectants Act, 1972 (Act 54 of 1972).*
- *Hazardous Substances Act, 1973 (Act 15 of 1973).*

Food hygiene and safety standards

Regarding grain and oilseeds destined for the market, the certificate issued to storage operators by the Perishable Products Export Control Board (PPECB) serves as confirmation that operators comply with food hygiene and food safety standards, as stipulated in the *Agricultural Product Standards Act, 1990 (Act 119 of 1990)* and as determined by Section 4(3)(a)(ii) of the *Act* and promulgated in *Notice R707* of 13 May 2005.

To comply with these standards, all silos must register with the Department of Agriculture, Forestry and Fisheries as food business operators (FBOs). Each silo receives an FBO number and certificate, and each registered business is given a unique FBO code and is audited by PPECB during a three-year cycle.

Conclusion

As a client, make sure you store your grain and oilseeds at a storage operator that supports a food safety code of conduct. If you are a consumer who purchases products from a miller or animal feed manufacturer, ask whether the processors obtain their raw materials from storage operators that subscribe to a code of conduct stipulating that staple food are stored safely and in line with legal requirements.

For more information, contact Wessel Lemmer at wessel@agbizgrain.co.za. To download a copy of the food safety conduct, visit *www.agbizgrain.co.za/document/open/agbiz-grain-food-safety-conduct*.

Electrical compliance: A necessity in grain storage and processing facilities

By Christal-Lize Muller, Plaas Media

Electricity forms an integral part of grain storage operations as well as other grain related operations such as animal feed manufacturing and milling. Apart from the general dangers associated with electricity, explosive dust clouds generated by various processes in grain handling facilities exacerbate the dangers associated with electricity.

Dust explosions is an indisputable reality and occur when electrical arcs or sparks ignite dust clouds. This can result in the loss of lives and cause major damage to infrastructure in grain storage and processing facilities, of which many examples exist across the world, including South Africa.

Putting safety first

This was emphasised by Pieter Dempsey, owner of Ark Holdings, during the first of two virtual Agbiz SHEQ (safety, health, environment and quality) workshops on legislative and compliance requirements for electrical installations and hazardous area classification (or zoning).

He specialises in electrical compliance, specifically compliance of installations in hazardous locations (or explosive atmospheres), and underlined the fact that all employers in the country are required to provide and maintain a safe and healthy workplace. "To achieve this, a pro-active approach, involving responsible inspection and maintenance of electrical installations, machinery and appliances, is required. Inspections will enable employers, as far as is reasonably practicable, to identify, eliminate or mitigate these hazards."

The *Occupational Health and Safety Act, 1993 (Act 85 of 1993)*, or *OHS Act*, states that owners of electrical installations are responsible for the safety of the installation, which includes safe use and maintenance. Electrical compliance is specified in the *OHS Act* and reference is made to 'codes of practice' that contain technical detail and specifications for the construction of safe electrical installations. Owners of grain handling and storage facilities therefore have a responsibility under the *Act* to identify areas where explosive dust clouds can occur.

There are, he said, four basic elements of importance when it comes to electrical compliance for grain handling facilities. These include:

- Identifying areas in a facility that can pose a risk as far as a dust explosion is concerned.
- Ensuring the introduction of risk mitigating measures, and ensuring that the electrical installation ultimately complies with the minimum legal requirements of the *OHS Act*.
- Maintaining the installation and conducting regular inspections to eliminate any risk of a dust explosion.
- Ensuring that training is provided to all employees to create awareness of the risks associated with such explosions.

The value of area classification

A process known as area classification is used to identify explosion hazards in a workplace. "Whether as a result of activities that include usage, storage or production of flammable gas, vapours, liquids or combustible dust, this activity requires specialised knowledge and should be conducted by someone with in-depth knowledge of not only the industry, but also the substance involved."

