

# *AgTech – don't wait for the future, create it*

## Africa Agribusiness Insights Survey 2016



### **P43**

*Technology can address  
climate change*

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### **P45**

*We need a second green  
revolution*

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### **P53**

*Population growth and  
food security*





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# Foreword



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## **Frans Weilbach – Agribusiness Industry Leader for PwC Africa**

We are proud to once again deliver a publication for agribusinesses in Africa with insights gained from agribusiness CEOs working in Africa. In this year's publication we had the advantage of being able to use the prior year's survey results as a baseline for comparison.

We believe that agribusinesses have a critical role to play not only in future economic growth in Africa but also in global food security. Last year we looked at five global megatrends that will impact agribusinesses in Africa. This year we take a closer look at technological advances, with the focus on the importance of innovation in agribusiness and the significant impact it might have on the future.

On the one hand, the *Africa Agribusiness Insights Survey 2016* provides insights into the strategic challenges that CEOs face in their businesses, while on the other hand it highlights areas where technological innovation is already taking place and where it can make a difference in the future.

Each year we include one or two viewpoints from PwC directors in Africa on agriculture as a sector in their respective countries. This year we are featuring viewpoints from Rasheed Rahji from Nigeria and Edward Kerich from Kenya.

We trust that you will find this report useful and interesting and that it will assist you to better understand your business environment and encourage you to excel in reaching your strategic goals.



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## **Mark James – PwC Global Agribusiness**

Agribusiness is a hugely important sector for our firm globally. And within this, we have a keen focus on Africa. An abundance of natural resources, coupled with coherent strategic and operational plans, relevant partnerships and sufficient capital, offer great opportunities for value creation in African agribusiness. We are working closely with companies, governments and multilateral organisations to make this happen.



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## ***Agribusiness in Nigeria - a driver for growth and empowerment***

Nigeria is blessed with rich, natural geographical features in the form of climate, soil and water resources, which support diverse agricultural products. The northern region supports grains (such as millet, sorghum and maize) and groundnuts, while the middle part, which prides itself on being Nigeria's food basket, produces rice, tubers, fruits and vegetables. The eastern belt is ideal for growing tubers as well as oil palm, with cocoa being grown in the west. Livestock consists mostly of cattle, which graze the open fields of the north, and fishing along the coast and rivers (although fish farming is growing), while there are poultry farms in most parts of the country.

Agriculture contributed 24.18% to real gross domestic product in Q4 2015. This is attributable to ongoing investment in mechanised farming and to other activities in the agribusiness value chain such as processing, storage, packaging and delivery logistics. It is being fuelled in part by government owing to its focus on agribusiness as a driver for poverty alleviation, and in part by continued investment by commercial farmers.

Government's key strategy over the past few years has included providing easy access to inputs such as fertiliser, and facilitating access to agri-credit at concessionary rates. Recent expansion in retail outlets has also served as an outlet for agriculture. Those outlets have furthermore helped to encourage local and foreign investment in large-scale agribusiness.

Given the fall in the international price of crude oil over the past 18 months, government has encouraged agricultural exports as an alternative foreign exchange earner. Incentives such as the export expansion grant (EEG) and other tax incentives need to be reviewed, however, in order to further encourage export. In the second half of 2015, restrictions were placed on agricultural exports from Nigeria, particularly from the European Union, based on perceived concerns over quality. Government's support is critical, not only in helping to raise quality standards, but also in interacting with foreign agencies in addressing this issue. Other challenges that need to be addressed include inadequate infrastructure (storage and transportation), access to credit, and the training and education of smallholder farmers in modern farming techniques.

Adequate focus on these issues would improve Nigeria's food security, grow its GDP and increase its foreign earnings.



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## **Agribusiness insights from Kenya**

Kenya relies heavily on the agricultural sector as the mainstay of its economy, with agriculture contributing 29% of GDP. Kenya is sub-Saharan Africa's leading tea exporter and one of the world's largest black tea producers. Within East Africa, Kenya is the key producer, accounting for 59.6% of total production in Africa, well above its neighbours, Uganda (8.7%), Tanzania (5.1%), Rwanda (3.6%) and Burundi (1.2%).

Tea is grown mainly in the South Rift escarpments of the Rift Valley and in the Central Highlands. The main tea producers are large-scale subsidiaries of multinationals (e.g. Unilever, Linton Park and James Finlay), and small-scale farmers organised under the Kenya Tea Development Authority (KTDA).

Tea is a major cash crop, and the government of Kenya lists the tea industry as one of the pillars of its Vision 2030. The industry is a major contributor to economic growth and a major provider of employment – the business strategies adopted by the agricultural firms, and tea firms in particular, have important implications for poverty and equity concerns in the country.

Over the years, the tea industry has weathered various economic challenges to become a reliable and leading foreign currency earner for the country. The organisation of small- and medium-scale tea growers under the KTDA has facilitated joint management and marketing of the tea produce to realise economies of scale. This is also reflected in the purchase or importation of fertilisers in bulk, which would not have been possible for the small-scale farmers to do.

There has been noteworthy growth in tea output, attributable to good weather as well as increased total tea acreage, over the past decade, with a 6.3% three-year CAGR being recorded. Total output has grown 37.2% from 324m kg in 2004 to 444.8m kg in 2014. Small-scale farmers contribute about 64% of the total hectares under tea production.

Most of Kenya's tea is sold through the Mombasa tea auction, although there are some direct contract sales as well, particularly for multinational subsidiaries. Prices for direct contract sales are still based on the MSA tea auction prices.

A significant development in the sector is growth in the number of privately owned tea factories outside of those owned by the KTDA and the large multinationals in the country. There is also increased focus on value addition and product diversification into premium products such as green tea and purple tea. The yield per hectare is also improving following the introduction of higher-yielding clones and the replanting of tea bushes aged 30 years and older.

The contribution of the tea industry to the Kenyan economy is expected to continue growing, and the benefits realised will be enhanced as some factories move to cheaper renewable energy such as hydropower production.



# Our research

*This year's publication is aimed at providing agribusinesses operating in Africa with information about the most significant industry trends, with a specific emphasis on the importance of technological innovation and its impact.*

All research indicates that agribusiness in sub-Saharan Africa has substantial potential to grow in the next few years. According to the World Bank, it may potentially become a US\$1 trillion industry by 2030. Agri-related activities as a whole (including the wider agro-processing sector) already account for nearly half of the GDP in sub-Saharan Africa; yet the region houses about half of the world's fertile but unused land, offering the opportunity to further support food security and lower food imports (Afro-business Expo, 2015).

It is predicted that technological innovation will act as a catalyst in lifting agribusiness in Africa to the next level, and we aim to explore some of the opportunities it presents.

**Section 1** provides a high-level economic outlook by Dr Roelof Botha, economic advisor to PwC. Dr Botha highlights the most significant macroeconomic trends for agribusinesses in Africa.

**Section 2** contains the responses from chief executive officers (CEOs) of agribusinesses in Africa to our survey. We aimed throughout this section to also interpret the findings and add PwC insights, with a focus on technological innovation.

To gain further personalised viewpoints, we interviewed an agri innovation expert, Mr Jason Brantley MD of sub-Saharan Africa at John Deere and we share his thoughts with you in **Section 3** of the publication.

## The spotlight is on... technological innovation

Throughout this publication, topics are viewed through a technology lens to provide information on some of the most popular technological innovations in the sector.



The appropriate technology can help businesses to minimise the administrative burden of compliance.



Going forward it will be critical for agribusinesses to keep abreast of new technologies that could possibly assist with managing their carbon footprint, ISO standards, HACCP, B-BBEE scorecard (South Africa), etc.



The best way to maintain a competitive edge and stay ahead of your peers is to embrace technological innovation. We recognise the importance of seizing the opportunity to create new technologies through innovation. Technology should contribute to creating an enabling environment in which businesses can reach their strategic goals faster and more efficiently. Through this publication, we endeavour to share information on technological innovation that could impact the world in which agribusinesses operate, enabling them to make smart decisions that will position them properly for the future.



**Ben Viljoen**  
Project coordinator



**Anneline Hugo**  
Research analyst and co-author



**Marli Oostenbrink**  
Research analyst and co-author

# Highlights from the report

## What will the second green revolution mean on a practical level?

Most land across the globe that is suitable for farming is already being farmed today. Some significant areas that could still be farmed in Africa and Latin America are covered with forest or savannah that cannot be used for agriculture without harming these areas' natural biodiversity (FAO, 2010). In addition to finding more land, the effective use of existing land is critical. The only way to accomplish this is with the right technology.

Examples of approaches towards the second green revolution include:

-  • Breeding crop varieties that can withstand adverse conditions, such as salt-tolerant rice or more drought-resistant sorghums and millets;
-  • Soil nutrient cycling through crop rotation and biomass recycling;
-  • Reliance on genetic pest and disease resistance to replace or reduce chemical and mechanical pest control; and
-  • Integrated crop management strategies to control pests and diseases and maintain soil fertility.

(FAO, 2010)

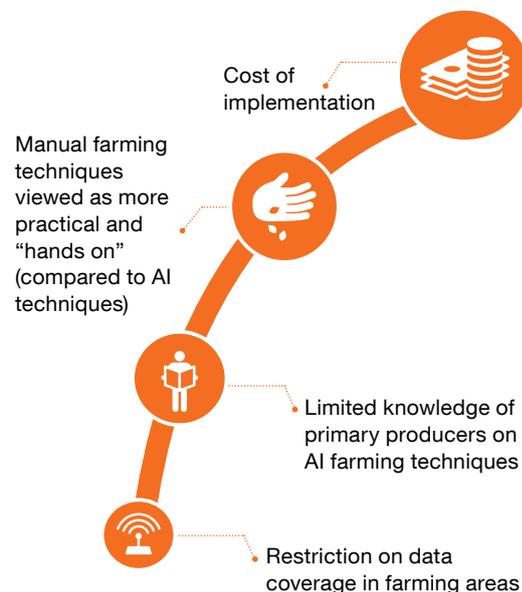
A promising

75%

of respondents were successful in their grant applications.



## Main restrictions to the use of AI farming capabilities



## Some of the most significant advances that are already revolutionising the agricultural sector include:



### Water-saving sensors

- Networks of wireless sensors
- Smart water management systems



### Precision drones

- Unmanned helicopters for crop spraying
- Precise aerial photography
- Soil and water surveys
- Spraying and watering assistance



### Chemical-free pest control

- Systems that can trap, count and monitor pests
- Systems that trigger the release of EPA-approved pheromones that disrupt pests' mating cycles
- Real-time field monitoring and targeted, automated responses



### Farming automation and management systems

- Interconnected machinery
- Machines that can inject fertiliser at precise depths
- Automated seed spacing based on soil fertility
- Measure harvest data in real-time

(Ericsson, 2014)

*Section* **1**  
*Economic  
outlook on sub-  
Saharan Africa*





# Sub-Saharan Africa – economic prospects, food security and water scarcity



**Dr Roelof Botha**

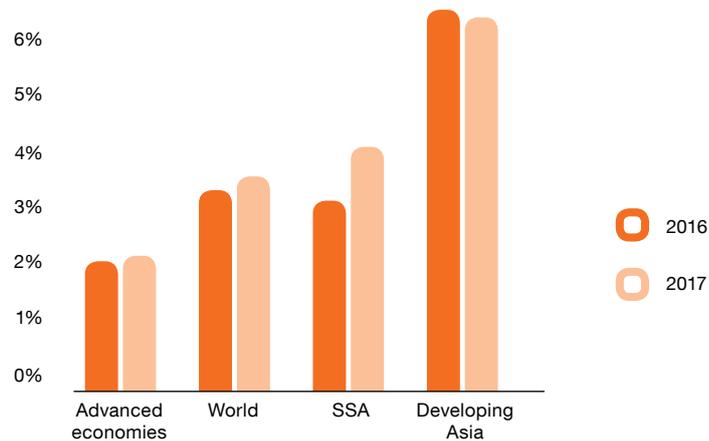
Economic advisor to PwC

Over the past four years, a prolonged commodity price slump, structurally lower growth in China and a lethargic European economy have combined to lower the GDP growth trajectory in sub-Saharan Africa (SSA).

Of late, the prospect of stricter monetary policy in the US has also served to subdue global growth prospects, although the International Monetary Fund (IMF) expects global growth to rise marginally to 3.2% in 2016 (from an estimated 3.1% in 2015).

The latest IMF global growth forecasts paint a gloomy picture for SSA in 2016, but a substantial recovery is expected next year (in contrast to countries in Asia, where economic growth is expected to remain high, but taper off slightly in 2017). The IMF expects real economic growth in SSA to return to the 5% level in 2018.

**Figure 1: Real GDP growth forecasts**



(Source: IMF)

It is clear that the latest IMF forecasts for countries in Africa are predicated on commodity prices remaining at the low levels recorded towards the end of 2015, hence the weak growth outlook for countries that rely heavily on commodity exports, including the three largest economies in SSA (Nigeria, South Africa and Angola).

