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Food Resources

Growing agriculture with the Technology Innovation Agency

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EDS NOTE



GREG PENFOLD
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To say that the topic of land reform gets people hot under the collar would be the understatement of the century. Add “expropriation without compensation” to the mix and you have a recipe to make the blood boil. Nothing can be achieved by shouting at each other without listening. Indeed, there is a certain art to listening, especially in a country where the majority stem from a culture of consensus and debate.

Speaking in the National Assembly, President Cyril Ramaphosa recently said that the land reform debate should not be reduced to a debate about expropriation without compensation.

“This is the time for everyone to stop pontificating and come forward with solutions,” he said.

This suggests that the President, who is a farmer himself, is open to suggestions from the agricultural sector. Further, he said he had already heard from Afrikaans-speaking farmers. Their question: “Hoe kan ons help? [How can we help?]”.

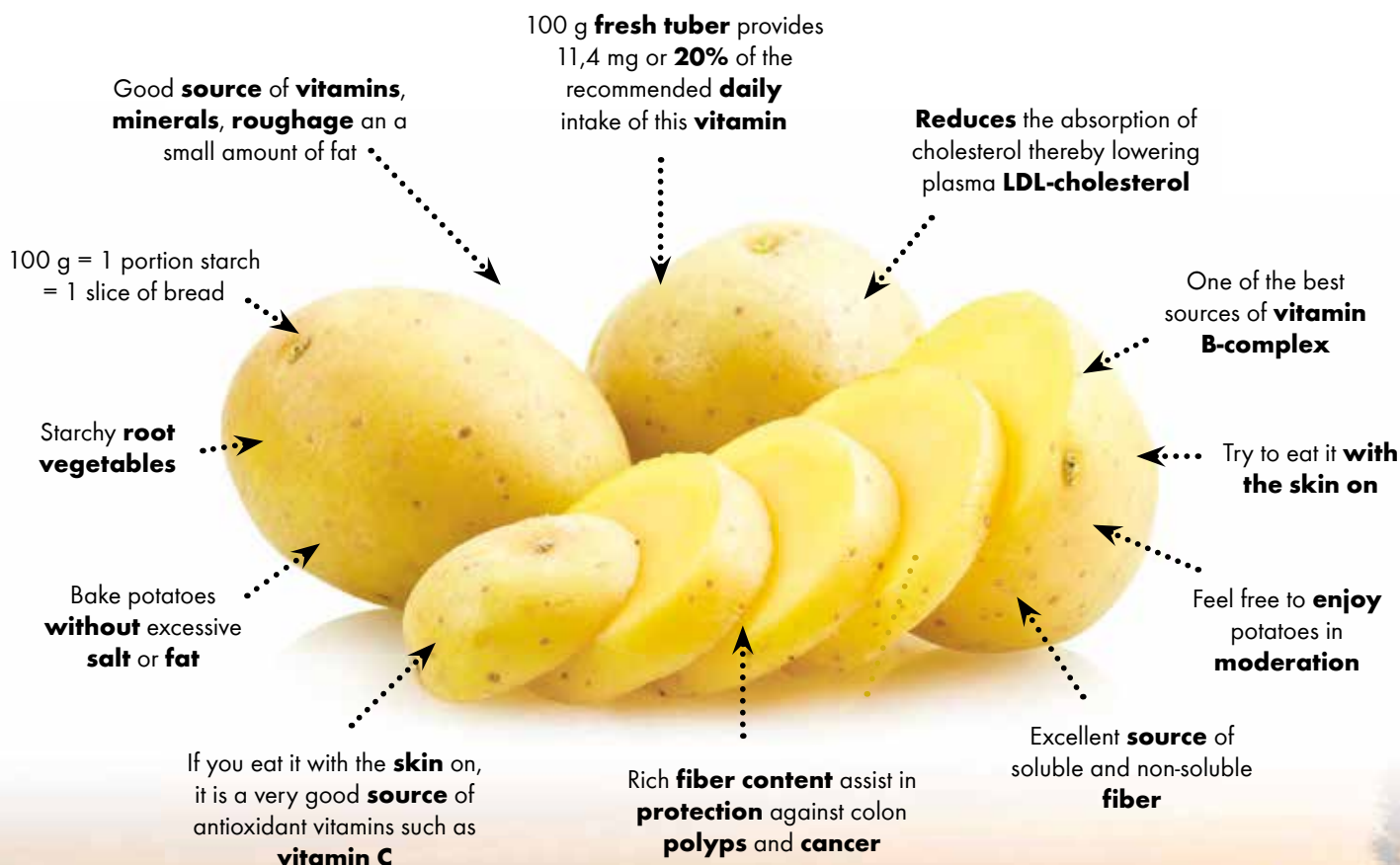
This topic is picked up in this issue by Land Bank, among others.

I have no doubt that the conversation will be carried further at NAMPO 2018 in May. Last year featured a series of excellent discussions with the participation of such diverse speakers as Roelf Meyer and Eusebius McKaiser, among others. The urgency of the debate is likely to be reflected at this year’s event. And the collective experience of the country’s farmers will be made to count.

The sky is not falling. Not yet. Cooler heads will prevail.

What you have to know about potatoes

Goodness from the earth



Potato
industry in
South Africa
R23
billion
worth

per capita
used
Growth
annually
between
2% -3%

Contributes
R7
billion
to SA's
economy

Annually creates
Between
45 000
50 000
job
opportunities

Potatoes
contain
0,1% fat
per **100g**

Potatoes
are produced
in 16
production
regions in
the country

2,24
billion tonnes
produced annually
is nearly equal to the
combined
production of toma-
toes, onions, sweet
corn and green
vegetables

Bumper crop and the cost of carry



Dr Raphael Karuaihe, Commodity Manager,
Johannesburg Stock Exchange

The 2016/17 marketing season delivered a record harvest for most of our summer crops. Maize production, both white and yellow, was a record 16.8 million metric tons, soybeans were a record 1.3 million tons as well as sunflower seeds and sorghum were all bountiful harvests respectively.

These production levels also meant that the record commodity prices that we saw during the preceding dry season have fallen drastically, and the near-dated yellow maize futures expiry, the Mar18 YMAZ, is currently trading at a R100 premium to its WMAZ counterpart at round R1879/ton. This is a drop of 50% when compared to same period last year.

Export parity on the other hand for yellow maize was recently standing at R1448/ton. This effectively means that even though our maize prices have dropped significantly, they are still not competitive enough on a global scale to promote exports. No wonder we are now sitting with a carry-over stock of about 4.2 million metric tons for both white and yellow maize. The anticipated maize production for the 2017/18 season of 12.2 million metric tons is not solving the problem either since this figure is well above our domestic consumption of about 10.5 million metric tons. Grain prices are therefore set to be low for a longer period of time.

Under these circumstances, market participants may have to consider rolling their stock forward making use of spread trades on the JSE platform. Depending on the theoretical value of the cost of carry (full carry) and where the market is trading at, participants can either buy or sell spreads optimise on the cost of carry. Taking our example of yellow maize again, the near-dated Mar18 YMAZ expiry, which serves as proxy for the spot market, is currently trading at R1879/ton while the Jul18 YMAZ expiry is trading at R1943/ton. The forward curve is therefore R64/ton.

We can obtain the full cost of carry from the daily cost of capital and the daily storage rate for the 120 days between March and July. I have calculated that value to be R2011/ton. Thus the full carry is R132/ton. What this means is that, while the fair value of the cost of carry from now to July is R132/ton, the market is actually trading at R64/ton which is a substantial discount to fair value. The only unknown here between now and then is actual production at the end of the marketing season which is a function of weather and yield. This may lead to the market trading at full carry when prices improve or we may continue to see discounted prices to full carry.

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*Sibusiso Manana, Head of Agriculture
Strategic Technology Area at the TIA*

Growing agriculture with technology

Stimulating the innovation value chain

South Africa's Bio-Economy Strategy aims to benefit South Africa's natural biological resources by developing them into commercial products – and agriculture is foremost among these resources. However, as farmers well know, a range of inconvenient phenomena from finance to climate change place obstacles along the way. Fortunately, these obstacles can to a large extent be smoothed out by technological innovation. Creating the conditions and providing the support for such innovation not only to take place but also to be commercialised on the market is the mandate of South Africa's hard-working Technology Innovation Agency (TIA). Harvest SA spoke to Sibusiso Manana, Head of Agriculture Strategic Technology Area at the TIA, to find out more about how the agency's activities pertain to the agricultural sector.

How far is SA from achieving “an inclusive agricultural economy that should create new direct and indirect jobs and to maintain a positive trade balance from primary and processed agricultural products”? What is the role of technology innovation in developing a globally competitive sector?

The South African agricultural economy is far from being inclusive. Participation in the agricultural economy is skewed largely towards established, commercial farmers. However there are plans and efforts through different government policy instruments towards achieving the desired inclusivity. Members of the small-holder farming community, which largely constitutes previously disadvantaged individuals, participate in the economy mainly

on a subsistence scale. Their participation in the primary production is limited while their involvement in processing of agricultural fresh produce to high-value products is minimal or non-existent. The reason may be that of the huge capital that is required to equip them with the infrastructure required to set up processing facilities, which they struggle to secure through the current financial industry setup.

The other impediment for small-holder farmers is the fact that the market does not recognise them. Currently, small-scale farmers are never poised for growth, and are therefore forever locked in subsistence farming; they must just consume the produce as they do not have viable markets to sell their excess produce to. Therefore, as TIA, in our effort towards fulfilling our mandate, we continue to drive investment in technological developments and innovations that enable inclusivity in the agricultural economy and also encourage equitable value derivation for both commercial and subsistence farmers.

What is the purpose of the Agri Business Unit?

Let us start first with the mandate of TIA. As broadly explained, the Technology Innovation Agency was established by the state through an act of parliament in order to promote the development and exploitation, in the public interest, of discoveries, inventions, innovations and improvements.

The main objective of TIA is to support the state in stimulating and intensifying technological innovation in order to improve economic growth and the quality of life of all South Africans by developing and exploiting technological innovations.

TIA supports the realisation of the mandate by enabling the progression of ideas across the innovation value chain.

How TIA does all of this is by providing risk funding to innovators who are either individuals, science councils, or institutions of higher learning, etc, in order to enable them to develop, pilot, demonstrate and exploit these technological innovations.

We also support by funding the commercialisation of industry-enhancing technologies in cooperation with the broader stakeholders in the National System of Innovation, the NSI in short, in order to ensure seamless adoption and absorption of technologies to the market.