The outcome of an area classification study provides the employer with different zoned areas. The 'risk profiles', or zones, for dust areas include zones 20, 21 and 22, of which zone 20 is the most lethal category (combustible atmosphere that exist continuously in a confined space, for example silos, hoppers, bins and cyclones). "Once the risk profile for the different

zoned areas is approved by the employer," Dempsey says, "the process starts of ensuring the electrical equipment located in the zoned areas meet the requirements of an approved safety standard."

This responsibility falls on a master installation electrician (MIE) who is registered by the Department of Employment and Labour's chief inspector of factories. "The role of an MIE is to ensure that specialised electrical installations in hazardous locations (zoned areas) comply with the minimum requirements as stipulated in the electrical machinery regulations of the *OHS Act*. "

The regulations also specify the use of explosion protected electrical equipment (Ex) to be installed in the zoned areas. "An MIE can only issue a certificate of compliance (CoC) for the specialised electrical installation to the employer once this installation meets the requirements of the regulations and approved safety standards (SABS)."

Failure by employers/owners of grain storage, seed processing, or any other type of facility where combustible dust is generated, to comply with these requirements in the *OHS Act* are guilty of contravening the *Act* and can be prosecuted if found guilty.

A proper area classification study can assist the employer/owner of a facility to take remedial measures. These include preventing the formation or explosive atmospheres, eliminating the risk of igniting these atmospheres, ensuring proper dust extraction where required, as well as adequate housekeeping measures to prevent the build-up of dust layers.

Dealing with explosive atmospheres

When considering who is responsible for electrical installations, the *OHS Act* sub-regulation (3) needs to be taken into account. It stipulates the following: "The user or lessor of an electrical installation, as the case may be, shall be responsible for the safety, safe use and maintenance of the electrical installation he or she uses or leases."

If employers lack the knowledge on how to deal with these atmospheres, experts should be contracted in to assist. "In many cases, this task is made more challenging by the scarcity of MIEs, especially those with in-depth knowledge of combustible dust atmospheres related to grain storage."

After 25 years in dealing with these types of atmospheres in the grain handling industry, Dempsey believes there are three common mistakes owners and operators make when operating and maintaining their facilities. Firstly, there is a lack of understanding what a dust explosion is, and which factors contribute to the danger of these explosions.

"Most grain storage facilities are based in rural areas. Therefore, the knowledge and skills available are not always at a desired level, and facility operators and maintenance personnel are in some cases unaware of the risks involved." The best place to start managing these risks is to ensure that employers provide training (dust explosion awareness) to all employees. "As soon as everybody is on the same page, the entire team can combat or mitigate these risks."

Secondly, owners and operators often underestimate the importance of housekeeping measures and the vital role it plays in preventing the formation of potential explosive dust atmospheres. Investigations have proven that severe explosions start as a primary dust explosion, or ignition of a dust cloud.

"During this stage all dust deposits that have settled down in layers, and which cannot be removed or cleaned, are made airborne where they form additional explosive dust clouds. A secondary dust explosion occurs when these 'new' clouds are ignited, causing a chain reaction that results in widespread damage throughout the facility." To emphasise the importance of housekeeping, Dempsey has a saying: "If you can clean it, you don't need to zone it."

The third mistake is normally associated with bigger facilities. "The design of most facilities includes dust extraction systems to ensure healthy and safe atmospheres within the workplace. The value of these systems is often underestimated as far as explosion prevention is concerned." There are many dust extraction systems that underperform due to equipment failure or lack of maintenance. When these facilities increase their production, the extraction system capacity is not adjusted or enhanced to cope with the accompanying rise in dust levels.

While these systems can alleviate most if not all the risks, dust extraction is one of the first systems affected when it comes to maintenance budget constraints. "In most cases, it is leaks in the very system designed to keep an area dust free, that contribute to explosive atmospheres."

Follow-up requirements

Once an MIE has certified a specialised electrical installation as compliant, legislation puts a follow-up burden on the owners and operators of these types of installations. According to Dempsey, legislation (particularly the electrical machinery regulations) requires facility owners/employers to have Ex-equipment installed – these should be inspected at least once every 24 months.