**Table 1: GDP growth forecasts for 2016 – Top 14 economies in SSA**

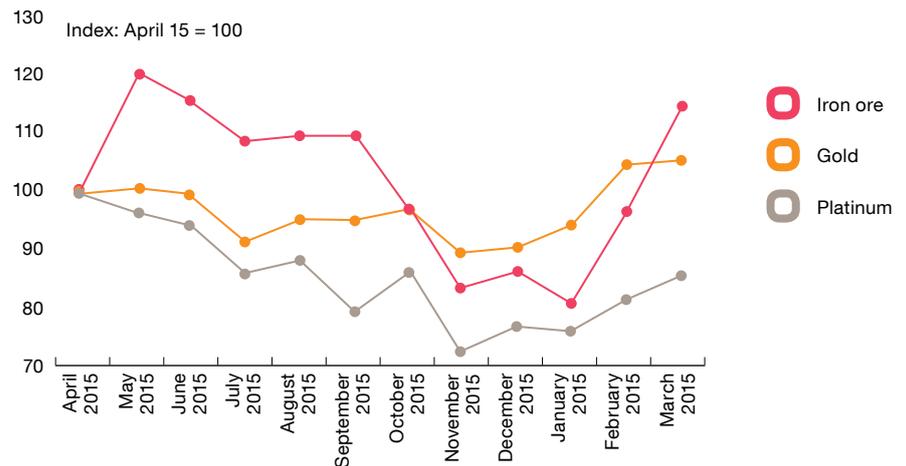
Côte d'Ivoire	8.5%	DR Congo	4.9%
Tanzania	6.9%	Ghana	4.5%
Senegal	6.6%	Ethiopia	4.5%
Kenya	6%	Zambia	3.4%
Mozambique	6%	Angola	2.5%
Uganda	5.3%	Nigeria	2.3%
Cameroon	4.9%	South Africa	0.6%

(Source: IMF)

It is clear from Table 1 that large divergences exist for the growth outlook within SSA, and that the top three are weighing the region down.

An end to the serious drought in several southern African countries and a reversal of the five-year commodity cycle slump remain key to the SSA region's growth outlook, whilst a constant need remains for improved public sector corporate governance and the expansion of basic infrastructure.

**Figure 2: 12-month price trends - gold, platinum and iron ore**



(Source: Thebe Securities, own calculations)

There may be good news in the offing on the first two counts – most metal and mineral prices have improved quite handsomely since the end of last year (see Figure 2) and any further momentum in upward commodity price trends could lead to significantly higher growth than the current IMF forecasts.

Furthermore, the World Meteorological Organisation seems confident that the unwelcome presence of a strong El Niño is poised towards a gradual decline during the second quarter of 2016 and may be replaced by a system that promises average to above average rainfall.

### Food security lacking

Table 2 provides the classification for SSA of the global food security index (GFSI), developed by the Economist Intelligence Unit (EIU) and sponsored by DuPont.

This model considers three core pillars of food security, namely affordability, availability, and quality and safety, covering 109 countries, including 28 from the SSA region.

Food security is defined as *the state in which people at all times have physical, social and economic access to sufficient and nutritious food that meets their dietary needs for a healthy and active life*. This framework is based on the internationally accepted definition established at the 1996 World Food Summit.

Nine of the ten lowest-ranked countries are from the SSA region, providing a clear indication of the substantial potential for developing the agriculture sector. The improvement of food security arguably represents the single most important objective that should be pursued by governments in southern Africa.

Table 2: 2015 Global Food Security Index – classification for sub-Saharan African (SSA) countries

<b>Good environment (score &gt; 63)</b>	<b>Requires improvement (score 33.7 to 41.2)</b>	<b>Requires improvement (continued) (score 25.1 to 33.6)</b>
South Africa	Kenya	Burkina Faso
Botswana	Ethiopia	Niger
	Mali	Togo
Moderate environment (score 41.7 to 46.1)	Nigeria	Zambia
	Sudan	Mozambique
	Malawi	DR Congo
Ghana/Benin	Angola	Sierra Leone
Côte d'Ivoire	Rwanda	Madagascar
Uganda	Guinea	Chad
Cameroon	Tanzania	Burundi
Senegal		

(Source: Du Pont/EIU GFSI)

A society that experiences hunger is also prey to low levels of immunity from a variety of diseases, and health is therefore compromised when food security is lacking.

The world is littered with the debilitating effects on the welfare of societies where governments have pursued policies in support of discredited ideologies such as extreme socialism and nationalisation, which do not incentivise surplus production for profit. Zimbabwe, Venezuela and North Korea serve as recent examples.

Policymakers that are sincere about improving the living standards of their citizens will take the improvement of food security seriously and prioritise strategies and initiatives aimed at reducing the vulnerability that accompanies under-nourishment, including cooperation with high-income countries that have attained the maximum degree of food security.

## **Water remains crucial**

It is fitting in an El Niño season to draw particular attention to the indispensable role of water in society in general and agriculture in particular. According to most authoritative references on resource economics, water represents one of the only natural limits to economic growth, and it is quite literally the life blood of primary food production.

The United Nations has warned that global water use is growing at twice the rate of global population growth. Unless this trend is reversed, two-thirds of the world's population will face so-called 'water stress' by 2025.

Working more carefully and effectively with water is therefore one of the greatest challenges facing the world today. Although food production is estimated to account for more than two-thirds of the earth's water footprint, lower water usage amongst urban households also has an important role to play in preserving water.

A comprehensive strategy aimed at the efficient use of water encompasses all the user groups in society. Water conservation policies will require adaptation to the characteristics of a particular country, as large differences exist in the global water footprint. In the US it is estimated at an average of 7 800 litres per person per day, whilst in China it is estimated at 2 900 litres.

Methods to lower a country's water footprint include the following:

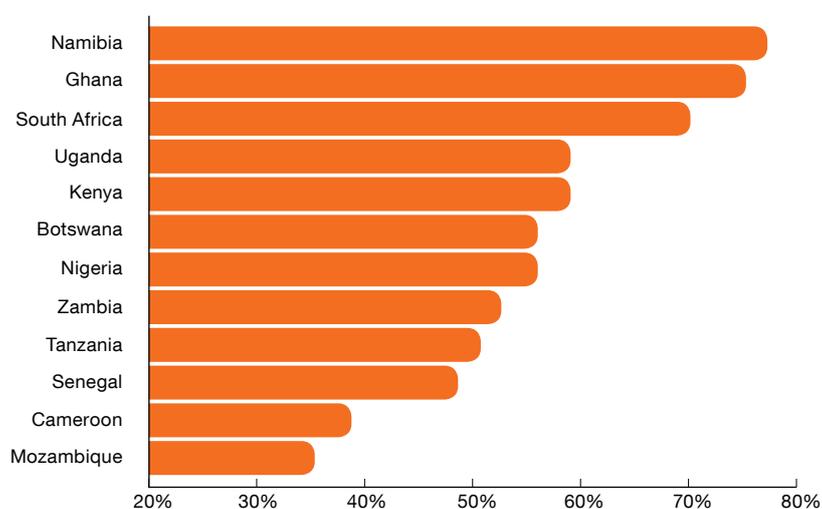
- Harvest rain water from roofs.
- Eliminate or minimise the watering of lawns and gardens through appropriate landscaping, including indigenous plants (especially succulents).
- Re-use bath water.
- Remove invasive alien plants.
- The use of water and energy is interlinked. Energy savings ultimately lead to lower water usage.
- Regularly inspect water pipes and taps. In the US, it is estimated that household water leaks waste more than 3.7 trillion litres of water each year.

In agriculture, the task of improved water utilisation is much more daunting, as substantial evaporation of surface water continuously occurs.

At the forefront of new innovations to meet the challenges of water scarcity are improved irrigation techniques (via drip systems), software designed to improve water reservoir retention, multiple cropping and the use of seed varieties that produce more drought-tolerant crops.

In Africa, water insecurity remains a vexing problem, as confirmed by data from the 2015 GFSI and also a recent survey by Afrobarometer (see Figure 3).

**Figure 3: Water security in selected countries in SSA - % of people with access to sufficient water**



(Source: Afrobarometer)

The latter involved 54 000 interviews in 36 African countries. Despite some infrastructure improvements, the results indicate that almost half (45%) of Africans went without sufficient clean water for home use during the past year.

One-third of surveyed communities lack access to a piped-water system, and two-thirds lack access to sewage infrastructure. The survey also found a high level of dissatisfaction amongst citizens over the performance of their respective governments in providing water and sanitation.

The results of the Afrobarometer survey on water and sanitation services are fairly closely correlated with the GFSI data. It is clear from Table 3 that access to potable water plays a significant role in the reduction of under-nourishment and also contributes to lowering the prevalence of poverty (data ranked by the lowest prevalence of under-nourishment).

Table 3: Global Food Security Index – selected indicators for SSA countries 2015 (%)

	Prevalence of poverty	Food loss (waste/supply)	Access to potable water	Under-nourishment
Ghana	51.8	19.2	81.3	5.0
South Africa	26.2	3.5	88.3	5.0
Cameroon	53.2	15.1	51.9	13.3
Nigeria	82.2	10.5	49.1	13.9
Côte d'Ivoire	59.1	7.7	67.8	20.5
Senegal	60.3	4.3	60.3	21.6
Angola	67.4	13.3	34.3	24.4
Botswana	27.8	4.0	92.8	25.7
Kenya	67.2	4.8	55.1	25.8
Rwanda	82.3	7.5	68.3	29.7
Uganda	62.9	7.4	71.0	30.1
Tanzania	73.0	10.1	44.0	33.0
Mozambique	82.5	12.4	35.0	36.8
Ethiopia	72.2	5.2	42.1	37.1
Zambia	86.6	3.0	49.2	43.1
Other developing countries				
Argentina	2.9	2.6	95.3	4.0
Chile	1.9	3.8	91.3	5.0
Turkey	2.6	9.0	98.8	5.0
Brazil	6.8	14.7	85.3	6.9
India	59.2	4.8	90.7	17.0

(Source: Du Pont/EIU GFSI)



## *Raising smallholder productivity*

In the quest for improving the productivity of agriculture, smallholders have been singled out as a top priority by both the McKinsey Global Institute (MGI) and the EIU. Approximately one-third of the world's population live on an estimated 500 million small farms.

In South Africa, the MGI estimates that between 10% and 13% of available agricultural land is farmed by smallholders and subsistence farmers, with 40% of the farm sizes ranging between 5ha and 20ha.

In terms of studies by the MGI and the EIU and research conducted by the author, the following specific policy interventions would stimulate significantly higher productivity in a crucially important segment of the agriculture sector. Several of these policies also apply to larger commercial farming operations:

- Switching to crops with a higher value, e.g. berries, tomatoes, eggs, avocado and tree nuts
- Improving soil management techniques
- Using seed varieties that are more drought and fungal resistant
- Facilitating enhanced access to financial support for working capital
- Processing beyond primary production, ideally through a co-operative venture that pools resources
- Facilitating access to new technologies in farming, including the optimisation of water usage and management techniques.

This list is not exhaustive, but serves to identify some of the key interventions that could collectively change the face of small-scale agriculture in SSA. A standard caveat in the implementation of these policies is the issue of training, mentorship and monitoring – an area where public-private partnerships could play a pivotal role.

From the public sector's side, an accommodating and flexible policy framework is required, supplemented by subsidised loans for farmers that have sound business plans and have conducted appropriate feasibility studies for securing access to markets.

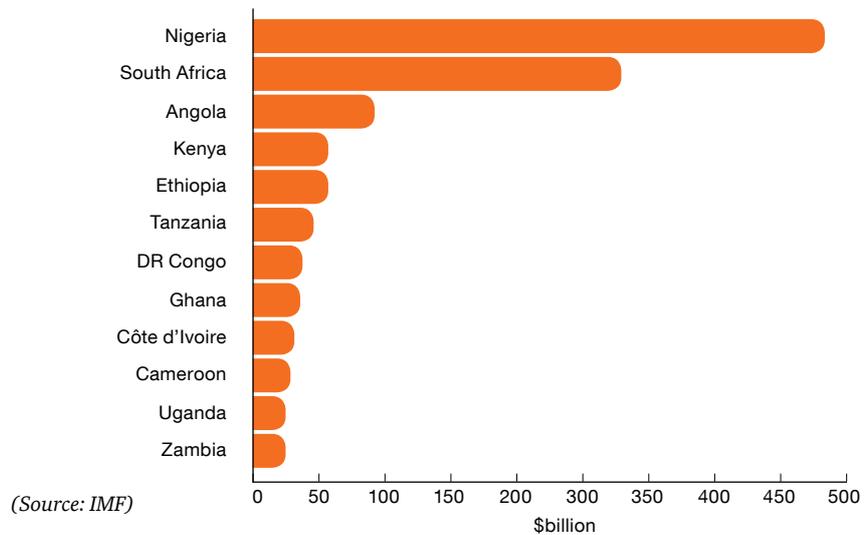
Furthermore, public sector agencies should provide incentives for private sector participation, especially in the field of training. Private firms could also play an important role in the areas of marketing and agro-processing.

## Concluding notes

In summary, it is encouraging to note that Africa is slowly but surely narrowing the gap in economic prowess with advanced economies. In 2015, the combined GDP of the twelve largest economies in SSA amounted to almost \$1.3 trillion (see Figure 4) – more than the combined GDP of Austria, Finland, Greece, Ireland and Portugal.

Other SSA countries that produced in excess of \$10 billion of output in 2015 are Mozambique, Senegal, Zimbabwe, Gabon, Botswana, South Sudan and Namibia.