Last but not least, TIA also provides access to infrastructure that will enable innovators to develop new technologies.

It is in this context that the main goal of the Agriculture Unit of TIA is to invest in the development of new South African technologies, to increase agricultural productivity of both animal and plant produce in order to enhance the local agricultural industry's competitiveness, and also contribute towards ensuring food security and poverty eradication.

The Agriculture Unit derives relevance, in the South African context, from the fact that we fund technology development and innovation in line with the Department of Science and Technology's mandate that is tabled in the National Biotechnology Strategy, which has since been revised to the new Bio-Economy Strategy. The Bio-Economy Strategy emphasises the need for a far greater focus on the full innovation value-chain, that is to drive development from concept to commercialisation, effectively bridging the grand challenge of tech-development, which is the innovation chasm.

In what ways is the Business Unit supporting the creation of an enabling environment for agricultural technology

innovation? What partners do you work with here?

Being an agency of the Department of Science and Technology, TIA operates within the National System of Innovation, the NSI, which is made up of various stakeholders, including higher education institutions, science councils (such as the CSIR, ARC, etc), industry bodies and entrepreneurs. The TIA Agriculture unit supports technology innovation in agriculture by investing through our funding instruments, namely the Technology Development Fund and the Pre-Commercialisation Fund.

TIA also has an instrument that funds development of its new project pipeline, which also cover all sectors including agriculture, which is the Seed Fund. Under this fund TIA works with other institutions such as universities and small business development agencies to fund new technological ideas.

How do you support the development and demonstration of attractive agricultural technology innovations, in terms of research, funding and commercialisation?

In addition to the funding instruments, TIA also supports technology innovation through non-financial instruments such as the Technology Stations and Technology Platforms that are hosted in Universities of Technology throughout the country. The Agrifood Technology Station at the Cape Peninsula University of Technology is one of the many examples of this support that TIA provides nationally.

TIA has entered into a number of structured relationships with other developmental finance institutions, such as the IDC, PIC, etc, in order to enable further funding towards commercialisation of the technology opportunities that have been successfully developed. Because of the risky nature of technology development, particularly in agriculture, funding participation of the private sector is still very limited.

The private sector's interest has been observed largely from their taking up of these successfully developed technologies to benefit their businesses, and in some instances, we have seen the establishment of new enterprises because of the strength and value that these technology innovations offer in the market.

What are de-risked technologies and how do you facilitate their commercialization?

Despite the high risk associated with the role TIA plays in the development of technologies, TIA does enable the environment by providing funding in the technology development which then enables innovators to prove technology feasibility, viability and then the technology progresses towards commercialisation.

The de-risking process produces bankable technologies, products and processes by ensuring that at every stage of the development, the innovator has sight of the end goal, which is commercialisation, and can also quantify and cost the work put into the technology development at every stage using the technology readiness tracking model.

TIA also plays the role of enabler and connector where we connect our clients with those who can enhance their technologies and facilitate third party funds for technologies that are successfully developed.

Getting the right technology to small-scale and emerging farmers is very important. How do you achieve this and what lessons have been learnt in the process?

One first needs to acknowledge that, from a South African context, innovation improvements and benefits have not yet accrued to the small-scale farmer. There are several factors that may have influenced this, mainly that previously there have not been incentives for small-scale farmers to adopt or up-take new technologies in the agricultural sector. This point may relate to the previously mentioned inclusive economy issue. Small-scale and emerging farmers are still excluded from the economy and technology innovation mainly owing to lack of resources (capital and infrastructure), knowledge and skills.

There is however a desire within the NSI to expedite inclusive development of the agricultural economy to this end, and TIA is at the forefront of driving various inclusive technology-diffusion programmes. These technology-diffusion programmes are a deliberate effort to support sustainable adoption of technologies and foster broader economic participation so as to address the bottleneck of economic

exclusion experienced particularly by small-scale farmers to date.

What projects are you working on in Breeding and Reproduction Technologies?

Currently, TIA has investments in the development of technologies towards wheat breeding for various disease resistance and abiotic conditions tolerance, drought tolerant maize production, etc. TIA has also invested towards the assisted reproductive technology programme, a technology that was aimed at addressing the low productivity challenge of rural cattle (emerging sector). There are many such technologies that TIA has invested into but these examples are just a few of out the agriculture portfolio of investments.

The latest thinking within the breeding and production technologies is that of looking for variants of plant and animal species that are drought tolerant, given the climate challenges the agricultural sector is facing. Previously technologies that were developed relied on the regularity of seasons and rainfall.

So, what would work are cost-effective innovations that will enable increased production of both animal and plant species to ensure food-security, in the context of climate-change. TIA has funded a number of such projects in this area of breeding and reproduction.

What are the latest developments in Animal Health and Nutrition?

Within the animal health and nutrition portfolio, there are investments in the development of dual vaccines, development of FMD diagnostics kits, point-of-care devices, etc, just to name a few. There are also developments towards developing nutraceuticals and feed supplements to enhance health and growth for broilers and poultry, developing alternative protein feed sources to fishmeal, and may more other technologies that we have invested into.

What is the latest thinking on Plant Health and Nutrition, from a technological perspective?

Within the plant health and nutrition portfolio, there are investments in the development of bio-fertilisers, adjuvants and

bio-stimulants, etc. This is in support of a move towards a green economy that requires the reduction of the use of chemical fertilisers in both plant health and food production.

What is the importance of Post-Harvest Technologies and how are you supporting them?

TIA is looking for new post-harvest innovations and technologies to fund and support, as there is a vast scope for innovation in this area and the market is ripe for it. These technologies are vital to value creation and expansion of the agricultural economy and that is mainly in the context of technologies to increase production, overcome challenges and create new opportunities. Two main areas that are seeing innovation are the increase of shelf-life for fresh produce as well as processing for value addition.

Trends in this area are driven also by the lifestyle changes we see globally. There is a shift to 'healthy living' which has seen an increase in the demand for nutrient rich, and organically grown natural products and advent creation of a new "health food industry".

In the same way, the market is looking for food that is quick to prepare, in light of the busy lifestyles we see today. There is therefore an opportunity for innovations in this area.

Is Conservation Agriculture on your radar?

Yes, we currently have two projects running in the Agri Bio-Economic Programme. One such project addresses preservation of biodiversity which contributes to conservation agriculture. The other is towards the development of a unique soil preparation method – towards conservation agriculture – that addresses the challenges of extensive use of mechanisation which can be detrimental to the soil structure.

With climate change, farmers and countries will have to gradually adapt. All regions, especially the heterogeneous and risky rainfed systems of Sub-Saharan Africa, need sustainable technologies that increase the productivity, stability,

and resilience of production systems. These changes imply that technology for development must go well beyond just raising yields to saving water and energy, reducing risk, improving product quality, protecting the environment, and tailoring to gender differences.

Could you give some case studies of projects that have been supported successfully from inception to commercialization?

Two examples I can offer are MABU Soil Casings and AgriProtein.

MABU offers a sustainable and eco-friendly casing soil to the Southern African mushroom industry. A process has been developed whereby pith from sugarcane bagasse can be used as a substitute for imported peat in mushroom cultivation. TIA supported MABU with technology development funds for optimising the production process and validating the product on SA mushroom farms. The project broadened into expanded mushroom growing field trials. MABU created and continues to develop technology that is a world first for the international mushroom scene, but has recently added seedling- and plant growth mediums to their product range.

AgriProtein is leading a new industry called nutrient recycling. Using fly larvae fed on existing organic waste, AgriProtein has developed and tested a new large scale and sustainable source of natural protein.

In 2014, TIA committed funds to support the demonstration, market testing and validation of this technology. AgriProtein committed an equal amount as co-funding towards the same milestones. The company has now built its 2 500 tons per year commercial scale facility in Cape Town that will enable it to demonstrate the technology with the intent to start commercial roll out and licensing of the technology.

In closing, I would like to thank Harvest SA for the opportunity to reach your readership and share TIA's work with your audience.

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Rational transformation

Policy-makers must comprehend and navigate land reform complexities

The recent adoption of the motion on the expropriation of land without compensation by the National Assembly has served to intensify the already heated debates on the country's agricultural trajectory and its future thereof. The fierce debate in the National Assembly on that historic day revealed just how complex land and agricultural reform is in South Africa. What is clear from the motion is that the current status quo on land in South Africa is both completely untenable and unsustainable. To ignore these realities is both unwise and altogether dangerous.

It is no secret that Government's land reform programme has not achieved its intended outcomes. The former Minister of Rural Development and Land Reform explained during the land expropriation debate in Parliament that the first group of land reform beneficiaries under the then Land Redistribution for Agricultural

Development (LRAD) programme had sold 5% of the redistributed farms back to the white commercial farmers who used to own it. This just highlights one of a number of challenges that have plagued our land reform efforts to date.

Even with policy developments seeking to address these issues and to fast track the land reform process like the implementation of the Proactive Land Acquisition Strategy (PLAS); Government's "use it or lose it" approach adopted in 2008, The 50/50 policy; the Extension of Security of Tenure Amendment Bill; the Regulation of Land Holdings Bill; and the Communal Land Bill amongst others, the pace of land reform in South Africa has been painfully slow.

One of the greatest land reform challenges to-date is the under-utilization of agricultural land that was given to communities especially in communal areas. Accurate official information on just how much land has been redistributed since 1994 is difficult to come by, including information on how much of this land is now

productive. It is widely acknowledged by sector players including Government that a major part of this unproductivity is due to the lack of capacity and skills of those who have received land as well as a lack of access to finance. This is a barrier that actually serves to reverse agricultural transformation in South Africa.

With the motion on land expropriation without compensation now taking centre stage in the land debate, it is now more important than ever to revisit the issue of land reform as a key departure point. The debate around whether or not the State should target private land or State land is less important than addressing the historical injustices brought about by the Land Act of 1913. The Constitution and other Government policy documents such as the National Development Plan (NDP) call for the greater inclusion of historically disadvantaged individuals into the agriculture sector, the facilitation of increased access to land as well as a deracialised sector working to achieve redress for past discriminatory policies.

Some of the current rhetoric in this debate present the arguments as a sort of zero-sum game – you are either entirely in favour or entirely against the expropriation without compensation proposal. There is no middle ground. With the complexities associated with land in general however, a deeper approach to both understanding and application is going to be essential as we move forward.