This is to ensure that all equipment forming part of the specialised electrical installation still conform to the original design specifications, and that the Ex-equipment does not have any alterations/modifications or wear and tear to the extent that it makes the equipment no longer suitable for use in hazardous locations.

Owners and operators making use of engineering measures instead of Ex-equipment also need to have these inspections done to make sure the engineering measures still provide the mitigating measures it is designed to do. "All electrical installations, whether in houses, schools, grain storage facilities or on farms, must comply with the requirements in the *OHS Act* and proof of compliance in the form of a CoC is required by law. CoCs for electrical installations are transferrable from seller to buyer, provided that no changes have been made and the certificate is less than two years old."

Dempsey also advised owners and employers to guard against complacency. "The biggest contributor of ignition sources of explosive dust atmospheres is undisciplined actions by employees, including welding, cutting, and any other form of hot work that was not pre-empted by a proper risk analysis."

For more information, contact Pieter Dempsey on 011 892 0804 or 082 442 2297 or email pieter.dempsey@arkholdings.co.za.

Photograph courtesy of VKB.

Responsible grain storage to prevent dust explosions

By Pieter Dempsey, Ark Holdings

Dust explosions can occur at any silo complex. Owners and operators therefore need to be aware of their responsibility to prevent such an event. Every February, Purdue University in Indiana reports on the number of dust explosions that has occurred at grain silos in the United States the previous year. In 2021, there were seven incidents compared to eight in 2020.

The explosions in 2021 led to one fatality and five injuries and occurred at a feed plant, ethanol plant, a mill and four grain silos. In one instance the explosion was ignited by a fire. Two others were caused by smouldering grain and the causes of the last four are still unknown. What we do know is that grain dust was the flammable substance in five of the seven cases.

These explosions could have been prevented if proactive measures had been taken to control grain dust or other measures applied to mitigate an explosion risk. This would have greatly reduced the probability of ignition or the extent of the explosions.

Prevention as remedy

The first line of defence is effective housekeeping – the storage facility and equipment must be kept clean and free of dust. Dust extraction in complexes that handle or store large volumes is indispensable. Smaller farm-operated silos, for example, will also benefit from this. Good housekeeping can significantly reduce the risk of a dust explosion.

High-pressure air cleaning processes that use strong bursts of air to clear dust layers,

or energy clouds that rise up when an electrical short-circuit current occurs, can stir up dust. These airborne particles form new clouds of dust that serve as fuel for secondary explosions. No high-pressure air cleaning processes must therefore be used, and all electrical equipment and installations need to meet the necessary requirements as contained in the safety standards.

All equipment must be well maintained and in excellent working order. It is equally important to train employees in the prevention of dust explosions.

How dust explodes

An explosion is activated when the following is present in a confined space: oxygen, a flammable substance suspended in air, and a spark to ignite it.

There are several types of dust explosions. Worldwide the greatest number of explosions occur in the wood processing industry (34%), followed by the handling, processing and storage of grain and oilseeds (24%) – dust explosions in the handling and storage sector therefore pose a significant risk. Mechanical sparks are responsible for most of these explosions (30%), followed by static electricity (9%), friction (9%), heat spots/smouldering spots (9%), hot surfaces (6,5%) or welding (5%).

Combustion and hot spots

Stored grain such as maize is a porous material with an air space that varies between 40 to 45% in maize. When fungi or mould becomes active in storage, it envelops grain kernels, fills the air spaces between them and clumps together into a grain mass. This process reduces and eventually eliminates all oxygen. Subsequently, a self-heating spot occurs in the middle of the grain mass.

Grain kernels will brown and even turn black due to mould spores that feed on the starch and oil. Some spores convert the starch and oil into heat, water and carbon dioxide.

Unless a temperature sensor is close to the 'hot spot', it will take a while for temperature cables to pick up on the self-heating of grain. Devices that sense elevated levels of CO_2 work great to detect early onset and spoilage in a stored grain mass.