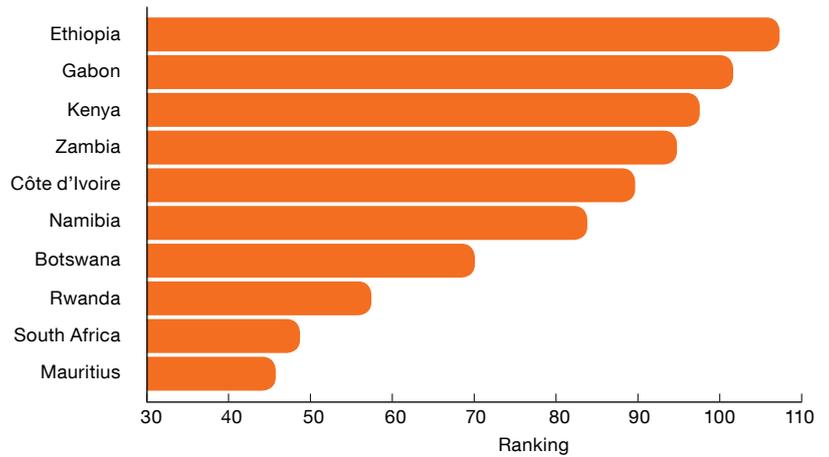
Figure 4: Largest 12 SSA economies



The next upswing in the commodity cycle, especially for metals and minerals, will undoubtedly hasten the pace of the relentless convergence of per capita income levels between Africa and Europe.

Several SSA countries possess an abundance of agricultural resources (land and water), and economic policies in some countries are increasingly focusing on improving the performance of the agriculture sector by, among other things, investing in irrigation, storage facilities, transport modes and training programmes.

**Figure 5: 10 most competitive economies in sub-Saharan Africa – out of 144 countries**



*(Source: World Economic Forum)*

Due to food production representing the mainstay of many African economies, significant gains in the global competitiveness stakes could be achieved by raising the productivity of the agriculture sector. It is clear from Figure 5 that SSA is still an under-performing region in terms of global competitiveness.

It has therefore become imperative for policymakers to create an economic and institutional environment that is more conducive to attracting foreign direct investment, especially in agriculture and food processing.

**May 2016**

# Section 2

## *Agribusiness in Africa – CEO insights*





*The speed of change in the global marketplace makes it increasingly difficult for organisations to predict the future without a significant degree of uncertainty. Organisations need to be fit for change and ready to evolve in tandem with changing business needs, new talent requirements and technological innovation. In light of this, agribusinesses need to understand how technology can improve and grow their business, innovate their talent management approach and enhance the customer experience.*

“Just as the industrial revolution did a century and a half ago, the digital revolution is reshaping the way we live our lives and the way we work; it’s also forcing a fundamental transformation of business – changing the relationship with customers, bringing new entrants and their disruptive technologies, driving new channels, products and services, breaking down the walls between industries and, in many cases, forcing a basic rethink of the business model.”  
(PwC, 18th Annual Global CEO Survey – 2015)

CEOs in the agricultural sector were asked to recount how their agribusinesses experienced the period from 2014 to 2015, and to comment on the agricultural landscape over that time. They responded to questions on various topics, including business growth, risk management, the role of government, people matters, cross-border expansion, technological innovation, population growth and food security, and the social impact thereof. In addition to these responses, current thought leadership and research were combined to provide the latest insights into the agribusiness environment. Throughout the publication, the topics and results are viewed through a **technology lens** to provide content focused on technological innovation.

“African farmers need more investment, better access to financial services such as loans, and quality inputs such as seeds and fertilisers” – Kofi Annan

## **Growing your business**

Economist Dr Roelof Botha, agriculture experts and CEOs participating in this survey all share optimistic sentiments about the growth in the agricultural industry despite the current tough economic climate (Mulaudzi, 2015).

Sub-Saharan African countries have been experiencing significant growth in recent years, with several factors contributing to their performance. First, macroeconomic reforms and stronger institutions, new technologies such as mobile phones and innovative ICTs, and higher commodity prices have been critical. Second, over the past decade, many African economies have undergone important transitions, mostly driven by a more interconnected, dynamic and complex global environment as well as other domestic changes that include increased urbanisation and rising urban incomes, and the associated higher demand for food (Suttie & Benfica, 2015).

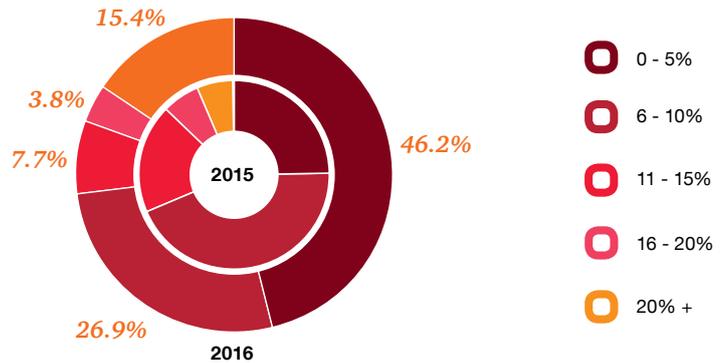
To sustain growth, it is critical that the agricultural sector adapts to change through agility and absorption, and that agribusinesses have strategies in place that deal with current as well as expected future trends. In this section, CEOs provide their views regarding revenue growth and business expansion for 2015/2016.



## Revenue growth

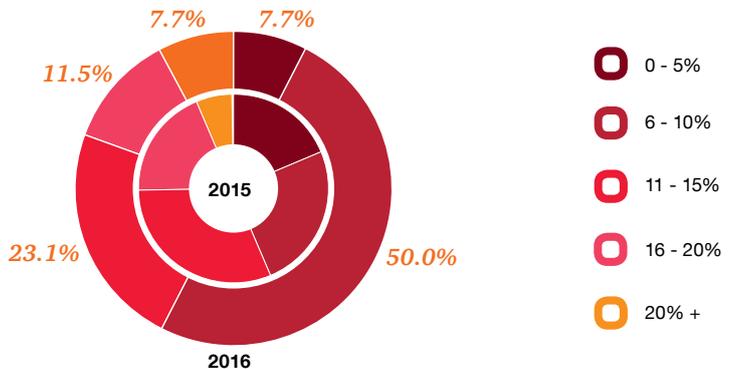
Participating CEOs are less optimistic about revenue growth over the next 12 months compared with their expectations a year ago. The majority of respondents (46.2%) are expecting revenue growth of between 0-5%, and 26.9% of respondents expect it to be between 6-10%. What is interesting to note is that the percentage of respondents expecting high growth (20%+) doubled from last year, as shown below.

### Revenue growth over the next 12 months



As for expectations regarding longer-term revenue growth, the largest group of respondents (50%) expect their revenue to grow between 6-10% over the next five years. During 2015, the expectation for revenue growth between 6-15% was 56.1%, compared to this year's 73.1%.

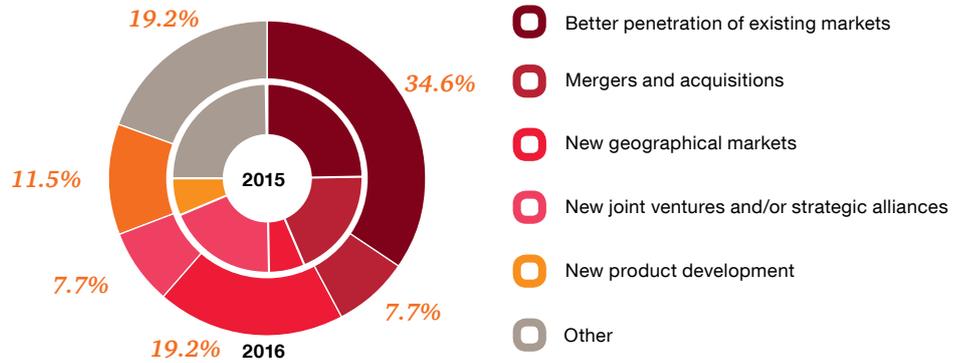
### Revenue growth over the next 5 years



## Business expansion

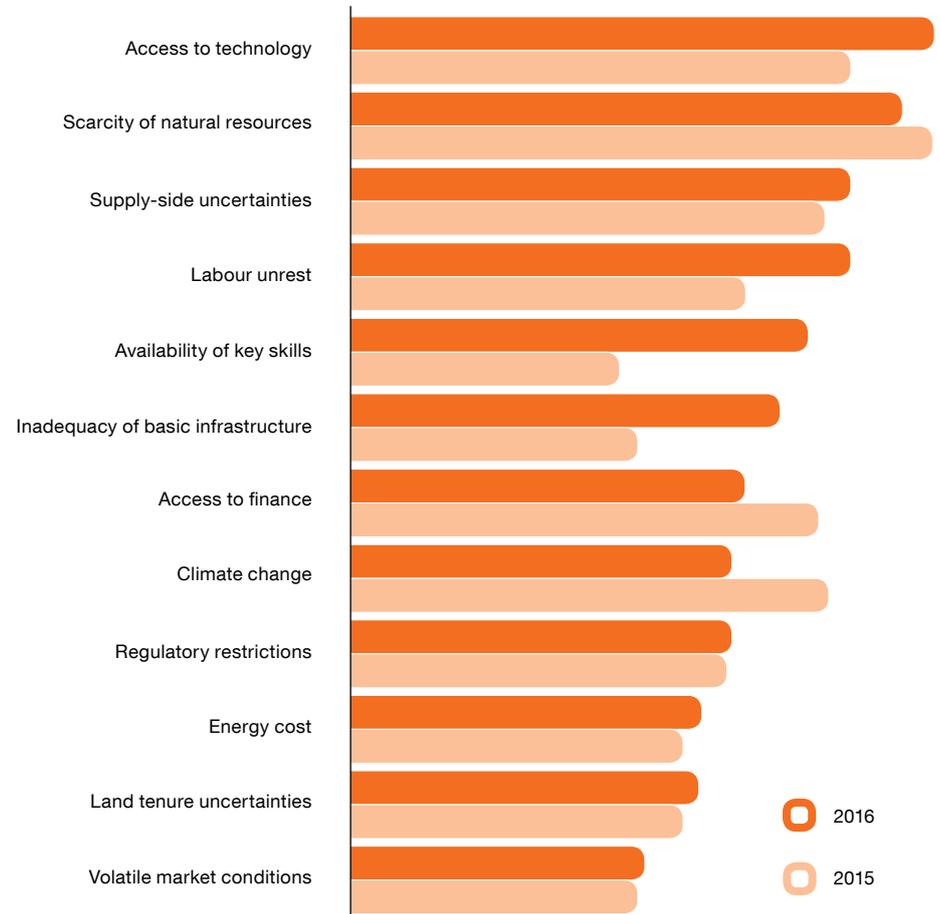
Consistent with the previous year's results, better penetration of existing markets was noted as the biggest opportunity for growth (34.6%) in the next 12 months. New geographical markets are also seen as an opportunity for business expansion. Expansion into other African countries is addressed later in this publication.

### Business expansion in the next 12 months



Respondents were asked to prioritise factors that pose the biggest challenges to business growth. Access to technology was prioritised as the biggest barrier to growth. Agribusinesses often struggle to fund new technological solutions, maintain the necessary support once technology has been implemented, and find the right solutions, tailored to their particular needs.

### Challenges to business expansion



## Risk management and compliance

Risk management refers to the identification, assessment and prioritisation of risks, followed by the coordinated and economical application of resources to minimise, monitor and control the probability and/or impact of adverse events.

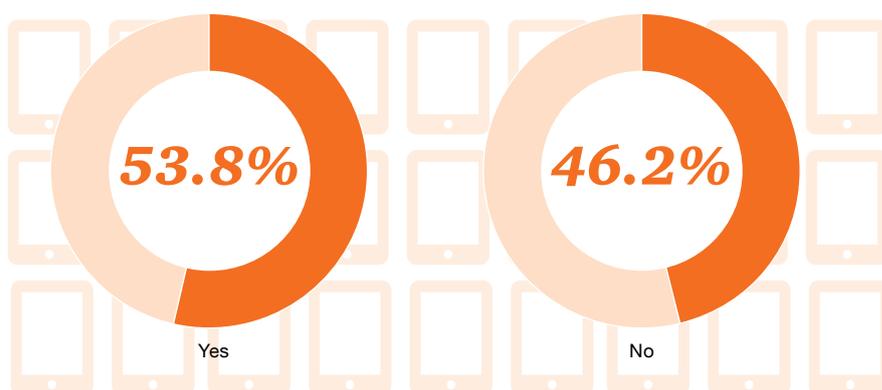
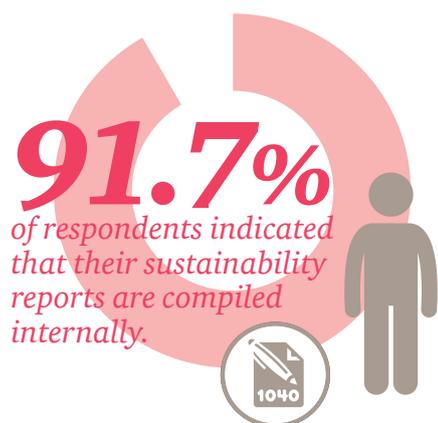
The challenge for businesses is that risk management and compliance, while necessary, can be extremely time consuming and distract attention away from the business' main focus, thereby becoming a burden instead of a tool. It should always have the core function of enabling the business to reach its goals successfully.

### Integrated reporting

One of the ways in which risks can be managed is by including financial, social and environmental indicators for the business in an annually prepared integrated or sustainability report.