It is entirely rational to support all efforts to advance an effective land reform programme that will achieve transformation in tandem with increased agricultural production, secure tenure, employment creation and food security. Given the skewed nature of land ownership in South Africa, it is also entirely rational to understand the strong calls for redress, especially in the face of deepening inequality and poverty which still persist very much along racial lines.

Both Government and the ruling party have continued to reiterate their commitment to implementing this option in a way in which potential risks and concerns are appropriately reduced. However this option materialises, it is important that the approach taken shields the economy from undesirable negative impacts and serves to strengthen agricultural production, property values, employment creation and food security.

As policy makers move to operationalise proposals on the expropriation of land without compensation, it is critical that they comprehend and navigate the complexities and intricacies that underpin land reform in South Africa.

The often competing and conflicting demands for land require a careful balancing act from a policy perspective. The phenomenon of in-migration continues to pose a serious challenge to the country's land reform and urbanisation processes, particularly with the increasing demand for residential land in urban centres. Local municipalities are faced with these challenges every day and Human Settlements programmes are compromised in the process. The state ought to be in a better position to mitigate these often conflicting and competing demands for land.

The challenge of access to finance that is facing Black farmers and producers is one complexity that government has not been able to fully comprehend since the dawn of democracy. A new land reform policy will have to reconfigure integrated agricultural development finance. Of critical importance will be the post-settlement support that will be given to the beneficiaries of land reform. The reconfiguration of agricultural finance should include among other things, mobilisation of the entire financial sector and state resources in support of land reform in its entirety.

There are currently various instruments and approaches available to advance land reform, and that the recent developments regarding expropriation without compensation affords an additional option in a range of existing alternatives. The Constitutional Review process initiated by Parliament will provide an opportunity

for wide-ranging public consultations on the matter from a range of stakeholders.

There are already a number of options that have been bandied about for policy makers to consider. These include a reconsideration of the "use-it-or-lose-it" principle for the millions of hectares of land lying fallow in communal areas as well as to land belonging to absentee property owners. There are also calls for the introduction of a land cap of 12 000 hectares or two farms as proposed in the Regulation of Land Holdings Bill, enabling the state to then expropriate surplus land. Another option is the expropriation of land that is used for criminal purposes like the manufacturing of drugs. The conditions under which expropriation without compensation can practically work will no doubt bring about many more options for legislators and regulators to consider.

Meaningful participation and contribution into this process, especially the sharing of experiences and expertise, is critically important. With an already stated commitment at minimising disruption to the sector, cool heads are going to be needed if we are going to jointly build a land reform programme that ramps up transformation and development in a meaningful way and contributes to the sustainable growth of the sector.

Zamikhaya Maseti is a Senior Specialist for Public and Sector Policy at Land Bank.



A future without fear

Using financial instruments to hedge risk

A composite image featuring a large sheep, a small lamb, and a cow in a field under a sunset sky. The sheep is in the center, the lamb is in the foreground, and the cow is on the right. The background shows a field of yellow flowers and a distant tree.

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Farming is a proverbially uncertain business, with nature an unpredictable quantity that is sometimes friend, sometimes foe. However, although nobody can predict the future, with experience and the assistance of a financial partner with insight into agriculture, it is possible to hedge against risk. We spoke to Dr Raphael N. Karuaihe, Head: Commodities at JSE Capital Markets, to find out more.

From a JSE perspective, what are the major challenges faced by small farmers in securing finance?

The challenges are numerous for smallholder farmers. Lack of credit history, lack of financial guarantees, lack of storage, inconsistent farming practices, poor yields and so on, are but some of the challenges.

How can small farmers use the JSE certificate as an instrument to use as collateral at commercial banks?

When delivering their maize at commercial storage facility registered as a JSE delivery point, farmers can request a JSE silo certificate. The certificate will indicate the type of grain, tonnage and quality of the commodity stored in the name of the farmer. The farmer can then cede this certificate to the bank in exchange for funding.

How can farmers gain such a certificate in the first place?

Farmers need to deliver their grain at a JSE-approved storage facility and request that a JSE certificate be issued. A list of approved storage operators and their locations is available on the JSE website.

What commodities can farmers trade through the JSE?

White and yellow maize, wheat, soybeans, sunflower seeds and sorghum are the principal commodities.

How can farmers benefit from the JSE agricultural derivatives market?

The JSE agricultural derivatives market is a platform where participants can manage price risk and discover the market price

(fair value) of the commodity being traded. An added benefit is that all the transactions are guaranteed by the JSE and there won't be any counterparty risk for the farmer.

How does price hedging work, and how does it benefit small farmers?

Hedging only applies to those market participants who have a vested interest in the traded commodity. Typically, farmers who produce and millers who process the commodity can be classified as hedgers when they sell (farmers) or buy (millers) contracts on the exchange to "lock in" a favourable price and avoid being exposed to rising and falling prices. The transaction the farmer enters into today will be for delivery at a stipulated future date.

What support does the JSE provide in terms of deciding when to hedge?

The JSE only provides an enabling environment and an efficient market for participants to trade and discover market prices. However we leave the trading decisions and advice to the brokers (commodity members).

What is the full range of JSE financial instruments related to agriculture?

We offer futures and options and a combination of both.

What does the JSE consider in producing a new agriculture-based financial instrument?

The financial instruments themselves are standard globally. However, when it comes to introducing new agricultural products, we normally consult the market to gauge the appetite. Sometimes we introduce products upon request from market participants.

When it comes to selling an agricultural derivative, is it possible to sell at any time?

Certainly. Mostly in consultation with his broker, a farmer can lock in a price three, six or even nine months in advance if he feels it is the right thing to do.

How is the value of the derivative determined?

The JSE uses a methodology called marking to the market on a daily basis to determine where the various instruments a closing the trading session. Simply put, this is a weighted average of all qualifying trades taking place in the last five minutes before the market closes.

Could JSE financial instruments be a way to get around the problem faced by farmers on communal land unable to use title as collateral?

Yes, certainly. The only challenge sometimes is that the communal farmer does not produce enough to have critical mass. Therefore it may be ideal to take positions on the JSE as a group or cooperative to benefit from economies of scale. There are some agribusinesses dedicated to helping emerging farmers in this regard.



Spudding hopes

2018 prospects for the SA potato industry

Potatoes is considered as South Africa's most important vegetable crop and is world-wide acknowledged as a stable staple food. It is cultivated in more than 125 countries and consumed daily by more than a billion people.



As far as the overall state of the potato industry in South Africa is concerned, it is important that there is growth in the industry. We really have excellent producers in this country who on the same number of hectares can increase their yield by being more productive and planting better cultivars. On the consumer side, growth is taking place. Over the last couple of years real prices are high in comparison with a decade ago. In other words, prices were supported above inflation which can only happen if the demand for potatoes is healthy.

If one specific challenge has to be singled out in the potato industry, it is the cost-price squeeze which impacts on the sustainability of potato production in the country. In many instances, potatoes are not the only crop on a farm, it is part of various other crops and even livestock or fruit, depending on the region. When the potato industry is under pressure, it will also place pressure on the total agricultural industry since it is a cash crop. In real terms the cost of production increased faster than inflation while prices did not increase at the same rate, in other words, the profit margins are becoming smaller. A high-risk product such as potatoes, which if it is under irrigation, can cost anything from R 150 000 and up per hectare (there are regions where the input cost is R230 000 per hectare) and there is a cost-price squeeze, it becomes a high-risk product which can jeopardise the viability of an entire enterprise.

Economic recovery will drive demand for potatoes

In the 1990's we had more than 2000 potato producers; today we have less than 600. The cost-price squeeze has a big impact on the industry and will continue to do so. Efficiency and effectiveness to support economies of scale, will play a bigger role in future and new markets and product innovation are critically important areas that we must investigate to increase demand further so that the real

price of potatoes can increase at the same or even higher rate of input costs.

Uncertainty in the political environment is a concern because potato production requires massive investments and one wants to have a stable environment where you know that if you make this investment in your farm or even further down in the value chain, that the investment will be safe and deliver the necessary returns.

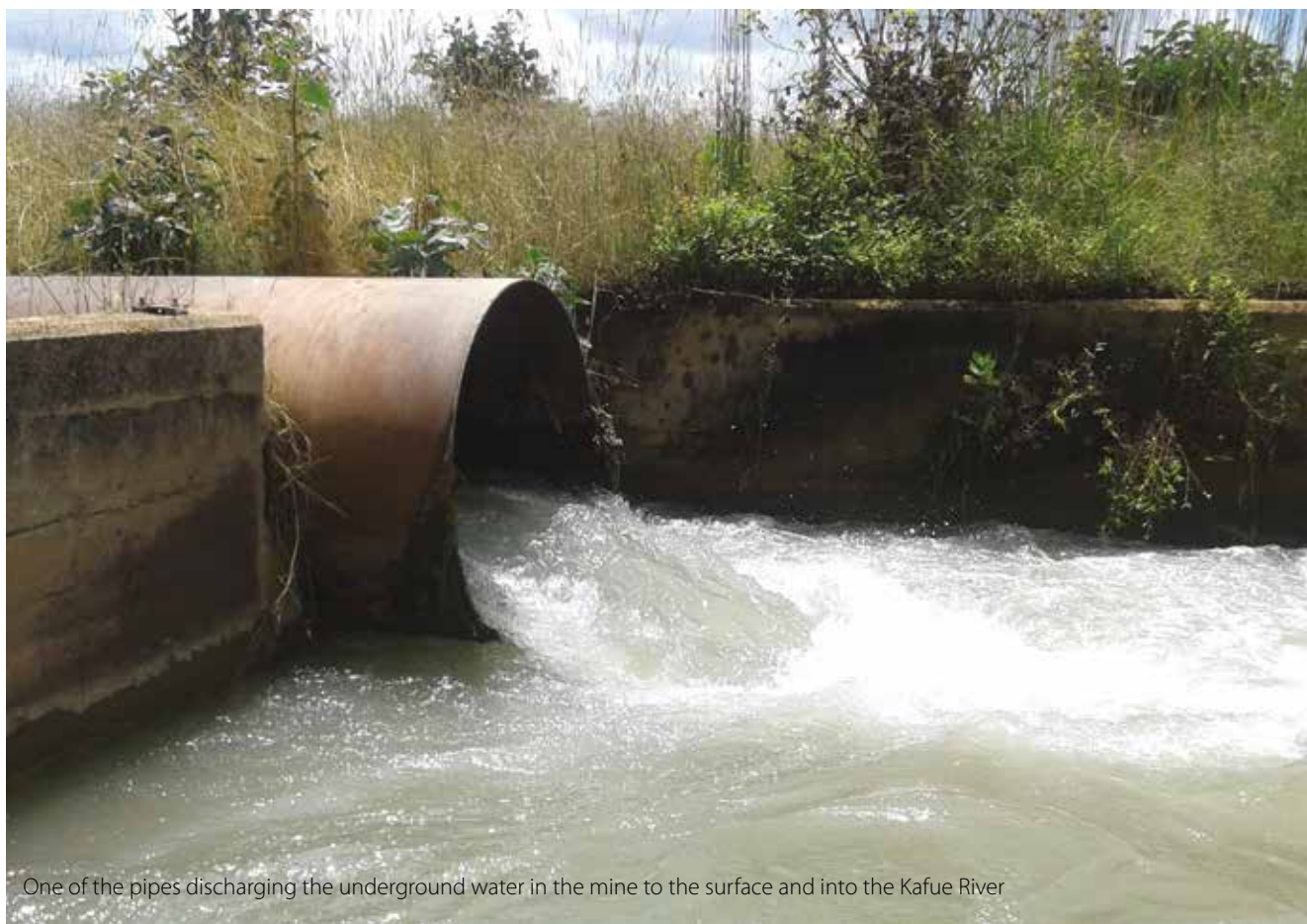
Prospects for the rest of 2018 will be influenced by issues such the drought, depending on how long it will still continue as it will determine in which direction the industry and prices will move. Hopefully, with the strengthening of the Rand, the pressure should lessen to some extent, especially on imported commodities such as fertilisers and chemicals.