Insects that feed on mould spores can also contribute to heat spots developing in grain. Insects and mould in grain die when temperatures reach levels above 45°C. As the mycelium created by mould spores fills the air spaces around infected kernels and seals in heat, the biochemical self-heating process stops once the oxygen is exhausted and the moisture evaporates. This is when the thermochemical pyrolysis process begins to take over (this is the same process by which charcoal is produced).

Legal requirements

What is an owner or employer's responsibility according to the *Occupational Health and Safety Act, 1993 (Act 85 of 1993)*? Read the previous article in this issue of *Agbiz Grain Quarterly* for a complete discussion regarding legislative requirements.

In short: Every employer must provide and maintain a safe and healthy workplace. All risks and dangerous conditions must be identified, and the necessary protection measures put in place. To achieve this, an employer must take a proactive approach that includes inspections and maintenance of electrical installations, machinery and appliances.

Greater hazards require higher safety standards. An employer will not be able to claim ignorance if the storage facility fails to meet all legal requirements and safety standards, and therefore the necessary expertise must be contracted in.

In terms of legislation, an employer must take reasonable measures to ensure an employee's safety. An employer's personal negligence must not lead to an employee being put at risk. Note that legislation does not only apply to the commercial storage sector, but also to producers who store and/or process grain and oilseeds for their own or commercial purposes.

Stick to safety standards

Between 80 to 85% of all incidents where employees are put at risk are the result of their own negligence and inability to maintain basic safety requirements through their actions. Most incidents are therefore not due to an unsafe work environment, but rather unsafe actions. However, employers must focus on both the workplace meeting the necessary safety standards, as well as addressing employee behaviour through awareness and training.

The best practice to prevent spontaneous combustion in storage facilities is to store grain at the recommended moisture requirements without exceeding them. Keep the grain as cool as possible to keep insects from multiplying or to kill all stages of insects through fumigation. Use a permanent monitoring device that measures the carbon dioxide level in the stored grain. A carbon dioxide concentration above 600 parts per million is indicative of mould growth, insect activity or that moisture has infiltrated the grain.

> "High-pressure air cleaning processes that use strong bursts of air to clear dust layers, or energy clouds that rise up when an electrical short-circuit current occurs, can stir up dust."

When it comes to the risk and dangers of dust explosions, ensure dust extraction equipment is in optimum working condition and in areas with dust deposits, that it is removed using acceptable and safe methods. In addition, make sure everyone involved in the storing or processing of grain is well informed about the dangers dust explosions pose to the workplace.

Conclusion

Every silo owner or operator has the responsibility to ensure employee safety while delivering quality grain for trading. Consumers must also make sure that grain and oilseeds shipped for processing come from reliable warehouses that have the necessary systems in place to maintain grain and employee safety. This applies to grain purchased directly from on-farm storage structures as well as commercial storage structures.

For any enquiries, contact
Pieter Dempsey on 011 892 0804
or 082 442 2297 or email
pieter.dempsey@arkholdings.co.za.

Top transportation issues in the United States

The following article was published in the *Grain Journal* of May/June 2022. It contains the results of a survey that highlights the challenges confronting the grain handling, storage and marketing sector in the United States (US). It is surprising to note that stakeholders in the grain and oilseeds industry in a developed country such as the US are listing almost identical challenges and trends the local grain and oilseeds industry are confronted with.

It is also interesting to note that the Grain River Country Co-op uses intermodal containers to access export markets for 50% of their soya bean sales. However, the availability of containers dropped by 60% in 2022. (The intermodal system is a concept that Transnet considers introducing in South Africa.)

It is sometimes comforting to know, irrespective of how bad things are, that countries in the developed world are confronted with similar issues and also struggling to get answers. In this regard, Agbiz and Transnet is collaborating closely to find strategic solutions for our local rail freight issues for the medium to long term and will meet in February with Agbiz Grain members situated on key corridors serving the local and export market. – *Wessel Lemmer*

Tom Madru, general manager, Kokomo Grain Co Inc, Kokomo, Indiana

"The first issue is the timeliness of rail movement. It used to take a train two days to arrive here from destination; now it can take five days to two weeks because trains are lacking crews. We also hear rumours that there may be a 30% increase in rail freight charges, which will affect basis costs. This situation is bad for railroads, too. When you call for an estimated time of arrival, they don't know if the crews will show up.