According to the experts, there is a clear correlation between sustainability and long-term performance. Reporting on sustainability is therefore becoming increasingly important. 53.8% of our respondents indicated that they prepare an integrated report:

*Do you prepare an integrated report, including sustainability reporting?*



### Technology and integrated reporting

Tools and technologies can be applied successfully to make corporate reporting faster, more efficient, more accurate and better integrated into normal business processes, enhancing the experience of the users of reports, who are often different stakeholders of the business. Technology can assist by:

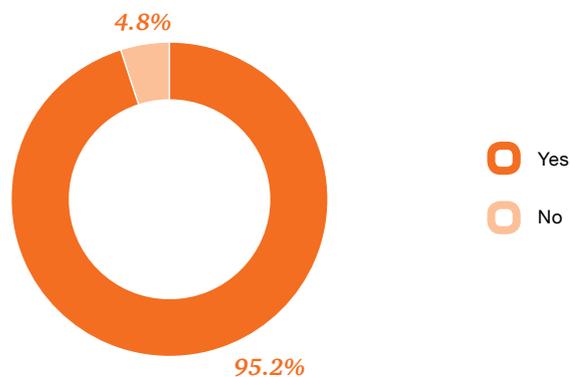
- ⚙️ Facilitating the reporting process,
- 🧠 Enhancing integrated thinking,
- 📊 Capturing narrative elements of financial and non-financial reporting, and
- 🗨️ Facilitating the audit and assurance of an integrated report.

## Assessing risk

Risk assessment provides a mechanism for identifying which risks represent opportunities and which represent potential pitfalls in order that the business may respond in a proactive manner. A robust risk assessment process, applied consistently throughout the business, empowers management to better identify, evaluate and exploit the right risks for their business, all the while maintaining appropriate controls to ensure effective and efficient operations and regulatory compliance.

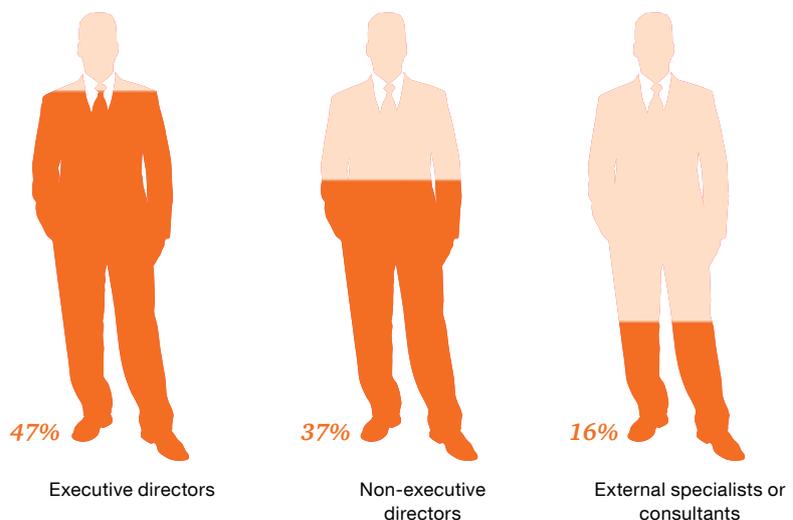
80.8% of respondents indicated that they delegate risk responsibilities to a specific board committee (an increase from 75% in the 2015 survey). 95.2% of respondents further indicated that their businesses conduct periodic formal risk assessments.

### Are formal risk assessments conducted periodically?



On average, the representation on risk committees is 47% executive directors, 37% non-executive directors and 16% external specialists or consultants. This is a healthy mix of the different parties contributing to the risk management process.

### What is the make-up of your risk committee?

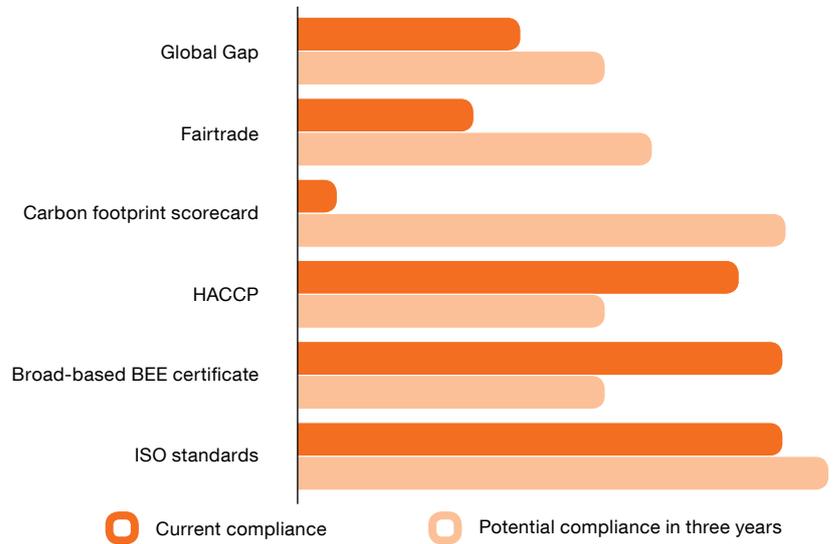




## Compliance

Compliance in the form of accreditations, systems and scorecards brings legitimacy to claims of sustainability and forms an integral part of the responsibilities of an agribusiness. The importance of this is seen in the number of agricultural industry bodies setting up a compliance desk to assist their members in this endeavour.

### Compliance accreditation



Currently, most respondents prioritise the implementation of ISO standards and have broad-based black economic empowerment (B-BBEE) initiatives. B-BBEE is specific to South African businesses.

For most respondents, future plans seem to include compliance in the form of a carbon footprint scorecard. This begs the question whether there is currently enough assistance in the market with carbon measurements. The fact that current compliance is low but potential compliance contrasts so significantly may point towards a need for assistance and support in this regard.



The appropriate technology can help businesses to minimise the administrative burden of compliance. The key is to integrate different compliance systems for which certain data need to be captured and measured routinely, in order to eliminate duplication. Industry bodies often provide assistance in the form of industry-specific compliance guidelines. There is further value for larger companies in appointing an in-house compliance officer.

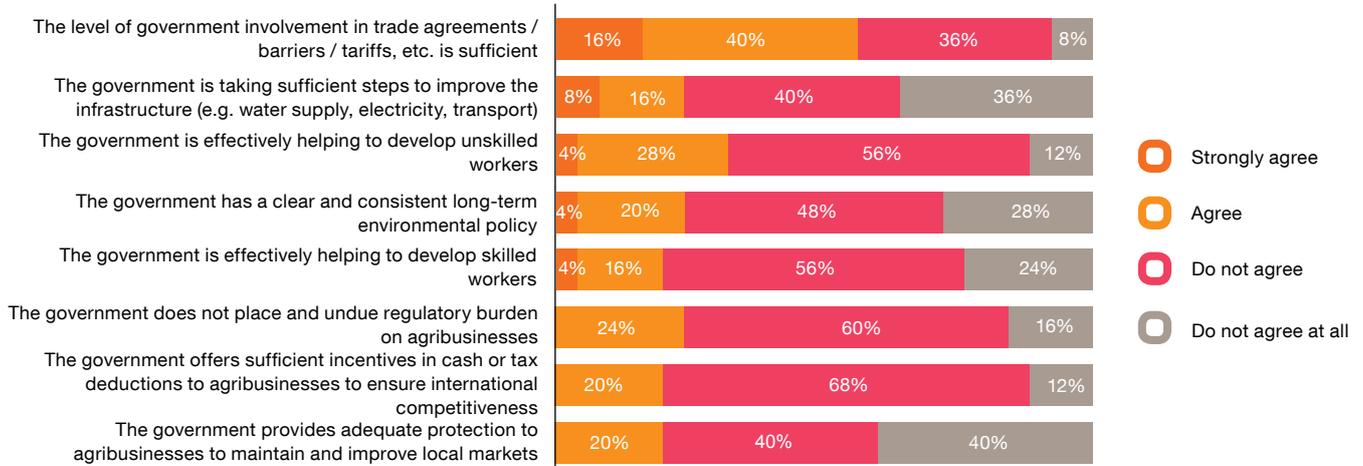
Going forward it will be critical for agribusinesses to keep abreast of new technologies that could possibly assist with managing their carbon footprint, ISO standards, HACCP, B-BBEE scorecard (South Africa), etc.

## Role of the government

Agriculture in Africa has a central part to play in ensuring food security, providing job opportunities and improving infrastructure. The role of the government in this is to create an enabling environment in which agricultural businesses can flourish and thereby contribute to the economy, infrastructure and social development in the areas in which they operate. Public-private partnerships will be critical in realising the future potential of the agricultural sector in Africa.

The following graph illustrates our respondents' perceptions of the level of support that their governments provide:

### Role of government



## Government grants

# 32%

*of respondents have applied for government grants during the past year.*

Specific mention was made of the following programmes:

- Youth subsidies and grants
- Zimbabwe Economic Trade Revival Facility (ZETREF)
- Manufacturing Competitiveness Enhancement Programme (MCEP)

*A promising*

# 75%

*of respondents were successful in their grant applications.*





The role of information and communication technology (ICT) is going to be critical if productivity in Africa is to be improved. There has been a rapid expansion of ICTs in Africa over the last few years, creating an important opportunity to improve the performance of agricultural value chains in Africa, from farm to market. Several potential avenues are available at each stage of the value chain to improve productivity, and all stakeholders may benefit, including business organisations, farmers, governments and researchers.



**Pre-cultivation:** ICTs have several uses, ranging from crop selection to the development of crop insurance products, enhanced land and water use and so forth.



**Crop cultivation and harvesting:** ICTs can generate valuable information on land preparation and sowing, crop health, input management (such as fertilizer selection), and pest and water management.



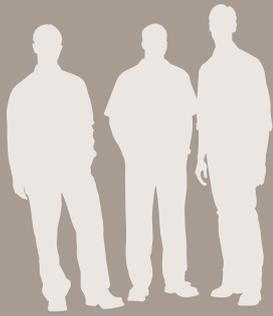
**Post-harvest:** ICTs can provide market information that may be crucial to increasing market efficiency.



**Other uses:** Other potential uses of ICTs include the traceability of food and animals.

*(World Economic Forum, 2015)*





Average number of employees per agribusiness:

**1608**  
employees

Permanent employees:

2016: **56%**

2015: **50%**

Casual/Contract workers:

2016: **44%**

2015: **50%**

## People matters

Human resources (HR) models are beginning to evolve. Far more emphasis is being placed on technology to improve networks and data, and HR is increasingly being seen as a consulting function that is capable of providing insights and strategic advice to management.

However, it is important to remember that whatever technological innovations may lie ahead, it is the organisation's people who will eventually determine its success or failure. Agribusinesses need a people strategy for the digital age that will change and innovate current HR approaches.

In 2014, PwC surveyed approximately 150 organisations from around the world to find out whether their operational teams, and more specifically their HR teams, are equipped to meet business expectations. Results confirmed that HR operational excellence, supported by technology, drives business outcomes. A compelling user experience, workforce intelligence and sustaining the talent pipeline through predictive workforce analytics play a key role in setting top performers apart from other organisations.

### HR Operational excellence drives business outcomes

*What sets top performers apart?*



Compelling user experience

Increase workforce productivity by minimising the time that people spend on operational processes



Applying value-adding workforce intelligence

Increase workforce engagement through innovative and intuitive technology

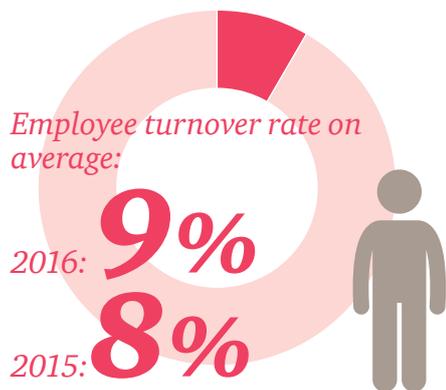


Sustaining the talent pipeline

Enable new market entry and product development through robust workforce planning

Anticipate talent risks through predictive workforce analytics

(PwC, Operational excellence in HR – Global survey 2014)



### Employee turnover

The employee turnover rate of an agribusiness is defined as the number of permanent employees that left the business, regardless of their reason, divided by the average number of permanent employees, during the past 12 months. Respondents indicated that their employee turnover rate had increased slightly to 9%. It is interesting to note that employee turnover was rated as the fourth-biggest human resource challenge for agribusinesses during this year.

### The value of an HR function

Most HR functions are simply looking at how they can improve what they are already doing, as opposed to investigating new innovative HR approaches to support the business. The frontrunners in HR excellence and innovation recognise the crucial importance of understanding and meeting today’s more demanding employee expectations. This is leading to a radical rethink of how HR interacts with and supports the business.

“People expect HR operations to provide the same user-friendly experience they have become accustomed to in other areas of their lives. Is your organisation delivering?”  
*(PwC, Operational excellence in HR – Global survey 2014)*

Once again, all respondents (100%) indicated that their agribusinesses have internal HR functions as opposed to outsourced HR functions. It was noted that these internal HR functions still focus the majority of their efforts on transactional activities such as administration, disciplinary procedures and recruitment.

“Organisations also want HR to inform workforce plans with the same rich data and analytics used in customer profiling and other forms of business intelligence.”  
*(PwC, Operational excellence in HR – Global survey 2014)*

### Providing value-adding workforce intelligence

Agribusinesses are looking to their HR teams to provide not only basic services and transactional activities but also strategic insights and workforce intelligence. Insightful workforce planning is needed to meet strategic objectives and business-wide goals. The data collected by HR can provide invaluable information on performance, recruitment needs, HR challenges and employee satisfaction.