On the other hand, we have issues such as labour costs with further increases due in May. The potato industry is highly labour intensive, therefore even a small increase in even the minimum wage has a huge impact on a potato farm in terms of the cost. In certain regions where labour cost was 5th and 6th on the cost ranking, it has moved up over the past few years to 3rd and even 2nd ranking.

The consumer demand is rather strong, but it is not optimal within a slow economy. If we can pull the economy back together again with the changes that are taking place in the country, then I think we can see an even bigger demand for potatoes in the medium to longer term.

André Jooste (PhD), CEO Potatoes South Africa





One of the pipes discharging the underground water in the mine to the surface and into the Kafue River

Symbiosis at scale

New partnership between mines and agribusiness

It was announced in February that Konkola Copper Mines plc (“KCM”), a subsidiary of Vedanta Resources plc, has joined forces with AFGRI Agri Services, part of AFGRI Group Holdings, and ImpactAgri (Holdings) Ltd to implement a scalable agribusiness alongside KCM’s copper mining operations in Chililabombwe. The aim of this collaboration is to develop agricultural and agro-processing opportunities adjacent to KCM’s mines to both create employment and to protect the ecosystem.

Speaking at the launch of the initiative, KCM CEO Steven Din said: ‘KCM is one of Zambia’s leading mining companies, but our vision for opportunities on the Copperbelt extends

beyond mining. We want to see the creation of new enterprises and new industries that will provide better local sourcing options for our business and greater economic opportunities for Copperbelt residents. That is why we are forming a partnership to develop agribusiness in the region.’

The aim of the collaboration is to develop agricultural and agro-processing, and in so doing to create employment and protect the ecosystem adjacent to KCM’s mines. The initiative is a core pillar of Vedanta’s vision to help transform the Copperbelt into a strong and resilient regional economic hub that can sustain livelihoods even when copper prices are low.

Some 1 500 hectares of land are initially being set aside for development

in Chililabombwe, using AFGRI’s and ImpactAgri’s signature approach to agribusiness, which combines both inclusive farming methods and environmental best practice. A mixture of both high-value and commodity crops will be grown to cater for the local market and to penetrate higher value export markets. The implementing partners aim to create a truly sustainable, commercial, large-scale agribusiness that can deliver strong and positive economic and social impact.

Jon White, CEO of ImpactAgri, said: ‘Often one of the biggest obstacles to developing agricultural projects in Africa is access to clean water in sufficient quantity. Thanks to the surplus of clean water coming from KCM’s Konkola mine, we have a perfect

opportunity to develop local farmers into serious agripreneurs as part of an organised large-scale, farming system."

We asked Steven Din for some more insight into the programme.

What is the role of the various players in this project?

Konkola Copper Mines plc ("KCM") will provide the land and other resources required to enable the success of the project. KCM will also hold an executive position within the agribusiness to ensure that its targets in terms of empowerment, skills transfer and creating an alternative employment stream are met on a sustainable basis.

AFGRI's role is to deploy its Agricultural Development Services ("ADS") programme at the mine to assist in unlocking the potential of emerging farmers in the area. This ADS programme – also known as the "Abba Initiative" because it makes use of father figures ("Abba") to help and mentor emerging local subsistence farmers – is currently operational in other areas of Zambia, as well as in Zimbabwe, Mozambique and Uganda. It has met with significant success in terms of enabling emerging / subsistence farmers to become commercially sustainable farmers through the daily mentorship and training provided by AFGRI.

At the mine, the idea is to create an incubation platform for existing local emerging



Surveying the lay of the land

farmers, as well as other community members, using the same approach. This will allow for the transfer of skills to ensure commercially-viable farmers in the future. This will not only create additional employment, but also act as a catalyst for the development of new independent farmers and service providers to the agri industry in Chililabombwe.

What kinds of crops will be grown and what will their markets be?

We are currently looking at higher value crops, such as horticultural crops, i.e. fruits and vegetables, which will be for local consumption, as well as targeted for export to the Democratic Republic of Congo ("DRC").

What is the initial scope of the project and how is it likely to scale up?

The scope is still under discussion, but the business will likely be looking at high intensity horticulture at scale and increase this as skills in the local community develop to

the point where community members can start farming under mentorship and ultimately, independently. However, there is an understanding that the business will grow as big as the market demand dictates, which we believe will be substantial given the local demand and the export potential to the DRC.

Where does the mine source its water in the first place?

The mine currently pumps around 350 000 metric cubes of water daily out of its shafts, which comes from underground aquifers. This water is currently being pumped into the Kafue River.

How will the project help the environment?

The project will ensure that unutilised or underutilised resources will be used for sustainable food production, which in turn, lends to food security. A full Environmental Impact Assessment is currently underway to ensure there is minimal impact on the environment. Our farming practices also focus on sustainability.

Is there any appetite for such an initiative among mines in South Africa?

AFGRI is currently in discussion with several South African mines that have shown interest in the concept.



One possible site for the Agri Development



Non-negotiable

Land reform and food security

Expropriation without compensation as a policy is an acknowledgement by Government that they have no confidence in their own ability to implement it in an orderly and corrupt-free environment to protect our food security in South Africa. The combination of land, capital, skills and labour are the basic components to produce food to all of us, especially those living in the cities. If you remove one of them, food production is compromised!

Every single African country, except South Africa, is currently food insecure. There are either not enough food, too expensive food or unsafe food or all of the above. For many months, South Africans were listening to politicians for days on end denying corruption and state capture. We felt the brunt of people messing with our electricity and water which caused defenceless people to die. We still have not discovered the extent to which taxpayers' money has been stolen or wasted. The past two months we were filled with new hope of a better future. Are we now going to enter a new phase where politicians are going to mess with our food too?

Land reform and food security can go hand-in-hand in a corrupt free environment, but expropriation without compensation and food security is nowhere to be found on this Continent. Government self-admitted that 90% of the farms bought for land reform purposes are lying fallow - a total of over 4 000 farms. If those 4 000 farms are increased substantially, South Africa will not have enough production

to live from. This current state of affairs with land reform farms, is no guarantee for food security. These actions will further erode another fundamental human right in our Constitution, namely the right to food. Yes, South Africa can import, but the maize price will more than double overnight. Food inflation will reach double digits resulting in social- and economic instability. No private title deeds, no food security. The average grain farmer in this country borrows between R5 and R8 million per annum to plant a crop for us (and the livestock) to eat. It is only possible to borrow if farmers offer their title deeds to the Bank as security to obtain a loan in order to buy seed, fertilizer, diesel and chemicals to control the weeds and insects. Never mind the tractors and planters. Most of our new black grain farmers with access to land are going nowhere because they cannot access finance due to Government not transferring title deeds to beneficiaries. Land reform without title deeds equals nationalisation.

No title deed, no loan, no production. The National Credit Act does not allow a financial institution to lend money to anybody without proper security. Before any politician can even think to expropriate land without compensation, they need to tell us, the people whom they representing, where our food is going to come from.

"Grain South Africa is in favour of land reform within the confines of the current Constitution. There are many ways to speed it up and to do it in a responsible way to keep the economy going and to keep South Africa food secure." Jannie de Villiers, CEO of Grain SA said. Expropriation without compensation is not an option.



The imperative to change

A new dawn for agriculture?

President Cyril Ramaphosa says land reform is a priority for South Africa and addressing the issue of land needs to happen immediately.

Addressing the official opening of the National House of Traditional Leaders at the Old Assembly Chamber, the President on Tuesday said it was time to usher in a new era of agricultural revolution in rural areas, adding that the country's traditional leaders need to play a prominent and influential role in the growth of our economy, the creation of employment and the transformation of society.

"During the State of the Nation Address earlier this month, we outlined some of the key priorities of government for the year. One of these is land reform. This issue is critical, emotive and very sensitive.

"Land dispossession is a defining feature of colonialism and apartheid in South Africa," he said.

The President said land hunger among black South Africans is genuine and pressing.

"The time has arrived that we act decisively to resolve this matter. We must repair the damage inflicted upon our people. As part of the measures to accelerate land redistribution, the 54th National Conference of the ANC resolved that where appropriate and justifiable, land will be expropriated without compensation.

"The programme of land reform must have clear targets and timeframes, be guided by sound legal and economic principles, and must contribute to the country's overall job creation and investment objectives," he said.

The President said, meanwhile, that government was committed to working closely with traditional leaders in the area of agriculture.

He said by providing more land to more producers for cultivation, and by providing the necessary support, government would be laying the foundation for an agricultural revolution.

"We are determined to work with traditional leaders to significantly expand agriculture not only to ensure food security, but also to create jobs on a significant scale and increase the value of our exports.

"We also want to build partnerships with traditional leaders to tackle the challenge of youth unemployment," he said.

President Ramaphosa said government needs to create opportunities for young people in rural areas – whether through education, internships, learnerships or employment.