"Regarding truck shipping, higher fuel surcharges are eating into profits. There's been a huge price increase because there are fewer truckers. They're in control, and they're more often charging an hourly cost versus cents per bushel.

"There's a shortage of parts, so truckers are having a hard time getting what they need to repair trucks. It can take a month to get parts for truck repairs.

"Lastly, it's difficult to maintain drivers for local fleets. Drivers leave, and it's hard to replace them. It's difficult to find qualified drivers. Wages are high, so, drivers are leaving for higher-paying jobs that don't require them to be away from home as often."

Mark Heil, general manager, Prairie Central Co-op Inc, Chenoa, Illinois

"Our transportation issues are a continuation of past themes: having to do more with less and spending more on technology due to the inability to hire enough employees. This is indirectly tied to transportation.

"Another issue is margin compression with rate structures and fuel surcharges. You have to begin asking, 'Do you need to do hedging?' It's becoming part of the discussion due to volatility in transportation costs.

"The third issue is volatility in the marketplace. We're not traveling down the road at a constant 55mph anymore – it's either 110 or 0, and transportation is playing into this. Windows of time are compressed in an inverted market, and the market might want grain today. There's less time to complete transactions. In the past, we could assume the truck, railcar or barge would be there when we needed it, but that's not always the case today. We are seeing wild swings in the marketplace presently."

Perry Sorrell, general manager, Bartlett Co-op Association, Bartlett, Kansas

"The first issue is finding enough CDL (commercial driver's license) drivers. There aren't enough drivers available who want to work in this industry. It's hard to recruit and retain drivers with CDL licenses. There are tons of job openings in our region but few candidates. I think the new requirements for CDL licenses are contributing to this. It can take up to three months or longer to

get a CDL license, where you used to be able to get it in one day. Anyone with a CDL is under scrutiny anytime there's any type of accident, and the blame is cast on the driver.

"Roads and infrastructure are the second issue. It's not being maintained as well as it once was. Bad roads are rough on equipment, tires and drivers.

"The third issue is fuel costs. Fuel costs have increased so much, and the volatility makes it difficult to know how much to charge customers. We need to charge customers but don't want to charge them too often. The cash flow required to put fuel in a tank is significant. It can take $500 more to put 500 gallons in a tank compared to a year ago."

John Graverson, vice-president, Grain Ray Carroll County Grain Growers, Richmond, Missouri

"Our first issue is rail fuel surcharges. The increases over the last couple months are much greater than anyone expected three to four months ago. When a railroad announces a fuel surcharge, it takes effect one month out.

"We do a lot of business further than two months out. We sell grain six months to one year out. No one would have predicted we would see such huge fuel surcharge increases that have occurred. We have to guess what the surcharges will be further than two months out."

Gary Beachner, CEO, Beachner Grain, Parsons, Kansas

"Availability of rail transportation is a big issue. We're fortunate to have many sites serviced by a short-line railroad, so we've avoided some availability issues facing those who use national rail carriers. Compared to other modes, we've been affected less by rail transportation.

"The availability of drivers is also huge. Department of Transportation requirements for CDL-licensed drivers will substantially reduce the number of CDL drivers, who need to go through 40 hours of classroom and approximately 120 hours of behind the wheel instruction. The cost of this instruction is also prohibitive, starting in the $5 000 range and up. Driver availability is the single biggest issue we'll have for years to come. Our industry operates on small margins, and other industries with higher margins can poach drivers, affecting availability and cost.

"Finally, fuel cost increases and volatility, as well as availability and cost of repair supplies, affect transportation. We've seen a 30 to 40% increase in the cost of new equipment, especially trailers, in the past year. Staffing costs have also substantially increased in the past year."