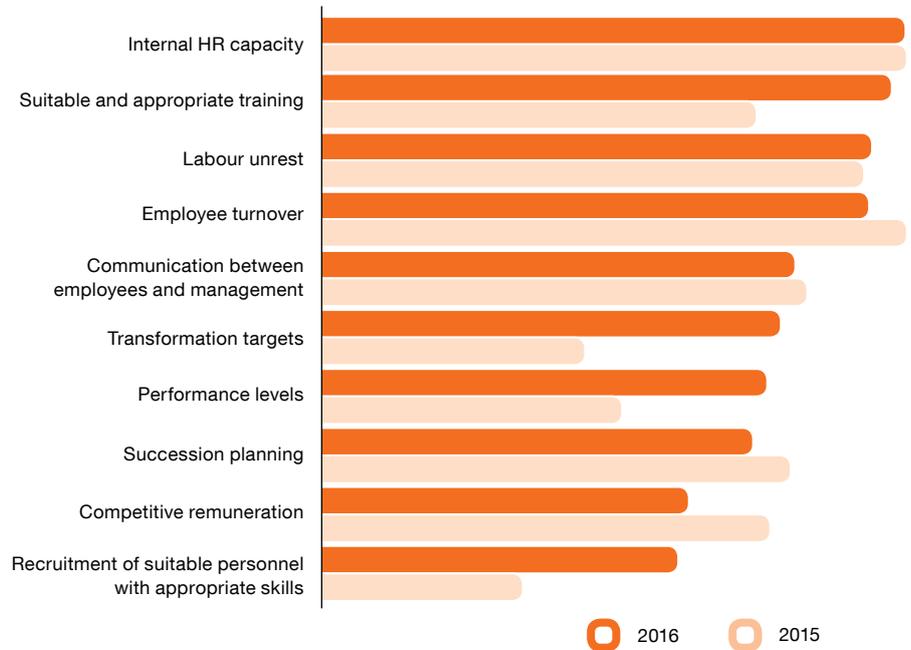
Together with user-friendly, technology-supported HR services, the ability to collect, collate and communicate information effectively is a crucial measure against which HR functions are increasingly being assessed by the business. It is thus key that HR functions consider whether the systems, data and reporting capabilities they have in place can deliver the required quality of analysis and insight.



## Overcoming HR challenges

It is incredibly difficult to build a successful agribusiness without the support of an effective, capable HR function. The HR function is often viewed as being merely a supporting function, whereas we believe it could be an enabling function, working with the organisation to achieve business goals. The graph below indicates the key challenges agribusinesses are facing, with internal HR capacity being rated as the most prevalent challenge.

### HR challenges



**64.7%**

of participating agribusinesses have a talent management strategy in place



## Talent management

Talent management is broadly defined as a set of integrated organisational HR processes designed to attract, develop, motivate and retain productive, engaged employees. The goal of talent management is to create a high-performance, sustainable organisation that meets its strategic and operational goals and objectives (TMOD, 2015).

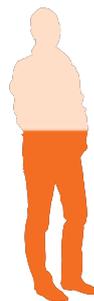
Success in the digital world with new technology demands new ways of thinking, especially when it comes to talent. It is comforting to note that 64.7% of participating agribusinesses have a talent management strategy in place. Only 29.4% of respondents do not have one in place, and 5.9% intend to develop a talent management strategy over the next 12 months.

Finding training programmes that will add value is the most prevalent current challenge for talent management, as seen in the graph:

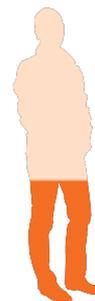
### Talent management challenges



Finding training programmes that will really add value



Being able to pay market related salaries for talent (having to compare to businesses in cities)



Retaining employees in my business (often rural areas)



Attracting the appropriate employees (i.t.o. skills and experience)



For agribusinesses to effectively manage their talent, it is key that HR teams address specific questions to ensure they are meeting the raising HR bar. Again, technology is the underlying factor in ensuring the future success of the HR function .



**1. Do you know how to engage more closely with your employees?**

The aim should be to support employee engagement with technology. For example, self-service as first point of contact improves the employee experience and reduces operating costs. Ask yourself: Could your technology be doing more to support your employees' HR experience?



**2. Are you able to cut through the fog of data in order to deliver real insights for your agribusiness?**

By focusing on having optimised and highly integrated systems with minimal customisation, businesses can ensure that they are ready for what the future might bring. Ask yourself: Is your technology solution right for today and flexible enough to deal with future demands?



**3. Are you attracting and retaining the right people and do you know how your talent needs are going to change?**

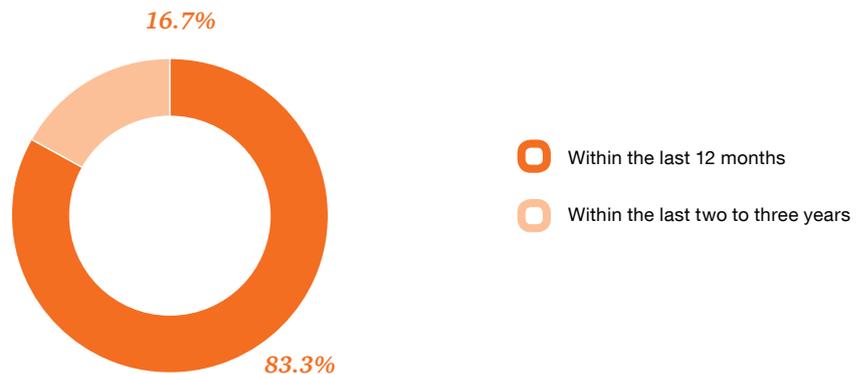
Agribusiness should apply the same rigour to internal HR talent management as they do to talent management in the wider business. This will ensure that they get the best out of their people and that they are meeting the career needs of their HR team. Ask yourself: Do you know how to get the best out of your talent, including operational teams such as HR and Finance?

*(PwC, Operational excellence in HR – Global survey 2014)*

## Organisational structure

Organisational structures provide guidance to an organisation by laying out the official reporting relationships that govern the workflow of the business. If a business' structure has a formal outline, it makes it easier to add new positions, as well as providing a flexible and ready means for growth. It is comforting to note that 83.3% of agribusinesses have reviewed their organisational structure within the last 12 months.

### Organisational structure/organogram reviewed



## Recruitment

In recent years, the automation of recruiting and hiring has developed beyond the traditional job boards and newspaper advertising.

### How is technology impacting recruitment?



#### 1 Social media recruiting

Social media tactics include video interviewing and considering a candidate's social media profiles as part of an application.

#### 2 Applicant tracking systems (ATS)

An ATS or candidate management system is a software application designed to help organisations recruit employees more efficiently by posting job openings on a corporate website or job board, screen resumés, generate interview requests to potential candidates by email, pre-screen questions and track responses.

(Reilly, 2013)

#### 3 Mobile recruiting

Career pages should be optimised for a mobile experience that creates a mobile-friendly application process.

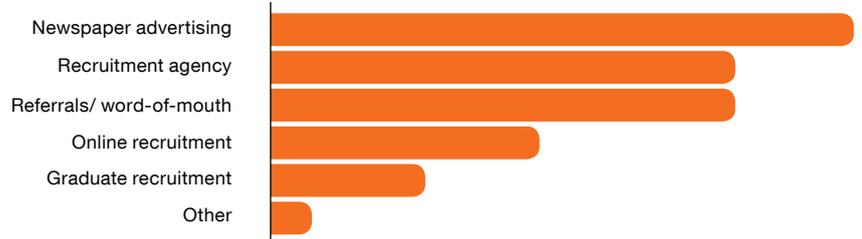
#### 4 Job boards and career pages

Career-based websites like LinkedIn have advanced automated outreach functionalities which can be tailored to specific candidates and organisations.

Mobile recruiting dictates that job boards and career pages need to be optimised for mobile, and that positions posted on job boards and career pages ought to be shared on social media also. An ATS can help to quantify how many resumés came through the job board, versus a referral or social media source.

The majority of agribusinesses (88.2%) use various methods of recruiting as opposed to only one method. These include newspaper advertising, graduate recruitment, online recruitment and recruitment agencies.

### Methods of recruitment



Training budget as percentage of payroll:

**4.9%**

Training budget as percentage of revenue:

**2.1%**

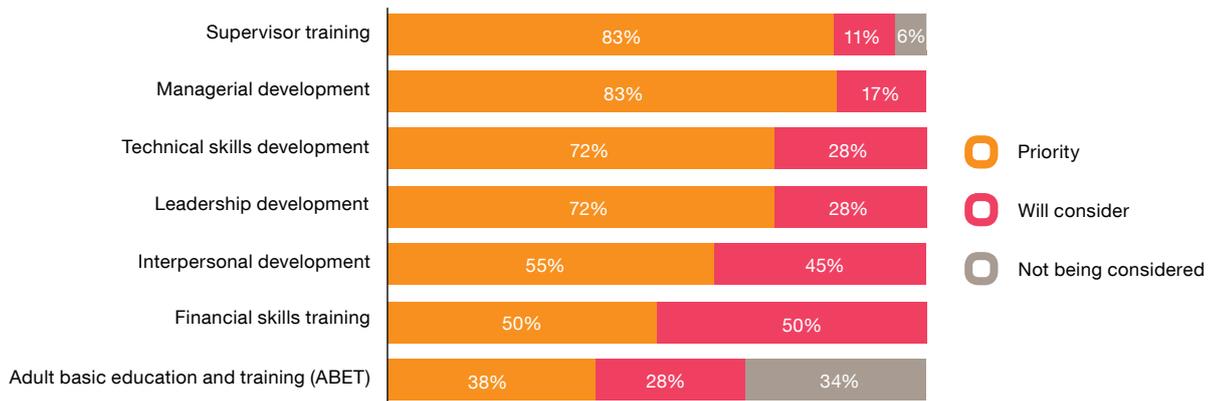


### Learning and development

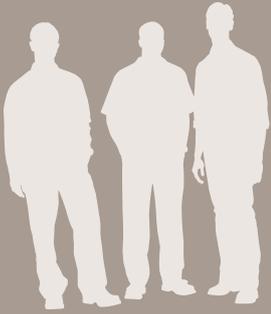
Respondents highlighted 'finding suitable and appropriate training' as the second-biggest HR challenge and 'finding training programmes that will add value' as the most prevalent challenge to talent management. This clearly points out an issue that needs to be addressed not only by individual agribusinesses but by the industry as a whole.

The development and implementation of a comprehensive learning and development strategy for the agricultural sector which incorporates the needs and focus areas of the various commodities would add significant value. Such a strategy would provide a roadmap for learning and development in the agricultural sector and realise the benefits that can be attained from greater collaboration, improved access to funding, the transferability of skills and the quality assurance of learning delivery and reporting.

### Role of government



The agricultural sector has prioritised supervisor training and managerial, technical, leadership and interpersonal development going forward. Industries the world over are increasingly realising the benefits of technology-based approaches to the delivery of training as alternatives to classroom-based learning. These include e-learning, online learning and cellular-based learning technology. This form of learning is relatively inexpensive and easily accessible, suits the learning styles of younger generations and is ideal for the delivery of both technical and non-technical training programmes.



Agribusinesses using manual performance management systems:

**83.3%**

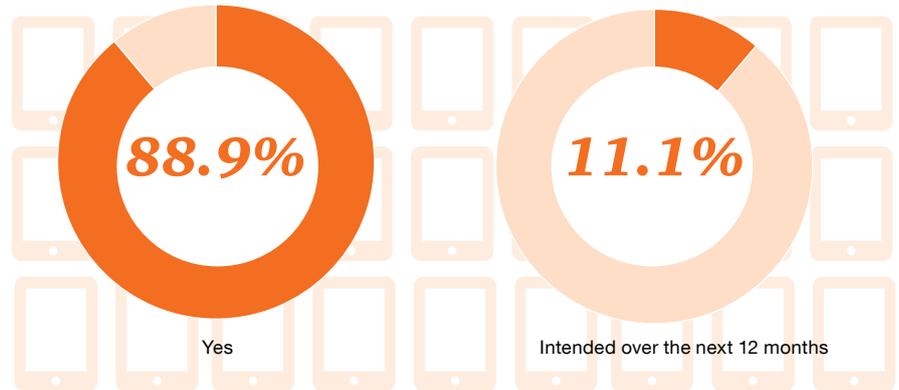
Agribusinesses using electronic performance management systems:

**16.7%**

## Performance management

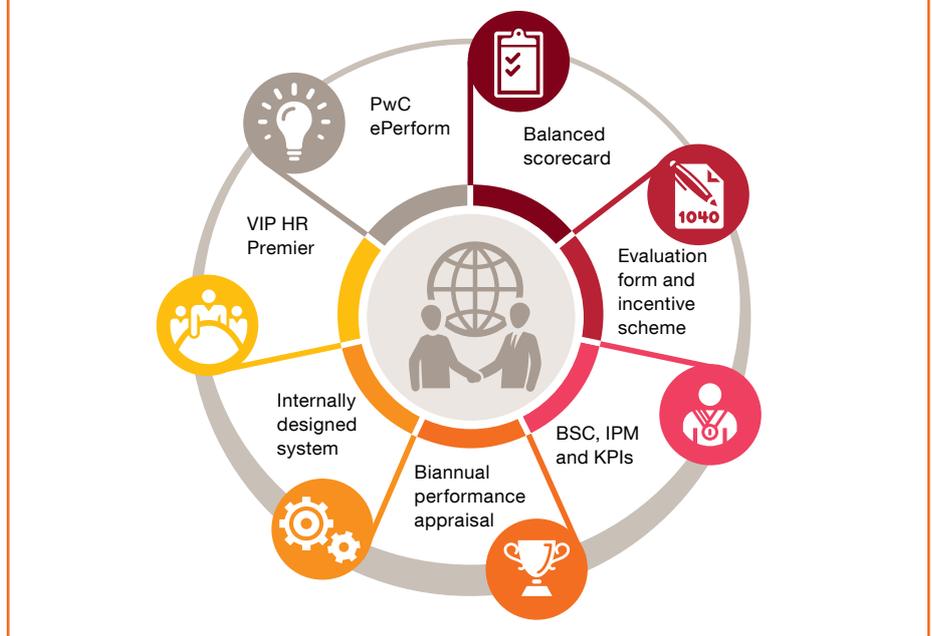
An overwhelming 88.9% of respondents indicated that they have performance management systems in place to improve performance and to develop the capabilities of employees. The remaining respondents (11.1%) intend to set up a performance management system over the next 12 months.