He said government will not succeed in developing rural areas if skilled young people migrate to big cities.

"Among other things, this means that we need to make agriculture an attractive and viable career for young people.

"We need to improve and properly resource TVET colleges and other training institutions in rural areas.

"We need to identify investment opportunities in small towns and rural areas and ensure that we use local suppliers and labour when building infrastructure like roads, dams, energy projects, schools and clinics," he said.

Pack savvy

Choose the packhouse system that suits you

Choosing a packhouse system for potatoes can seem overwhelming and is often associated with large capex figures, which may need to be recouped over a number of years. This in turn makes investing a daunting task.

There are also the numerous logistical issues that go with the process.

Automatic computerized portion weighers? Automatic or manual bagging systems? Storage/Feeding Silos and their sizes? Grading/sizing options: Can I justify installing a computerized optical grader/sizer or will a mechanical grader/sizer be adequate?

Certainly, a computerized linear portion weigher has some definite and measureable benefits, in that the average overweight per pack can be reduced radically compared to manual weighing.

Bear in mind that the average overweight when weighing portions manually can vary anything from 12% to 20%.

By contrast, the average overweight when portions are weighed on a computerized linear weigher is unlikely to be over 3%.

This saving on the overweight portions of product contributes greatly towards the funding of the investment in the packhouse equipment.

So let's discuss the basics.

The fundamental elements of a potato or in fact any pack house are as follows: washing and drying, polishing, grading, storage and feeding, portion weighing, and bagging.

Washing /drying and storage/feeding

These systems can be supplied by Goldpack through Emve of Sweden.

Polishing for root crops

Goldpack through their UK principal Haith can also supply this type of equipment.

Grading systems – mechanical

Goldpack can also supply this type of grading equipment through their principals Emve and Haith.

Grading machines can be supplied to grade at various levels from simple to sophisticated and with simultaneous optical grading and sizing. The benefit of advanced grading is that it ensures that the crop receives the best possible market prices and protects the reputation of the supplier at all times.

Optical computerized grading systems

In this instance, Goldpack would supply Newtec Optical Grading Systems through Emve Equipment.

Weighing

A Newtec Automatic Portion Weighing System is the heart of the pack-house system, as this is where the big savings are, both cash savings from reduced overweights/give-aways and increased efficiencies in the bagging process and speed of bagging at a constant rate. Weighers are capable of ensuring a high degree of accuracy when weighing out portions of the product.

Goldpack is the South African agency for prestigious Newtec weighers and can supply machines that are suitable for potatoes and onions (which many farmers plant as an alternative crop).

Bagging

In the past, the bagging process in the Farm Packhouse, has been limited to bagging into paper sacks varying from 4kg to 10kg. More recently, some farm packhouses have started packing into retail packs for supermarkets. This has required the packing of smaller portions into paper bags, extruded net bags, plastic bags, or a net /film combination.

Whatever the requirement, Goldpack has a system that will be able to fill that type of bag.

Bagging systems can be manual, semi-automatic or fully automatic and the difference between the systems is the amount of labour needed.

Systems can be designed to accommodate various labour landscapes.

For example, for paper sacks, a Newtec weigher can be fitted with sack clamps and with sufficient labour, manual bagging can operate as fast as automatic bagging. Some of our latest installations use just this method.

However, please note that even wholesale manual bagging will require a machine stitching system for closing the bag.

In situations where labour is scarcer or not available, an automatic bagger can take over. All it requires is one person per bagger to load the pallet with the sealed bags.

The type of bagging chosen will depend on the weight selected. For up to 3kg, net bagging is popular and can be done on Goldpack-supplied Daumar machines, which bag and label simultaneously.

This option is especially good for supply to high-end retail stores and works with onions as well.

Weights between 4 and 10kgs can use paper-bagging systems with or without carry handles, depending on the end user market.

Developing or expanding a pack-house requires expertise and sound advice to ensure that every rand is spent wisely. Goldpack has the expertise to do just that.

Trevor Reardon is the pack-house systems director at Goldpack, which is a major supplier to the South African root crop industry. Based in Durban with branches in Cape Town and Johannesburg, he is able to access and supply the most cost effective local and international solutions. Goldpack has a national footprint through branches in Cape Town and Johannesburg.

For further information, please visit our website @www.goldpack.co.za

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Planning for a drier future

Day Zero is only half the picture

South Africa is in the grips of a water shortage that is reaching a critical stage, though much is said about the looming Day Zero in the Western Cape, the depleting water levels remain a concern in other parts of the country.

Although the estimated date of Day Zero in the Western Cape keeps shifting, this will largely depend on demand versus usage and supply through the alternative sources like boreholes, and any considerations of desalination. However, the critical water shortages in provinces such as the Eastern Cape and Northern Cape are equally cause for concern. This is according to Dawie Maree, Head of Marketing and Information at FNB Agric Business.

The Eastern Cape and Northern Cape are facing the same shortage as the Western Cape. In fact, the Kouga Dam, which supplies water to Port Elizabeth and surrounding rural towns in the Eastern Cape,

was sitting at 9.2% dam for the week ending 2 February level before the recent rains, which will probably lift it in the short term to approximately 12% for the week ending 2nd February. The western parts of the Northern Cape are also experiencing a prolonged drought and livestock farmers in these areas are under immense pressure.

Maree says that the immediate agricultural impact will be on cash crops such as vegetables as well as livestock due to their high water needs, while perennial crops such as fruit with deeper root systems might hold on for a bit longer. It is also possible that output in terms of yields and fruit sizes will decline. If the drought persists for another season some fruit trees might have to be uprooted with longer term implications for supplies as it takes them longer to replant and grow the trees to a point where they are sufficient for production.

The true impact of the drought will in essence depend on how the winter rain season plays out in the Western Cape and other parts of the country. However, given

that the summer rain season started late, it is forecasted that the winter season might also be late. This suggests that we may see a more protruded length of the current drought.

In Maree's words, "We need to face another reality in that even when the rains return, the crisis will not simply 'wash away'. Firstly, ground water levels need to rise before any run-off to replenish the dams. The best case scenario would be a large amount of rain in a short space of time, in which case the process speeds up."

On the upside, South Africa has gone through a similar situation in the inland when Vaal Dam water levels fell critically low. When the rains returned, the Vaal Dam levels went from empty to full within a space of three weeks.

"The impact of Day Zero in Cape Town on agriculture is minimal in the short term as restrictions have already been in place to ensure that the industry does not make excessive use of water, which in essence mean that farmers are already past their Day Zero. Should the drought persist, we may start to see a far more concerning impact on



the industry, for now, we wait for the rains to return," concludes Maree.

What does this mean for farmers and what can farmers do? Maree responded to Harvest SA's questions as follows.

How can farmers further reduce their own water demand?

Since farmers have already invested in water-efficient technologies and use water sparingly, a viable alternative beyond the measures that are already in place is to diversify to drought resistant cultivars.

Is it possible that farmers will have to consider growing different crops?

It is possible, however it will not be an easy change, since infrastructure and machinery will also have to be changed. It is therefore a very expensive decision to change dramatically.

Is the thirsty wine industry a sustainable option under water scarcity?

It is sustainable if water scheduling is planned accordingly. Remember that not all crops are suitable to all areas, thus certain crops need to be produced in areas where it has a comparative advantage.

What are the financial implications of water scarcity?

There isn't a clear measure for it at this stage. We will probably only know the impact in the next season, since we are dealing with long-term crops.

What can financial service providers bring to the table?

Assistance to restructure finance where possible. We will assist where we can but within the parameters of the regulatory and legislative environment that is applicable to the Bank. We will therefore look at every farmer's individual situation and make decisions on merit.

Paul Makube, Senior Agricultural Economist at FNB Business

Agriculture punches above its weight

On the back of a devastating drought in South Africa's biggest agriculture region, the Western Cape (WC), the sector has managed to pull off an impressive 37.5% q/q and contributed 0.8 percentage points to GDP growth.

The WC is however still gripped by drought conditions and accounts for 23% of the total South African agriculture GDP. The agriculture, forestry and fishing GDP for 2017 also grew by 17.7% year on year and contributed 0.4 of a percentage point to the overall South African GDP.

The robust agriculture output was boosted by favourable production conditions for the second consecutive season following the worst drought in 100 years two ago. The first production estimate for the 2017/18 season surprised on the upside for grains with the major staple maize coming in at 12.22 million tons though still down from the record 17 million tons last year.

We expect the industry to continue on its stellar performance as the summer crop season tails off.



Hand-picked for profit

Cherries are water-wise and in demand worldwide

Once a very small crop in the Western Cape, cherries have more than quadrupled their export market share over the last four years, and continue to show excellent potential as an alternative crop. This is according to the Western Cape Ministry of Economic Opportunity.

The Western Cape Government has to date invested R6.916 million in the development of alternative crops such as berries, cherries, fynbos, pomegranates, and honeybush.

These are smaller, export-oriented crops with high market-value, and greater potential for job creation.

Cherries use about half of the water required per hectare to irrigate than apples, and are a labour intensive crop.

The export value of cherries from South Africa has increased exponentially over the past few years. Total exports of the fruit in 2012 were valued at R2.6 million, and reached R28.18 million in 2016. South Africa's export market share, while still small, has quadrupled from 0.019% in 2012 to 0.080% in 2016.

Global demand for cherries has also increased exponentially over the same period.

The primary market for locally produced cherries is the United Kingdom, with Hong Kong, the Netherlands and Malaysia forming the remainder of the top four export markets.

Similar growth trends are being seen in fresh berry exports, which grew in value from R1.5 million in 2004, to R80.1 million in 2013.

Minister of Economic Opportunities, Alan Winde, said: "As we continue to be faced with the reality of climate change, it's important that our agricultural industry adapts and diversifies. These kinds of alternative crops allow farmers to diversify their offerings, and present new and untapped export markets for the province."

"The research fund specifically supports crops that have the potential to create jobs, are economically viable, more sustainable and which will lead to increased exports. Cherries are also a lower water use crop, which is important in our current and future context," he said.

"Hong Kong and the United Kingdom are both in the top ten importers of cherries

worldwide, so having a foot in the door in these important markets means that there is potential for growth," Minister Winde said.

For evidence of the cherry's fantastic potential, look no further than Tru-Cape, whose cherries are already earning farmers millions.

Tru-Cape Fruit Marketing, the largest exporter of South African apples and pears has, over the last three years, focussed more heavily on cherry production and achieving high-value sales for growers than it did in the past and, this past season, earned R9 million for cherry growers.