Paul Kerber, vice-president, Grain River Country Co-op, Bloomer, Wisconsin

"We use intermodal containers to access export markets that aren't normally accessible in our area, mainly shipping soya beans for export to Indonesia, Vietnam and other east Asian countries. Before the pandemic, we shipped over half of our soya beans on containers to these export markets.

"Intermodal rail networks are struggling due to a variety of reasons that have led to a lack of container availability. This has reduced our ability to access these additional markets that allow us to be more aggressively priced for our farmer-customers. Our container volume is down approximately 60% from our averages prior to the pandemic.

"Both the increased freight costs and lack of access to export markets have greatly affected the agricultural community in our area. We've had to alter our marketing plans due to the increased costs and the lack of availability of containers."

Dennis Inman, vice-president, Grain Central Farm Service, Spirit Lake, Iowa

"The cost of buying, operating and fixing/maintaining our trucks, as well as the cost of drivers are all escalating rapidly, and it's difficult to find drivers today. We're fortunate that our drivers can be home every night, and we pay them by the hour, but it's difficult to recruit drivers during a time of low unemployment.

"Another issue is inefficiency with trucking grain to end users. Lines of trucks are long, and some facilities have limited hours, so it's hard to get a lot done. Trucks sitting in line compounds the costs of driver shortages. We need maximum efficiency in this environment – it's much more painful with costs as high as they are today.

"We've had reasonably good rail service, albeit at higher prices. Some facilities have slowed production due to lack of railcars, which backs us up even further."

Ty Jessup, merchandising manager, Highline Grain Growers, Waterville, Washington

"Another issue is the disruption in the Black Sea. Due to the war in Ukraine, global shipping lanes are changing. For example, India is a bigger player, and Ukraine is becoming a smaller player. These are things we need to figure out, and we will with time."

Andy Swerlein, grain merchandising manager, Mercer Landmark Inc, Celina, Ohio

"Our first issue is the uncertainty of freight service, particularly when a shipment will show up. This inconsistent service has been caused in large part by the labour shortage. You only have so much time to turn around a train, and sometimes the train doesn't arrive on time. It's hard to manage a situation where you need to have labour ready for a train that might not show up at the right time.

"Service irregularities create a market imbalance. You might have to line up trucks if the railroad can't perform and meet your needs due to demand. This creates shortages for some areas and backlogs in others. These scenarios limit our market opportunities.

NGFA supports STB's proposed changes to emergency service rules

The National Grain and Feed Association (NGFA) in late May announced its support for the Surface Transportation Board's (STB) proposed revisions to emergency service regulations.

"The NGFA urges the STB to issue final rules in this proceeding as quickly as possible, given that the current rail service crisis in the US and the substantial harm it is causing to NGFA members, other rail shippers, and the country's economy as a whole, is showing no signs of abating any time soon," NGFA stated.

Article courtesy of
Grain Journal, May/June 2022.
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MEMBERS

AFGRI
+27 11 063 8000
jerry.maritz@afgri.co.za
www.afgri.co.za

BKB Grain Storage
+27 21 807 8936
casper.schmidt@bkbgs.co.za
www.bkb.co.za

GWK
innovate agriculture
+27 53 298 8200
tomm@gwk.co.za
www.gwk.co.za

KAAP AGRI
+27 22 931 8205
akriel@kaapagri.co.za
www.kaapagri.co.za

NWK
+27 18 633 1000
officemanager@nwk.co.za
www.nwk.co.za

OVERBERG SINCE 1918
+27 28 214 3854
johanl@overbergagri.co.za
www.overbergagri.co.za

OVK
+27 51 923 4500
rudolphvw@ovk.co.za
www.ovk.co.za

Senwes
+27 18 464 7800
Wikus.Grobler@senwes.co.za
www.senwes.co.za

Silostrat
+27 57 391 1900
cassie@silostrat.com
www.silostrat.com

SSK
+27 28 514 8600
Pieter.Malan@ssk.co.za
www.ssk.co.za

TWK agri
+27 17 824 1005
bdk@twkagri.com
www.twkagri.com

vkb
+27 58 863 8111
francoisf@vkb.co.za
www.vkb.co.za

agbiz GRAIN
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ASSOCIATE MEMBERS