*Does your organisation have a performance management system?*



The majority of agribusinesses use a manual performance management system, which illustrates the need for technological innovation in this regard.

*Examples of performance management methodologies and systems used:*



PwC developed a web-based performance management application, ePerform, that provides for a seamless integration between strategic, organisational and individual performance, thus simplifying the performance planning, measurement and reporting processes.

Participating agribusinesses experience various frustrations and challenges when it comes to performance management, summarised below. It is worth noting that many of these challenges can be addressed by means of an electronic or web-based performance management system.



### Benefits of an automated performance management system:

#### Time saving

- Automatically generate evaluation forms from performance plans, reducing administrative time.
- Online/Web-based applications provide employees and managers with instant access to all required forms to do evaluations.
- A portfolio of evidence can be stored on the application, thus eliminating the need to store paper-based files.

#### Reporting and trends

- As data is centrally stored, dashboards can provide valuable information on past and present performance.
- Improvements in the employee/organisation can be measured over time (monthly, quarterly and annually).

#### Best practices

- Systems like ePerform contain industry best practice standards, such as aligning individual goals to organisational objectives, cascading across the organisation and objective rating scales.

#### Responsibility

- Objectives can be linked to individuals, thus individuals can easily see those aspects they are responsible for.

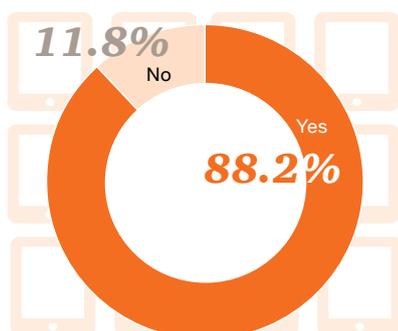
#### Objectivity and accuracy

- A standardised performance calculator assists in measuring objectively across business units or different employees.

#### Culture

- Electronic performance management applications assist in developing a culture of excellence, as individuals are able to relate their work to organisational success.

Does your organisation offer short-term incentives/performance bonuses?



### Remuneration and reward

The majority of agribusinesses offer short-term incentives or performance bonuses to their employees.

To conclude this year's *People matters* section, it would not be amiss to say that HR has often been perceived as a passive, service-oriented function. However, given the demands of tomorrow's workplace and business environment, we believe HR is at a crossroads: armed with a proactive mindset and a focus on business strategy, it would do well to turn towards a new wider people remit that includes incorporating and influencing many other aspects of the business.

## Cross-border expansion

Africa's economic performance over the past decade has been remarkable, showing an average growth of 5%. If this growth is maintained, projections indicate that Africa's gross domestic product should increase approximately threefold by 2030 and sevenfold by 2050, exceeding Asia's growth (Lopes, 2014).

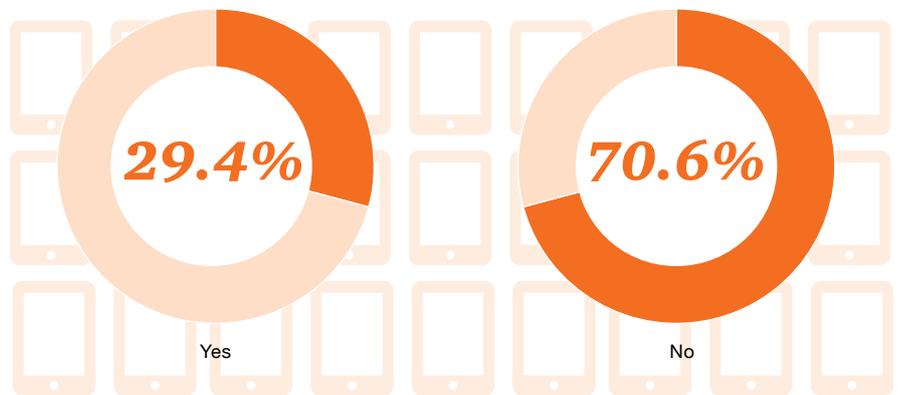
The agriculture sector, regarded as one of the most critical industries for the African continent due to its economic potential, is projected to become a US\$1 trillion industry in sub-Saharan Africa alone by 2030 (Spintelligent, 2014).

“Improving agriculture, the backbone of the African economy, can drive massive poverty reduction and improve life across the continent.”  
– Bill Gates

### Expansion in Africa

The vast majority of respondents (70.6%) indicated that they had not yet invested in African countries other than their own.

*Are you currently invested in African countries other than your own?*





## Key indicators on some African countries

### Tanzania

Population (millions)	46.3
GDP (US\$ billions)	32.5
GDP per capita (US\$)	703.08
GDP (PPP) as share (%) of world total	0.09

#### Global Competitiveness Index:

Rank /140 countries	120
Score	3.6

### Zambia

Population (millions)	14.5
GDP (US\$ billions)	22.4
GDP per capita (US\$)	1541.76
GDP (PPP) as share (%) of world total	0.03

#### Global Competitiveness Index:

Rank /140 countries	96
Score	3.9

### Malawi

Population (millions)	17.1
GDP (US\$ billions)	3.8
GDP per capita (US\$)	222.88
GDP (PPP) as share (%) of world total	0.02

#### Global Competitiveness Index:

Rank /140 countries	135
Score	3.2

### South Africa

Population (millions)	53.0
GDP (US\$ billions)	350.8
GDP per capita (US\$)	6620.72
GDP (PPP) as share (%) of world total	0.69

#### Global Competitiveness Index:

Rank /140 countries	49
Score	4.4

### Kenya

Population (millions)	44.4
GDP (US\$ billions)	45.1
GDP per capita (US\$)	1016.49
GDP (PPP) as share (%) of world total	0.09

#### Global Competitiveness Index:

Rank /140 countries	99
Score	3.9

### Botswana

Population (millions)	2.1
GDP (US\$ billions)	14.8
GDP per capita (US\$)	7135.92
GDP (PPP) as share (%) of world total	0.04

#### Global Competitiveness Index:

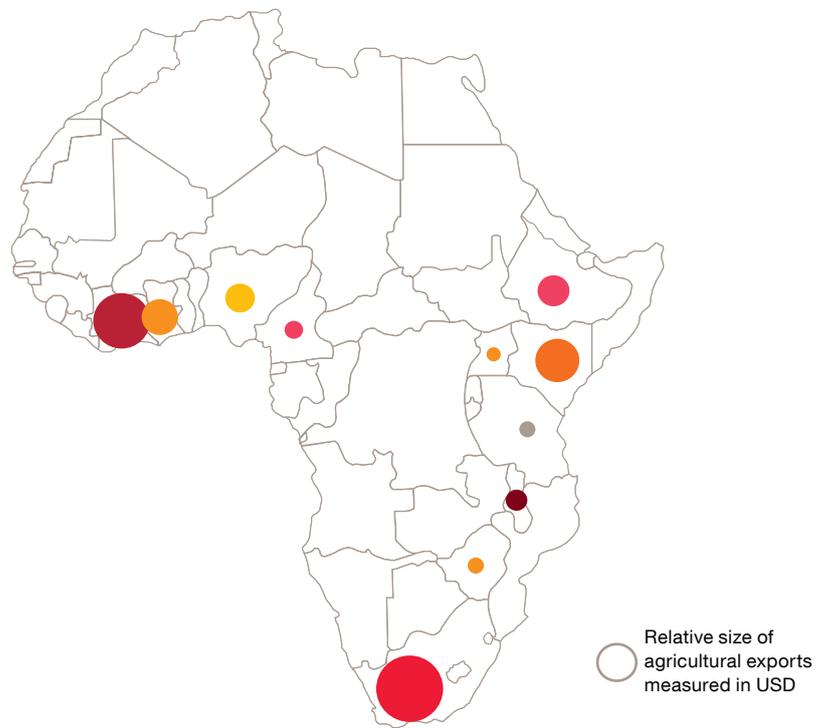
Rank /140 countries	71
Score	4.2

(World Economic Forum, 2015)

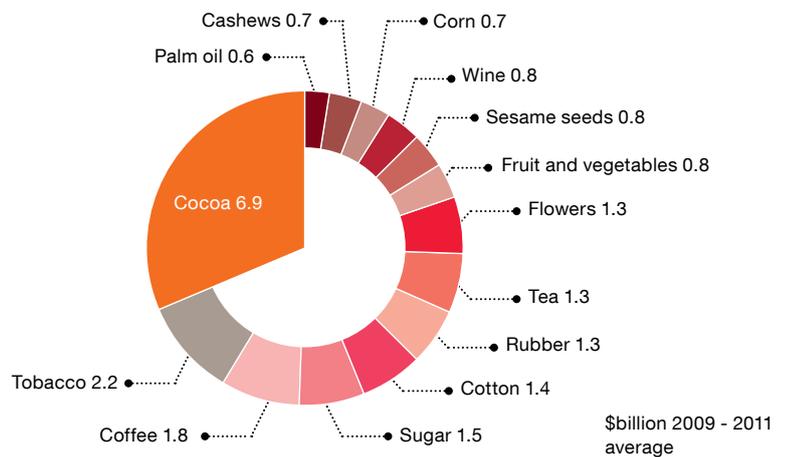


## Agricultural value chains in sub-Saharan Africa

### Main agricultural exporting countries



### Most significant agricultural commodities exported from this region

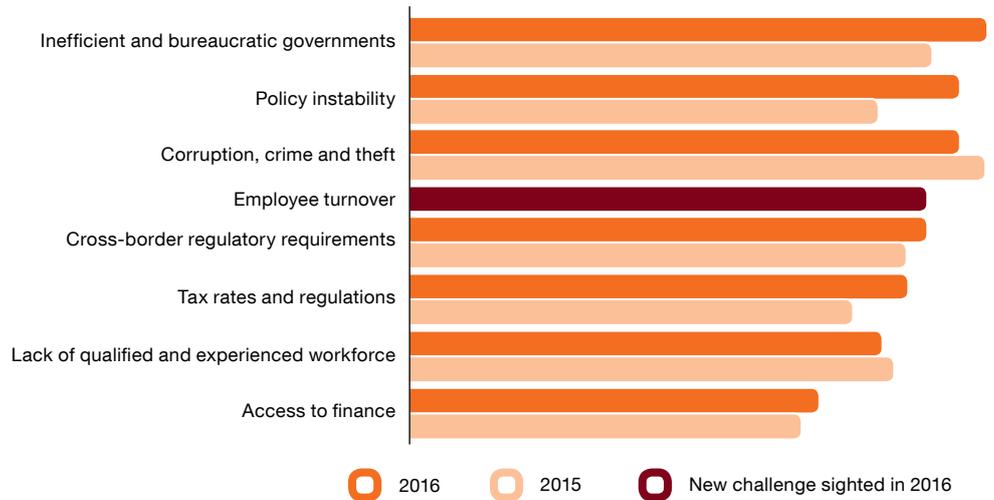


These exports make up around 65% of all agricultural exports from SSA

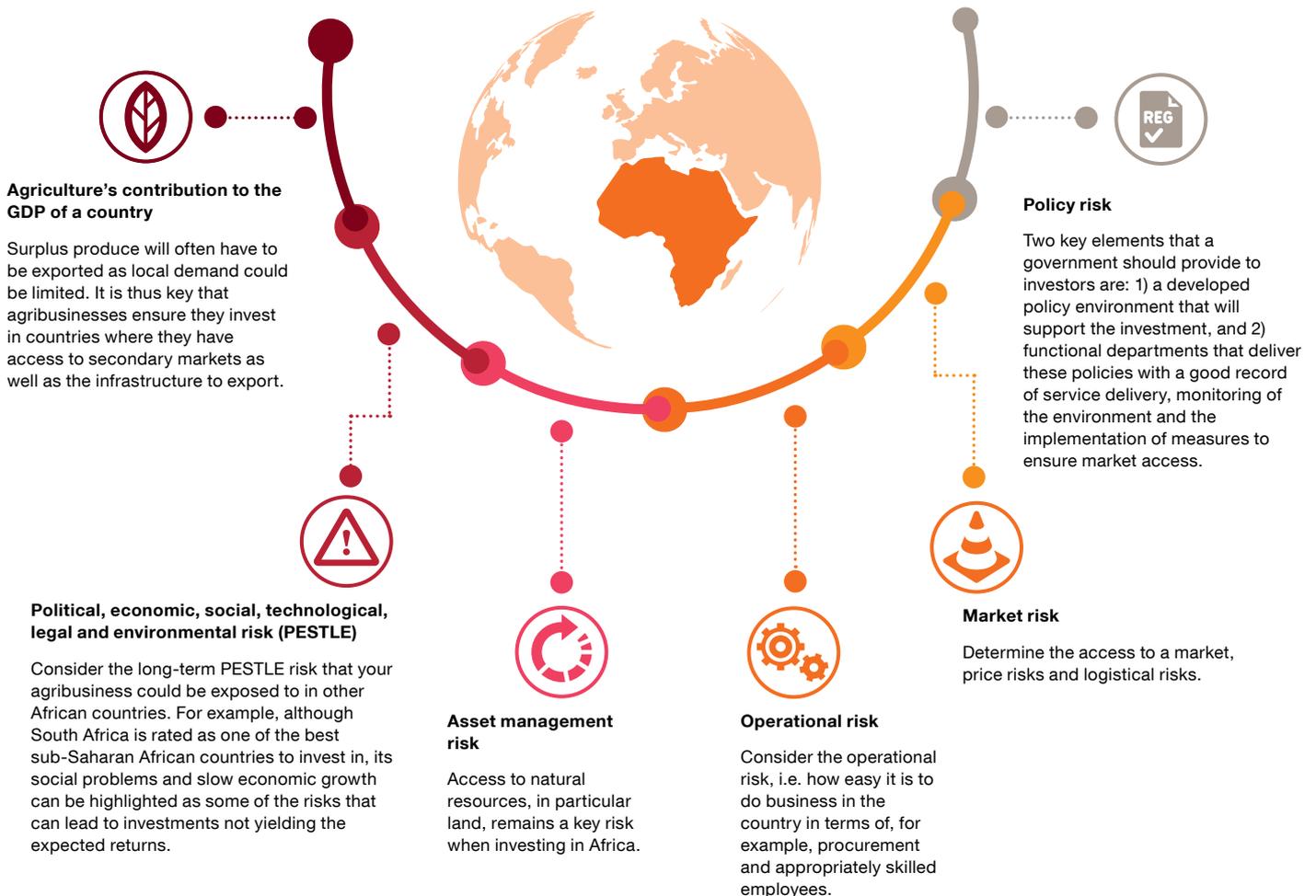
(FAQ, Deutsche Bank Research)