Managing director of Tru-Cape, Roelf Pienaar, said that despite the smaller than expected 2016 crop, down by about half year-on-year, Tru-Cape cherries were of a high quality and achieved good values. "The smaller 2016 crop was as a result of a challenging climate but despite this Tru-Cape growers produced beautiful fruit," he says, adding that, "cherry varieties Sweetheart, Royal Dawn and Rainier seem to produce the best results in the Ceres valley. The 2017 harvest was even stronger with excellent returns to growers and the company is optimistic about the 2018 crop continuing the upward trend," he says.

Tru-Cape took the strategic decision to focus on the local rather than export market to give the company the full possible sales window over the festive season and not lose out while fruit was on the sea. "In some cases, Tru-Cape achieved higher local-market prices for our quality product than other exporters did for their export crop as they were competing with other exported cherries," Pienaar says.

Despite Ficksburg's self-proclaimed position as South Africa's Cherry Capital, the Free State might soon have to fight for its crown as Ceres in the Western Cape is increasingly getting a bigger piece of the cherry pie as the Ceres climate of hot summer temperatures and cold winter nights, so desirable also for apple and pear production, is perfect for cherries.

With harvest between mid-October and mid-November, the South African cherry season is a short one but, because of its proximity to the high-value Christmas season, this most traditional celebratory fruit delivers strong returns and Tru-Cape expects the 2018 crop to be no different.

Effective inspection

Exports depend on quality control



Lucien Jansen, CEO

Quality control has never been more topical or important. South African agricultural exports enjoy a good reputation, but that's only thanks to the efforts of a team of experts working ceaselessly to ensure that our produce meets the stringent quality standards demanded by the countries of destination. We spoke to Lucien Jansen, CEO of the Perishable Products Export Control Board (PPCEB), to find out more about the vital role played by his organisation.

What is PPCEB's position in the industry?

The PPECB is a national public entity, constituted and mandated in terms of the Perishable Products Export Control (PPEC) Act No 9 of 1983. As such we are accountable to the Minister of Agriculture, Forestry and Fisheries and are responsible to regulate the exports of perishable produce. This entails the inspection of listed agricultural products, cold chain monitoring and food safety certification.

Why is it necessary to carry out inspections on perishable export produce?

South Africa has export regulations which make it compulsory for listed agricultural products to be inspected. These inspections ensure that the produce complies with the standards of both South Africa and in many instances, that of the importing country. Furthermore, the inspections safeguard the integrity of South African produce and ensures that consistent quality is supplied internationally.

What can go wrong if inspections are not carried out properly?

Should inspections not be conducted properly or at all the exporter runs the risk that the produce will not meet the minimum export requirements. This can result in the produce being rejected by the importing country which can lead to significant financial losses for the exporter. In addition, supplying products of an inferior quality to the market can have a detrimental effect on the reputation of South African produce and thus compromise future prospects for the entire industry.

What are the latest trends in the perishable export market?

In recent years we have seen a definite move away from traditional markets as we well as originally minor products gaining popularity internationally. Products such as pomegranates, macadamias, avocados and berries have become increasingly in demand with international markets. Furthermore, seasons are now much longer as compared to the past which is due to new, and often earlier varieties, entering the market.

From your perspective, how have changing weather patterns affected agriculture?

In past years we have seen the weather become increasingly hotter and drier, in particular the current drought which has gripped parts of the country. This has affected the irrigation mechanisms and patterns applied by producers who have become

South Africa remains exceptionally competitive in international markets

increasingly less reliant on traditional water sources. Furthermore, we have seen that the drought has had a definite impact on the size of fruit as well as the volumes produced.

What is the importance of cold chain management?

It is vital that throughout the cold chain life-cycle that there is never a break and that the management thereof is consistently applied. As such basic principles should always be adhered to to ensure the quality of the produce is maintained. Throughout packing, transport and storage products should be held under optimum temperature conditions which will extend the lifespan of fruit, extend its shelf life and preserve the quality if applied correctly.

What are the risks of not managing the cold chain properly?

A break in the cold chain may compromise the quality of the produce which could lead to extensive financial losses for both the producer and exporter should the produce not be of good quality and/or rejected for export. In addition, as

previously mentioned, there is the risk of reputational damage for both the exporter and South Africa.

Given your position in the industry, what stakeholders do you communicate with?

The PPECB views sound stakeholder relations as vital for it to maintain a well-functioning industry. As such it strives to ensure regular interactions with the Department of Agriculture, Forestry and Fisheries, producers, exporters, pack houses, cold stores, producer bodies, forwarding and clearing agents and even importers and import authorities.

As CEO, what is your approach to stakeholder management, collaboration and integration?

I believe that regular stakeholder engagement is essential for the PPECB to understand the dynamics and needs of the industry as well as the needs of our stakeholders in order to deliver an effective and efficient service. We therefore have adopted a service orientated culture and regularly interact with stakeholders on a variety of platforms.

Is the industry as a whole achieving its objectives?

Yes, merely looking at the general growth in exports over the medium term I can confidently say that South Africa is meeting its objectives and doing exceptionally well as an exporting country. Ultimately these objectives include the growth of markets and thus increased income as well as the enhanced reputation of South African produce in international markets. Furthermore, feedback received from international stakeholders indicates that South African produce is still in demand and can compete globally. We believe that this is largely due to the fact that South African produce is internationally associated with consistent quality.

How competitive is SA on international markets?

It is our belief that South Africa remains exceptionally competitive in international markets. This is demonstrated by the fact that South Africa remains one of the largest exporters of citrus fruit globally. Likewise, for several other products South Africa remains a preferred supplier internationally.

Together we
grow and sustain
your business



Our passion for excellence helps you grow your business and establish yourself as a preferred supplier of perishable products.



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The big C

The role of organic carbon and
conservation agriculture in soil health

Figure 3: Maize and cowpeas in a CA rotation treatment.



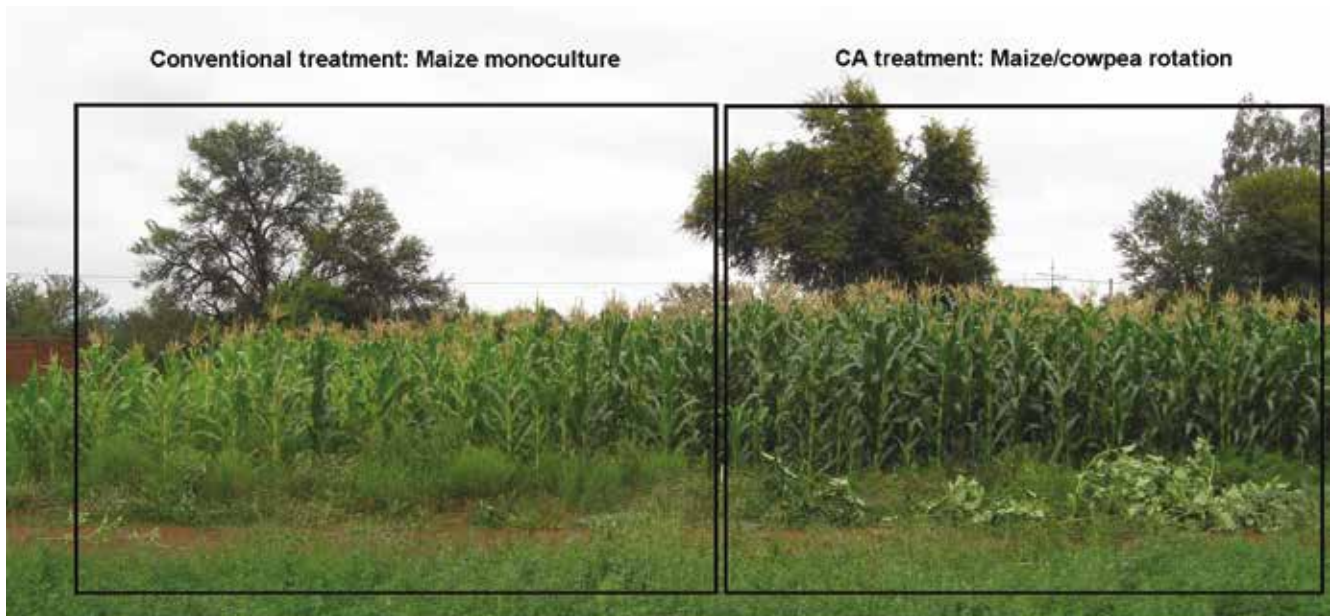


Figure 4: Maize in a monoculture treatment (left) compared with maize planted after a cowpea crop (right). Fertilizer, pesticide and herbicide applications were all similar.

Soil organic matter is closely linked to soil quality and sustainable agricultural production. Organic matter has been shown to improve biological, chemical and physical properties of soils. Indeed, soils with an organic matter content of 2% or higher are often regarded as fertile, stable, erosion-resistant soils with increased infiltration rates, improved water-holding capacity and enhanced nutrient availability. Most South African soils, however, are low in organic matter, fragile and only marginally suitable for cultivation. The majority of the country is more suitable for grazing than for crop production. Even so, South African farmers have managed to successfully cultivate numerous field crops, in spite of environmental challenges.

In a recent study on soil organic carbon (C, an indicator element of organic matter), it was calculated that cultivation has

resulted in an overall 46% loss of organic C in South African soils. With an already low natural C content in cultivated soils, this is a worrying trend. According to the soil database at the Agricultural Research Council (ARC), only 4% of our soils have organic C contents of 2% and higher, while 65% of the soils contain less than 0.5% C (Figure 1). Carbon is not just significant for soil quality, it also plays an important role in climate change. Soil is the largest terrestrial sink and therefore a very important pathway to sequester (gather) and store carbon. By doing so, the atmospheric C can be reduced and the soil C increased: a “win-win” situation.

Conservation agriculture (CA) has been widely advocated as a sustainable alternative to conventional practices such as ploughing and monoculture cropping systems. CA focuses on three main principles: minimal soil disturbance, diversified cropping systems and permanent organic soil cover. By applying these principles simultaneously,

CA can effectively conserve and build up soil organic matter. Conservative estimates indicate that organic C can increase by about 17% over a duration of 7 years after converting from conventional farming systems to CA. Considering the naturally low C content of local soils, this increase might seem small, but with the extensive areas under cultivation in South Africa, it could result in a significant contribution towards climate change reduction targets.