AES Agri-Enviro Solutions
Solutions for Analytical Technology

Malcolm Holman
malcolmh@aelab.co.za
www.AELab.co.za

BÜHLER

Taryn Browne
taryn.browne@buhlergroup.com
www.buhlergroup.com

henchem
environmental management solutions

Chatelle Henning
chantelle@henchem.co.za
www.henchem.co.za

Kuphela Environmental
Sustainable solutions

JD Buckle
jd@k-enviro.co.za
www.k-enviro.co.za

RR
Rhine Ruhr (Pty) Ltd, since 1956

Philip van der Merwe
philip@rhineruhr.net
www.rhineruhr.net

Santam
agriculture

Hanlie Kroese
hanlie.kroese@santam.co.za
www.santam.co.za

Points to ponder

By Jannie de Villiers

Steering through the floods of life

December afforded me many hours in which to reflect and do some reading. I always seek some understanding in scripture for our current circumstances and what Christians need to do in times like these.

One such reflection invoked an image of a flood – in this case an uncontrollable, unstoppable flood of bad news washing over South Africa. I ended up with a verse that really helped me to better understand our current circumstances: "When the enemy shall come in like a flood, the Spirit of the Lord shall lift up a standard against him …" (Isaiah 59:19).

What drew my attention was the part in the verse about the Spirit raising a standard, because I'm very much aware of the enemy coming at us like a flood.

Although rain is seen as a blessing in agriculture, sometimes, as we've experienced recently, a flood, like sin, can cause serious damage. Uncontrollable floods spare nothing and hopelessness can easily set in. For example, if you lose your topsoil or the crop you have planted is washed away, recovery seems difficult and out of reach. Not to mention the flood of darkness that reigns across South Africa – we have lost our electricity-generating capacity in the wake of corruption, and are struggling to recover from it.

A ray of light

In my search to understand the raising of a standard, I discovered some encouragement for 2023. The standard is like a banner, or flag if you like, used in battle many years ago. It was highly prized in war. On it was engraved the names of all the past victories to remind the team of what they were capable of and remind the enemy of whom they were dealing with. The team that lost their banner were forever disgraced, and many soldiers had fallen in a bid to protect it.

The Holy Spirit is our standard carrier and Jesus is our banner. Nothing can stop the flood of sin but the Son of God.

God declared war against the enemy right at the start in Genesis 3:15 and announced the victory through His Son and confirmed it in Revelation 19:1. Thus, despite the flood of wrongs we do, as well as all the wrongs in South Africa that try to pull us under, God reminded me that He, as the Conqueror, will raise a banner against it. He is calling His people together at His banner, asking us to follow Him to victory. He gave us our marching orders in Luke 9:23, saying that we must deny ourselves and take up our cross daily and follow Him.

Choose to walk in faith

I decided not to allow the poison of corruption, crime and bad service so often reported in the news to slowly kill my soul, but to rather gather myself daily at the banner of Jesus and follow Him.

This means that I need to deny myself the right to be right, as well as my right to criticise the leaders running our country and our businesses. By doing this, I trust that I will be able to display love and encourage others in their faith to follow and trust Him too. I choose to stand and fall to protect the values and principles of my banner! On this banner is written my many victories, which is proof enough that I am fighting on the right side and that I can trust the 'standard carrier' in this battle.

> "Although rain is seen as a blessing in agriculture, sometimes, as we've experienced recently, a flood, like sin, can cause serious damage."

When the people of Israel were on the verge of being drowned by the Red Sea's flood of water, the Spirit of the Lord came in the form of a strong wind that helped them to pass unharmed to the other side. He is still the same today. He will help you to navigate 2023 without you being overwhelmed by fear and floods.

For enquiries, send an email to Jannie de Villiers at jannie@graingrowers.co.za.

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