## Challenges to cross-border expansion into Africa

The graph below indicates the challenges that agribusinesses experience when considering cross-border expansion into Africa.



In Absa's *Agricultural Outlook for 2015*, a number of risk considerations are pointed out. These aspects should be evaluated when planning to expand into other African countries.



“Access to land in Africa is a combination of freehold and leasehold. The bulk of the African countries will approve leasing the land, but, as agriculture is a long-term investment, long-term lease periods are essential. The trading of these leases and their legal stature are also very important, not only for the investor but also for the financial institution.”



### Renewable energy dashboard – where do we stand?

Investment in renewable energy:

**29.4%**

Investigating investment in renewable energy:

**35.3%**

Types of renewable energy invested in:



Solar: **60%**



Biogas: **60%**

## Climate change and resource scarcity

Although there is widespread consensus on the reality of global climate change, much uncertainty still exists when it comes to the exact measurable impact of changes in climatic conditions on agriculture and food security. This, however, makes it all the more critical for the agriculture sector to take climate change seriously.

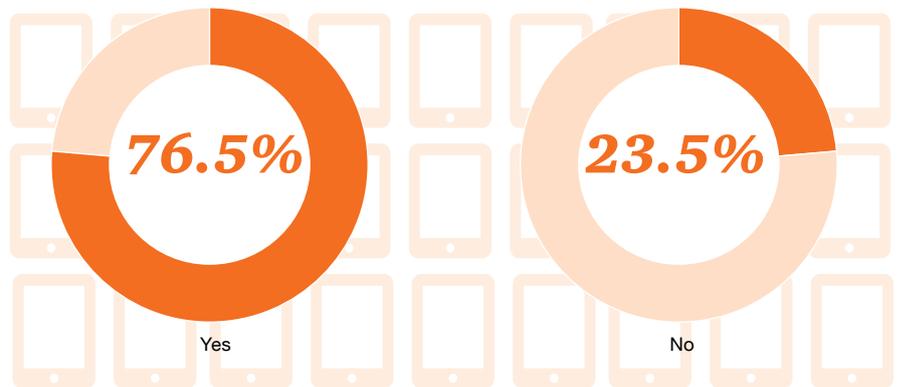
According to the FAO (Food and Agriculture Organisation), over the next 50 to 100 years there is likely to be a decline in the productivity of cropland, especially in sub-Saharan Africa.

Currently, the average crop yield for sub-Saharan Africa is estimated at a mere 25%, compared to 90% for East Asia. If sub-Saharan Africa can increase its yield to at least 50%, it will be able not only to feed itself, but to become a net food exporter in the process (Suttie, DR and Benfica, RMS, 2015, Srivathsan, 2015).

Agricultural activities can perpetuate climate change due to the resulting emission of greenhouse gases (GHGs). However, there is a growing focus on agriculture’s positive contribution to mitigating climate change through carbon sequestration and, for instance, the substitution of biofuels for fossil fuels. These contributions will hopefully increase in the future, with a stronger focus on mitigating strategies in the developing world.

76.5% of respondents indicated that their businesses are subject to external reviews that include sustainability issues such as energy consumption, water consumption, chemical usage, and health and safety.

### Are your operations subject to external audits or reviews that include sustainability issues?



## Green economy

The concept of a green economy has emerged as a way of potentially conceptualising opportunities resulting from the challenges of climate change and resource scarcity.

### What does this mean for Africa?

A green economy has been defined as an economy that results in human wellbeing and social equity while significantly reducing environmental risks and ecological scarcities. A green economy has to have a low carbon measurement, be resource efficient and socially inclusive, reduce pollution and waste, and prevent biodiversity degradation and the loss of ecosystem services.

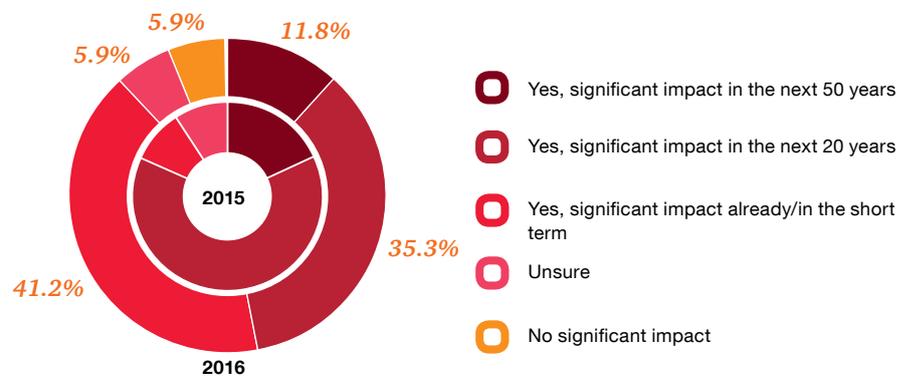
The general consensus on the critical role of agriculture in a green economy provides impetus for individual countries to focus on agriculture as a contributor to the green economy, and potentially provides opportunities for countries to share learning and experiences.

This is extremely relevant in the case of Africa, as agriculture has been highlighted as one of the most important sectors to stimulate economic growth on the continent.

(CSIR, 2014)

The majority of respondents are of the opinion that climate change will have a noteworthy and significant impact on South African agriculture in the future – 41.2% indicated that there will already be a significant impact in the short term and 35.3% that there will be a significant impact over the next 20 years.

### Expected impact of climate change on SA



Eighteen percent of respondents have measured their water and carbon footprints. A further 35% of respondents have considered conducting these measurements in the future.

### Have you measured your carbon and/or water footprint?

	2016	2015
 Water footprint	18%	9%
 Carbon footprint	0%	0%
 Both water and carbon footprint	18%	9%
 Considered one of the above	35%	73%
 Never considered any of above	29%	9%



The biggest drivers of environmental sustainability from least to most important are:



## Technology and climate change

Technology is going to be a valuable tool in addressing climate change without compromising growth in the future. According to the OECD (2011), governments are going to have to provide the right incentives for innovation in this field in order to fuel the development of climate-friendly technologies.

The following illustrates different ways in which emissions can be managed through innovation:

$$\begin{aligned}
 \text{Total emissions} &= \left[ \frac{\text{Emissions}}{\text{Output}} * \text{Output} \right] + \left[ \frac{\text{Emissions}}{\text{Input}} * \frac{\text{Input}}{\text{Output}} * \text{Output} \right] - \text{Emissions mitigated} \\
 &\quad \text{①} \quad \text{⑦} \quad \quad \quad \text{②} \quad \text{③} \quad \text{④} \quad \text{⑤} \quad \text{⑦} \quad \quad \quad \text{⑥} \\
 &\quad \text{Products innovation} \quad \quad \quad \text{Cleaner production} \quad \quad \quad \text{End-of-pipe} \\
 &\quad \quad \text{Organisational innovation}
 \end{aligned}$$

The numbers represent specific actions that can be taken to reduce emissions:

1. Create new products for consumers that generate fewer emissions when used.
2. Use less emission-intensive inputs (of the same type).
3. Use less emission-intensive inputs (of a different type).
4. Reduce pollution intensity per unit of input (without modifying inputs).
5. Reduce input use per unit of output.
6. Undertake remedial, “end-of-pipe” measures.
7. Of course, the agribusiness (and the consumer) could simply produce (and consume) less.

This list may assist a business in developing a mitigating strategy for carbon emission reduction.

## Technological innovation

Technology is a key resource for ensuring corporate profitability and growth for both primary producers and agribusinesses. Its role is to add new dimensions to human capability, thereby enabling us to accomplish tasks or satisfy needs that were not possible in the past using human labour only. To remain competitive, either at the leading edge or as a follower, agribusinesses need to pre-empt or at least respond effectively to changes in the technology environment (SA Department of Agriculture, 2012).



**795 million**  
people go hungry every day

The need for technological innovation and reform in agriculture goes far deeper than this, however. At the roots of this need lies the important realisation that we live in a world that is experiencing an exponential increase in population figures and a rapidly growing need for greater food security. According to the World Economic Forum (WEF, 2016), some 795 million people around the globe go hungry every day, and the world's population is well on course to reach the nine billion mark by 2050. Rough projections show that the global food supply would need to more than double to accommodate the growing population.

Feeding this crowd will necessitate that the agricultural sector undergoes major reform in order to improve its productivity levels. We cannot merely keep doing more of the same – we need a revolution of some sort. The following section will focus on food security and the perceptions of our respondents on the matter, but in this section we want to investigate further how food security can be addressed through technological innovation.



## A green revolution

According to researchers, we are currently standing on the brink of a second green revolution. This revolution will entail great shifts in how the agricultural sector implements technology in order to improve output in a sustainable manner and address the need for greater food security.

So it would be fair to ask: If there is a second green revolution, what did the first entail, and why was it not sufficient? Here is a quick overview of the first and second revolutions in agriculture:



### First green revolution

### Second green revolution

#### When

The first green revolution took place after World War II, at a time of worldwide depression and starvation. The world was in desperate need of a solution to the problem of rapidly growing starvation and needed to turn around the trend. The winner of the Nobel Peace Prize in 1970, Norman Borlaug, is acknowledged as the father of this revolution, which allegedly saved over one billion people across the globe from starvation.

#### When

The second green revolution is underway today, with some 795 million people in the world going hungry already and a rapidly growing population that needs to be fed. There is a desperate need for food security and therefore higher agricultural output without compromising resources in the process. Sustainability is key.

#### What

The first green revolution entailed the following:

- New varieties of high-yielding cereal grains
- Distribution of hybridized seeds
- Synthetic fertilizers, pesticides and herbicides
- Modernised management techniques
- Expansion of irrigation infrastructure

#### What

The second green revolution, also referred to as a science-based revolution, entails the following:

- Not new techniques, but new technologies
- A focus on technological innovation – being able to use real-time data to ensure effective farming practices while ensuring social and environmental sustainability
- Acting proactively on real-time data through precision farming

#### Challenges

This revolution had some unintended consequences such as increased water use for irrigation, thereby depleting natural resources; soil degradation; and chemical runoff. This had an adverse effect on agricultural and natural biodiversity. Furthermore, there was a reliance on seeds that had to be bought instead of seeds that can be reseeded (such as rice varieties). Subsequently, the need developed for a second green revolution that is more sustainable and environmentally conscious.

#### Challenges

There remain very real challenges:

- Production cannot merely be increased – it needs to be not only 'more' but 'better'.
- Communication channels are critical. Connectivity and ICT infrastructure are going to be priorities in developed as well as developing countries.
- Partnerships are needed to achieve a successful revolution. The power of captured data can be increased exponentially if it can be aggregated and compared with data from other farms, other areas, etc.

**Under the umbrella of the second green revolution, we see innovative solutions coming to the fore:**

'The rice farmers I met in Bihar (India), for instance, are now growing a new variety of flood-tolerant rice – nicknamed 'scuba' rice – that can survive two weeks underwater. If shifts in the weather pattern bring more flooding to their region, they are already prepared for it.' – Bill Gates

Innovations such as these will be necessary to address the scale of food security needed to address world hunger in developing countries.

### What will the second green revolution mean on a practical level?

Most land across the globe that is suitable for farming is already being farmed today. Some significant areas that could still be farmed in Africa and Latin America are covered with forest or savannah that cannot be used for agriculture without harming these areas' natural biodiversity (FAO, 2010). In addition to finding more land, the effective use of existing land is critical. The only way to accomplish this is with the right technology.