There are several challenges in implementing CA in a semi-arid country. For example, rainfall and associated water availability is commonly one of the major limitations in dryland crop production. Farmers often complain that the available water is not enough to support the biomass production needed to create effective organic soil cover and soil organic matter to sustain or build up C in the soil. Also, in some areas the competing needs for biomass (e.g. soil cover versus fodder for livestock) limit the effectiveness of the CA system. On the

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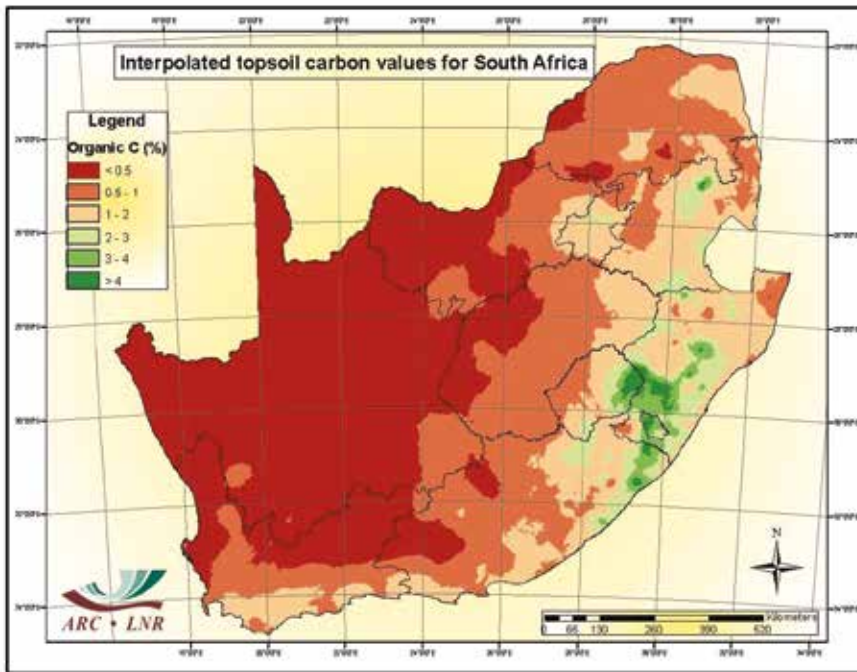


Figure 1: Topsoil organic carbon values for South Africa (source: ARC-ISCW).

other hand, there are many interesting and effective interactions in such a system. Crop rotations that include pastures are highly effective in restoring organic C and improving soil health. Intercropping with grazing vetch that utilises the last moisture of the season, and allows for annual maize crops, was highly successful in most research trials. One such trial was conducted by the ARC at Zeekoegat, just outside Pretoria, over a number of years, with very positive results (see Figures 2-4).

Limitations and problems in CA systems should therefore be seen as an opportunity to understand and refine CA for dryland cropping in South Africa.

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Figure 2: Staff from the ARC sampling grazing vetch in a maize/grazing vetch intercropping system. The vetch formed a thick, effective organic soil cover that significantly increased water infiltration, soil C and nutrient status, and subsequently, maize grain yield.

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Huge chance for change

Game-changing app boosts crop health

Cassava is one of the developing world's most important crops. Its starchy roots and leaves are a staple food for more than 500 million people in Africa each day. And Africa produces half of the world's total cassava output; the continent's main growers are the Congo, Côte d'Ivoire, Ghana, Nigeria, Tanzania and Uganda.

It's also climate resilient, as it is predicted to improve yield in higher temperatures. Its role as a staple food will become ever more important, then, as climate change continues to take hold.

But cassava, like many other crops, is vulnerable to viruses and other plant diseases. These diseases can affect cassava yields, cost farmers money, and threaten food security in sub-Saharan Africa. Two diseases, cassava mosaic disease and cassava brown streak disease, have become the largest constraints to cassava production and food security in sub-Saharan Africa resulting in losses of over US\$1 billion every year.

These plant diseases are not new to Africa and have been causing losses for many decades. However, a lack of infrastructure and engagement by trained plant disease experts with farmers means the farmers are not trained to recognise them in their early stages. That's why we set out to create a disease-recognition app for smartphones. We tested the ability of an image recognition model, called a convolutional neural network, to accurately identify up to five different cassava diseases.

The model is deployed using a mobile device's camera. What's novel about it is that it can run entirely on a smartphone without the need for a wireless connection, or access to large processing power. Once farmers have identified the disease using the app, we provide the necessary information so they can go ahead and treat their plants.

Our results, based on research conducted in Tanzania, show that the image recognition model had up to 98% accuracy in identifying cassava diseases in the field.

These results are promising as our method is much simpler to implement than traditional computer vision models. The model was also trained on a desktop with vastly smaller computing power than the typical supercomputer used in training image recognition models. These results highlight our method's potential to be a reliable, fast, affordable and easily deployable strategy for digital plant disease detection.

We were also able to deploy the model on a smartphone without an Internet connection, something no other mobile app for plant disease diagnosis has been able to do. For the continent of Africa where data costs are high for smallholder farmers the ability to provide a diagnosis offline is critical.

Creating a dataset

Traditional disease identification approaches rely on the support of agricultural experts visiting a field and checking on crops. But these approaches are limited in countries with low logistical and human infrastructure capacity, and are expensive to scale up.

In such areas, smartphones offer new tools for in-field plant disease detection based on automated image recognition that can aid in large scale early detection. This is a viable tool for Africa: smartphone adoption is growing rapidly on the continent.

Our technique is suitable for providing help to smallholder farmers, for several reasons. Firstly, it is fast: a disease can be identified with the model in less than one second. Because the app is on a mobile device, it is also easily deployed over large areas – farmers no longer need to wait for an agricultural expert to visit them and check their plants

We put the model, which works on Android phones, to the test in collaboration with research staff at the International Institute for Tropical Agriculture in Dar es Salaam, Tanzania.

There were six class labels for the model: three disease classes, two mite damage classes and one healthy class (that is, a lack of disease or mite damage on the leaf.)

We then trained our model to identify the three diseases and two types of pest damage, or lack thereof. After training the model and loading it on to a phone app, researchers went out to test the app in the field. Staff from the institute would walk around fields holding the phone up to different cassava plants to see how the app responds. If no disease is recognised the app says the leaf is healthy.

The model was able to identify diseases, pest damage and healthy plants with a high degree of accuracy – up to 98% in some classes.

This particular model is now being used by researchers at the institute. Planned steps in 2018 include designing the app to make it suitable for farmers in East Africa, especially female farmers. For example, the app is currently being designed in English and Swahili, with both text and voice features. Our app is linked to PlantVillage which is the largest source of free knowledge on crop health in the world.

This kind of technology can be transformative for smallholder farmers, who produce 70% of Africa's food supply. With access to information about diseases in their fields, this tool is an efficient extension system that can reach smallholder farmers with targeted diagnoses and advice.

Amanda Ramcharan, Postdoctoral Researcher, Pennsylvania State University

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Cattle of the ages

An ancient breed comes to South Africa

For the first time since 1994, South Africa has a president who is also a farmer – and a published author. The story of how Cyril Ramaphosa became the proud owner of a herd of truly regal African cattle is related in his book “Cattle of the Ages” (Jacana, 2017) and merits the attention of anyone is concerned with the possibilities of cattle farming in this country.

The subject of the book is twofold. First, it speaks of cattle: the Ankole cattle breed from Uganda, “the Cattle of Kings”, known for their soaring horns, and Ramaphosa’s quest to establish his own herd of these animals, in which grace and power are lyrically combined. Second, it speaks of Ramaphosa’s bid to fulfil the legacy of his father, whose cattle-breeding ambitions were thwarted by the hardships of the apartheid era, forcing him to abandon his herd in Venda and trek to

Johannesburg as a migrant worker in order to support his family – a story familiar to millions of families throughout South Africa, and consequently one of universal interest.

“Like many of the men of my father’s generation, he had no choice but to go to the city of Johannesburg to find work. His traditions, his wealth and his very identity were left behind, and whatever wealth he had built up would later be eroded,” Ramaphosa writes in the book.

“I am sure my late cattle-loving father would have been proud to see that I have become a cattle breeder.”

It was Ugandan president Yoweri Museveni who introduced Ramaphosa to the Ankole cattle breed in October 2003. “I was on a business trip to Uganda, and that is where the fire was lit. Upon hearing that I was visiting his country, Ugandan President Yoweri Museveni invited me to visit him at his cattle ranch. I wasn’t the

deputy president of South Africa at the time, but I was told that inviting heads of state and business leaders to his ranch was something of a tradition for the Ugandan president, so naturally we accepted the invitation.”

For Ramaphosa, it was a case of love at first sight:

“I was intrigued and in awe and fell in love with these creatures immediately. President Museveni and I exchanged a few pleasantries, but I couldn’t help myself. ‘Please,’ I said. ‘You must tell me about these cattle. They are simply beautiful,’” Ramaphosa writes.

It turns out that the Ankole lineage stretches back before the remotest living memory. Ramaphosa explains: “Historically and scientifically speaking, the Ankole can be traced back thousands of years before our time—even before the time of the Banyankole in Uganda or the Tutsi in



Rwanda, who both love these cattle equally (they are called Watusi cattle in Rwanda). We find them in cave drawings and other cultural murals, and in many oral traditions. We find them in the histories of India and Ethiopia, Egypt and Europe. In fact, the Ankole's heritage stretches as far back as 8000 years to the wild aurochs, the first cattle to be domesticated by humans. And some think the aurochs may have grazed the earth for over a hundred thousand years before humans came into the picture."

Immediately, Ramaphosa resolved to bring this incredible legacy to the country of his birth.

"My visit to Uganda made it clear to me that these cattle could bring many advantages to the cattle-farming community in South Africa, and so I set to work to bring some Ankole to our country," he writes.

"But there were several barriers to overcome. After reaching a sale-and-purchase agreement with President Museveni, I returned home and immediately contacted the Department of Agriculture to see how I should go about bringing the Ankole to South Africa and getting them registered as a new breed."

Bringing live animals into South Africa was not as simple a proposition as it might sound.

"The department was concerned about different strains of animal diseases from that part of Africa; and about South Africa's lack of knowledge concerning animal disease-control measures in Uganda. I found this incredible and felt almost mortally disappointed at the prohibition... But I knew I could not give up so easily," he writes.

A cunning plan was formulated: Ramaphosa worked with local embryo-transfer experts to clone the Ankole cattle in South Africa from embryos harvested from Museveni's herd. The first calves were born in 2007. The lineage had been transmitted.

Now, eleven years after the birth of the first Ankole was on South African soil, Ramaphosa is one of the biggest breeders on the African continent.

"I am sure that my cattle-loving father would have been proud to see I have become a cattle breeder," writes Ramaphosa. "That I have become a breeder of three stud cattle – the Boran, a Kenyan breed; the Bonsmara, a South African

breed developed by

Professor
J a n

Bonsma; and, of course, the Ankole – would have amazed and pleased him no end."

Best of breed

As one would expect from someone with the finely honed business instincts of President Ramaphosa, the Ankole herd has also proved a shrewd business investment. In fact, last year, one of his Ankole bulls went for R640 000 at the Ntaba Nyoni auction near Ermelo, in the eManzana region of Mpumalanga – the first auction of Ankole and Ankole crossbreeds in South Africa.

Ramaphosa's bull – Lot 35, NANK10-115, with a right horn length of over 110cm, left horn length of more than 114cm, and tip-to-tip horn length of over 129cm – fetched the highest price of any bull at the auction.

Now a registered breed, Ankole is administered by the Afrikaner Cattle Breeders' Society of South Africa.

Ankole meat is naturally low in cholesterol and high in polyunsaturated fatty acids, two purely genetic that neither development nor feeding can attain.

Since they are not selective grazers, Ankole cattle adapt quickly to tough conditions such as those pertaining in the eManzana region, with its sourveld vegetation.

According to the Ankole Watusi International Registry website, "The Ankole-Watusi should appear elegant,



well-bred, and graceful. A straight topline and a sloping rump are required; a neck hump is preferred, but not required. Cattle may be solid or spotted in color. Horns are long and symmetrical, with a base large and proportional to horn length. Lyre and circular shapes are preferable to flat. The Ankole-Watusi is medium in size, with cows weighing 900-1200 pounds and bulls weighing 1000-1600 pounds. Newborn calves weigh 30-50 pounds. This small birth-weight makes Ankole-Watusi bulls useful for breeding to first-calf-heifers of other breeds. During the day, calves sleep together, with an 'auntie' cow for protection. At night, the herd-members sleep together, with the calves in the center of the group for protection. The horns of the adults serve as formidable weapons against any intruders.

"The milk is about 10% fat. Some dairy farmers have used crossbred Ankole-Watusi cows in their herds to boost the butter-fat levels.

"Because they were developed in a climate where daily temperatures vary greatly, Ankole-Watusi tolerate temperature and weather extremes well. The large horns act as radiators; blood circulating through the horn area is cooled and then returned to the main body. This allows excess body heat to be dispersed."

History of an ancient breed

Long-horned, humpless domestic cattle were well established in the Nile Valley by 4000 B.C. These cattle, known as the Egyptian or Hamitic Longhorn, appear in pictographs in Egyptian pyramids. Over the next twenty centuries (2,000 years), the Egyptian Longhorn migrated with its owners from the Nile to Ethiopia, and then down to the southern reaches of Africa.

By 2000 B. C., humped cattle (Longhorn Zebu) from Pakistan and India reached Africa. When these Zebu reached the region now known as Ethiopia and Somalia, they were interbred with the Egyptian Longhorn. The admixture thus produced – the Sanga – spread to the Sudan, Uganda, Kenya, and other parts of eastern Africa, and became the base stock of many of the indigenous African breeds. The Sanga demonstrated most of the typical Zebu characteristics, such as pendulous dewlap and sheath, upturned horns, and a neck hump of variable size. Modern descendants of the Sanga, however, vary greatly in size, conformation, and horns, due to differing selection pressures by different tribes.

Particularly remarkable are the cattle found in Uganda, Rwanda, and Burundi. In Uganda, the Nkole tribe's Sanga variety is known as the Ankole. In Rwanda and Burundi, the Tutsi tribe's Sanga variety is called the Watusi. The Rwanda common strain of Watusi is called Inkuku. The giant-horned strain, owned by the Tutsi kings and chiefs, is called the Inyambo. (Some current tribal reports claim that this type is now extinct.) Traditionally, Ankole-Watusi were considered sacred. They supplied milk to the owners, but were only rarely used for meat production, since an owner's wealth was counted in live animals. Under traditional management, the Ankole cow grazed all day, and was then brought home to her young calf. The calf was allowed to suckle briefly to stimulate milk let-down, then the cow was milked by the herdsman. The calf suckled after hand-milking was finished and was again separated from its mother. The process was repeated in the morning. This minimal nourishment of calves resulted in high death rates in the young. Milk production was not high, with a typical cow producing only 1 litre of milk daily, although an exceptional one could manage up to 4 litres. In addition, the lactation period was short. Over the last 15 years, the national government has attempted to select for animals which produce more milk and have better meat production. Famine, disease, and wars, as well as the conflict with traditional practices, have slowed this effort.

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Empirical evidence

History – what was the alternative?

The debate around colonialism was recently aggravated by a tweet by the Democratic Alliance Western Cape premier Helen Zille who declared that much had been gained in South Africa from colonialism, quoting piped water, transport infrastructure and an independent judiciary as a few examples. This is of course true because from where else did these elements of civilization emanate? They are but a smidgeon of what was bequeathed to South Africa and indeed to many nations around the world during the colonial era.

In most affected countries, the legacies of colonialism, both good and bad, are openly acknowledged: what physically existed after the colonialists left was built upon and certainly not complained about. No one repudiated the legacy because it would have been obtuse to do so. Those who castigated Ms. Zille and forced her to apologise didn't seem to realize they were rejecting empirical history.

In 2013, former finance minister Trevor Manuel declared that "Africa's conquest by European and Western powers, and South Africa's rule by a supreme white minority, is that racial, religious, social, political and economic divides (or lines) were drawn to the exclusion and detriment of the black majority during those eras. Although colonialism entailed the extraction and use of Africa's mineral capital and labour resources

by non-African countries, white African descendants also received a fair share of those resources and were better off compared to the destitute black African majority who mainly served as workers (slaves) and farm peasants for the benefit of the privileged minority group".

There are other protagonists of "decolonization": one Suren Pillay told an audience at Azania House, Wits University in June 2015 that he was perplexed as to what to do with the universities "we have inherited within the larger question of justice and the transformation of the wrongs of apartheid". His long and lugubrious castigation was peppered with the usual suspects: rich whites, the violence of migrant labour, settler colonialism's political violence and capitalism's economic violence. He then waxed lyrical about the achievements of some "African" universities, all of which were in the Arab nations in Africa, way above sub-Saharan. He doesn't like South African education's "Eurocentric world view" and "white supremacy", but he didn't actually come up with an alternative to that which he reluctantly inherited.

None of the complainants can, because there is no alternative. There never was an alternative. Those who planned the roads and the railways, the schools and universities, the factories, the dams and who gave us electricity, clean water and enough food to feed a growing population were the colonialists or the settlers or whatever one wants to call them. The social legacy of colonialism is deplorable, but the material benefits are there to be used.

Colonialism was an important political development that commenced in the 16th century. Its basic aim was to expand trade and power. Certainly countries were exploited in the Middle East, the Far East, Australia (a British penal colony!), the United States and elsewhere. Some rebelled against European imperialism and control earlier than others, and gained independence. But some legacies like the Suez Canal became an endowment to the whole world. In Africa many of today's rail networks were built by the colonialists, and are still in use. Some are the only reliable links between towns. India's huge rail network built by the British was at one stage the only means of long distance travel in that country, and today that same rail network connects millions of people every day. We don't hear India publicly denigrating this colonial legacy! Similarly, the railways were instrumental in assisting the British Empire to decimate the Boer population during the Second Anglo-Boer war, but Afrikaners today are not too proud to benefit from this infrastructure. What alternative do they have? Similarly, what is the alternative to the 35 000 commercial farmers who feed South Africa's 55 million odd population?

Many countries originally colonized have become world leaders – Korea today is designated one of the world's top nations, in so many categories. Yet sixty years ago it was an ash heap, almost destroyed by war. Erstwhile colonies such as Indonesia, Vietnam, Malaysia, India and some countries

in Africa are thriving. Many would have given their eye teeth to have had a country like South Africa handed to them on a plate.

It should be noted that those who provide the world with financial and other aid to the developing countries that are now world powers, were developed by the progeny of colonialists. Former US President George Bush is a descendant of colonialists, as are the Australian, the Canadian and the New Zealand prime ministers.

Those who decry colonialism are, ironically, those who partake in it to the hilt. They communicate in the language of the colonialist, they wear Western clothes, drive Western cars and when they get sick, they head straight for Western hospitals. They sit in Western-style parliaments and utilize those systems to govern. They jet far and wide in Western airplanes, stay at Western-style hotels in Western capitals and usually present the begging bowl to the Eurocentrists in those countries.

The hypocrisy of this attitude is succinctly set out by John Kane-Berman, a fellow at the South African Institute of Race Relations. Commenting on the preposterous reaction to Ms. Helen Zille's tweet about colonialism in 2017, Mr. Kane-Berman says the reaction to her remarks about colonialism "reminds us yet again how vigorously free speech needs to be defended ... against the more insidious threat from all those virtue-signallers who would shut it down by intellectual intimidation and moral one-upmanship of the kind that has characterized some of the attacks on Ms. Zille by journalists and academics.

"South Africa's twin ruling parties, the African National Congress (ANC) and the SA Communist Party (SACP) rely heavily on depicting black people as helpless victims of various forms of white malfeasance, among them apartheid, colonialism, white monopoly capital, institutionalized racism and of course the ineradicable sin of "whiteness" itself. The presumption of helpless and irretrievable black victimhood serves to legitimize a powerful policy response. This includes legislation ... to "empower" people unable to do anything for themselves without the help of the state or the white man.

"This intrusive state ... also undermines individual effort and self-reliance on the part of the presumed victims making someone or something else the scapegoat for every ill that afflicts them. Somebody needs to resist this never-ending search for scapegoats among whites, some of them long dead."

"The debilitating ideology of victimhood" as Kane-Berman puts it is of course behind the blame game against colonialism. As we said, if you don't like what was bequeathed to you, start something yourself, an alternative. Otherwise leave well alone what needs to be left alone. No South African who knows history, let alone our country's world observers, are fooled for one moment that the finger pointing blame game is nothing more than a cover up for the State's inadequacies.

Bennie van Zyl, CEO, TAU SA

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