Examples of approaches towards the second green revolution include:



- Breeding crop varieties that can withstand adverse conditions, such as salt-tolerant rice or more drought-resistant sorghums and millets;



- Soil nutrient cycling through crop rotation and biomass recycling;



- Reliance on genetic pest and disease resistance to replace or reduce chemical and mechanical pest control; and



- Integrated crop management strategies to control pests and diseases and maintain soil fertility.

(FAO, 2010)

### A new culture of problem solving

It is essential that primary producers and agribusinesses understand the importance of technological reform in agriculture. In order to apply technology successfully, a culture of problem solving needs to be adopted. It is one thing to have all the connectivity, apps and tools, but quite another to use it efficiently to implement change. According to Whittaker, a company's competitive advantage is linked to its ability to react to challenges and use the technology at its disposal to solve problems. The following three premises should be considered:

**Embody innovation:** Innovation can only increase in organisations that create an enabling environment for this. In such an enabling environment, creative solutions will come naturally.

**Embrace transparency:** Collaboration is a necessity in this game. One can grow faster and learn more if you share and collaborate with your competitors. Furthermore, the consumer expects transparency in terms of the origin of a product, how it was produced, and how the environment was impacted by its production.

**Energise labour:** Increased awareness of technology and the increasing sophistication of the production process of agricultural produce necessitate that employees become more tech-orientated, better trained and more willing to learn to use technological tools.

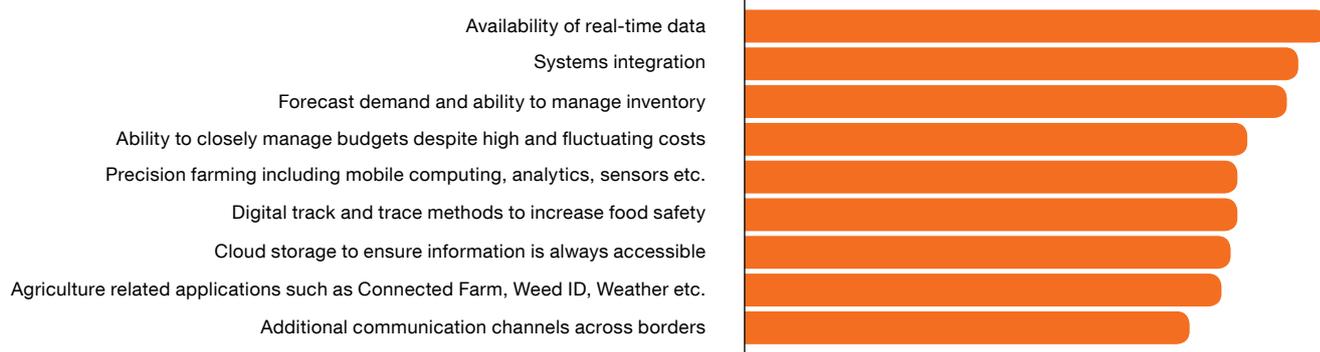
## Opportunities for technological innovation

Traditionally, agriculture was practised by performing a particular task such as planting or harvesting according to a predetermined schedule. However, by collecting real-time data on weather, soil and air quality, crop maturity and even equipment and labour costs and availability, predictive analytics can be used to make smarter decisions. This is known as precision agriculture.

With precision agriculture, control centres collect and process data in real time to help farmers make the best decisions with regard to planting, fertilizing and harvesting crops. Sensors placed throughout the fields are used to measure the temperature and humidity of the soil and surrounding air. In addition, pictures are taken of fields using satellite imagery and robotic drones. Over time, these images show crop maturity, and when coupled with predictive weather modelling, conditions can be pinpointed 48 hours in advance. These technologies can assist to predict future conditions and help farmers make proactive decisions (Mello & Treinish, 2015).

Participating respondents noted the availability of real-time data as the biggest opportunity for technological innovation. The agriculture industry is reaching a level of precision that was almost unimaginable just a decade ago. With the existing technologies in place, the availability of real-time data could provide more efficient decision-making and a proactive farming approach that can be tremendously valuable.

### Opportunities for technological innovation



Some of the most significant advances that are already revolutionising the agricultural sector include:



#### Water-saving sensors

- Networks of wireless sensors
- Smart water management systems



#### Precision drones

- Unmanned helicopters for crop spraying
- Precise aerial photography
- Soil and water surveys
- Spraying and watering assistance



#### Chemical-free pest control

- Systems that can trap, count and monitor pests
- Systems that trigger the release of EPA-approved pheromones that disrupt pests' mating cycles
- Real-time field monitoring and targeted, automated responses



#### Farming automation and management systems

- Interconnected machinery
- Machines that can inject fertiliser at precise depths
- Automated seed spacing based on soil fertility
- Measure harvest data in real-time

(Ericsson, 2014)





## The use of drones for agricultural purposes

Drones, coming from military aviation technology that has been adapted, offer a typical example of the new technologies that are giving rise to the second green revolution. Real-time aerial data is obtained through precision drones, and significant time and cost are often saved in the process of managing large portions of land in this new way. It is estimated that the addressable market of drone-powered solutions in the agricultural industry is \$32.4 billion (PwC, 2016).

One of the greatest challenges in the management of agricultural land in the past was the precise and efficient monitoring of crops planted in large areas. The increasing unpredictability of weather conditions due to climate change only adds to the challenge. Until recently, the most advanced form of monitoring of large areas of land was satellite imagery. These images had to be ordered in advance, there was a lag between the ordering and the viewing of imagery, and it was not very precise. Furthermore, these services proved to be overly expensive, with no guarantee of the quality of images.

Drone technology has offered an alternative to satellite imagery that is more precise and more cost effective and can be provided in real time – a low-cost aerial camera platform.

Drones are equipped with an autopilot, using GPS and a standard ‘point-and-shoot’ camera controlled by the autopilot. Software on the ground can then stitch together the aerial shots into a high-resolution mosaic map.

Precision drones can be used throughout the life cycle of the crop – from soil analysis to harvesting – and are part and parcel of a trend towards an increasingly data-driven agricultural sector. Starting off as military technology, drones are fast becoming a real green-tech tool.

### Soil and field analyses

Drones can assist with the process of soil analysis by providing precise 3D maps in order to plan seed planting patterns. Various start-ups have implemented drone planting systems successfully, achieving an uptake rate of 75% and an 85% decrease in planting costs. These systems shoot pods with seeds and plant nutrients into the soil. Furthermore, drones with hyperspectral, multispectral or thermal sensors are able to indicate which areas need more water. Once the crop is growing, drones make it possible to calculate the vegetation index.

### Health assessments

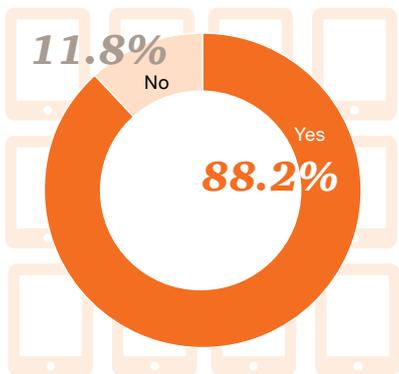
Later on in the life of a crop, the main objective is to keep the crop healthy by constantly monitoring it and acting quickly when there is any indication of problems. Drone management systems can significantly reduce the risk of unhealthy crops.

Through one of the latest developments, crops are scanned using visible light and near-infrared light to indicate changes in plant health. A whole field or orchard can often be saved by reacting quickly, while more efficient remedies can be applied and monitored, making for a decrease in crop failure in the future.

### Crop spraying

Crop spraying is another application of drones in agriculture. Drones are able to maintain the right distance from the crops to spray the appropriate amount of liquid, modulating spraying in real time for even coverage. This increases the efficiency of spraying and reduces the amount of excess chemical runoff. Estimates are that aerial spraying can be done as much as five times faster than with traditional machinery such as tractors.

*Do you consider any technology-related projects within the next 12 months?*



“Artificial intelligence is the study of creating computers and software capable of intelligent behaviour. Linked to this is the concept of machine learning, which allows computers to learn from vast amounts of data and calculations, and then make decisions.”

Jay Johnston, chief executive of Ritchie Feed and Seed Inc.

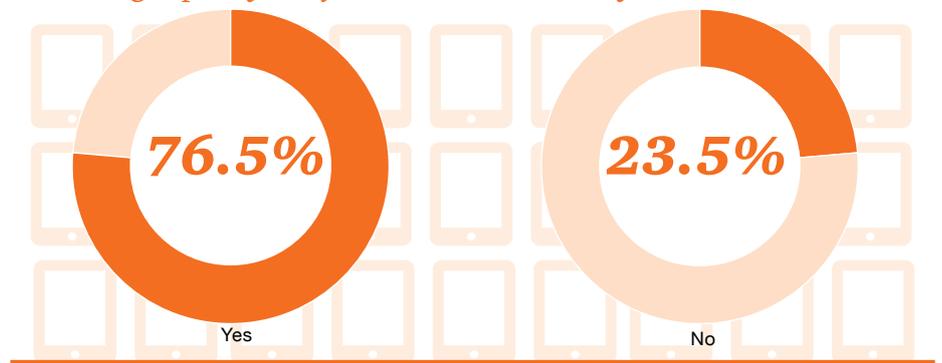
### Artificial intelligence farming

Research indicates that artificial intelligence (AI) farming will be the main enabling factor in increasing the world’s agricultural production capacity in order to meet the demands of the growing world population. This goes hand in hand with precision farming and other technology trends that tie in with the second green revolution.

However, the prevalence of AI farming is still low in Africa compared to the rest of the world.

The majority of respondents (76.5%) agree that AI farming will make a major contribution to increasing capacity in Africa over the next ten years.

*Do you agree that AI farming will make a major contribution to increasing capacity in Africa over the next ten years?*

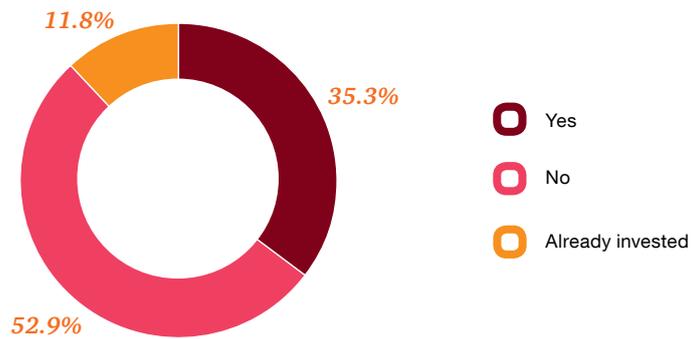


More than three quarters of survey respondents reported a high level of confidence that their agribusiness could play a strategic enabling role in increasing the use of AI farming in Africa.

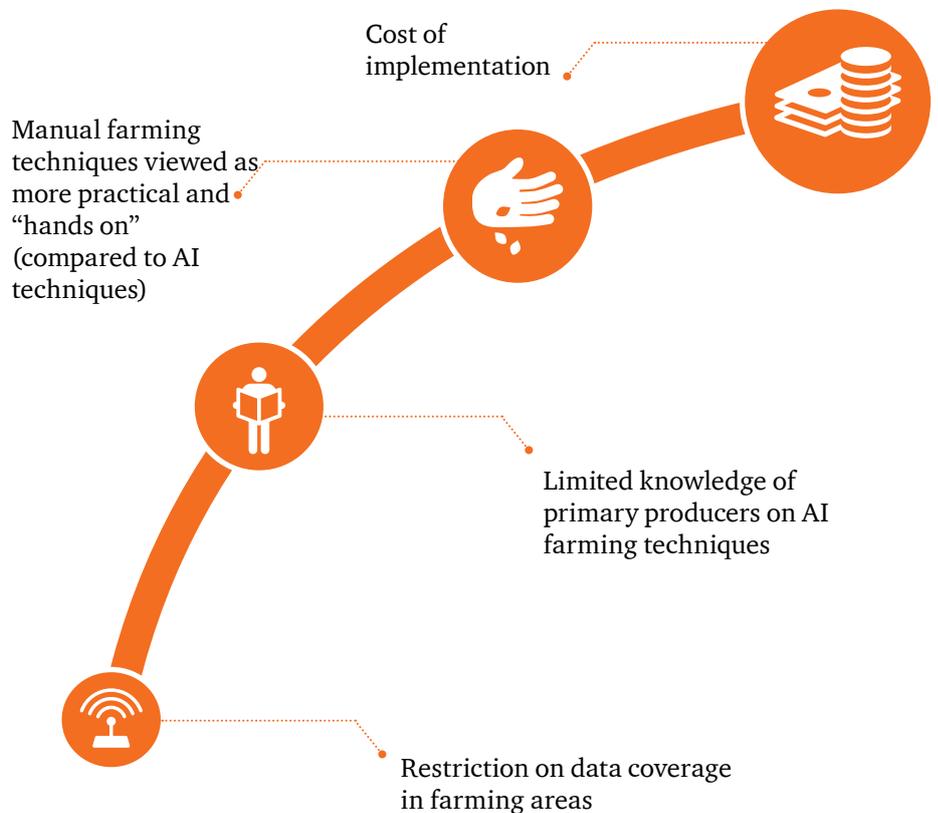


Only 47.1% of survey respondents had already invested (11.8%) or would invest (35.3%) in the development of AI farming capabilities for primary production. This could be due to the cost of implementation, which was noted as the biggest restriction to the use of AI farming capabilities (64.7%). Other restrictions include perceptions or views that manual farming techniques are seen as being more practical and “hands on” when compared to AI techniques (52.9%). Primary producers’ limited knowledge of AI farming techniques is the third biggest challenge (47.1%). Limited data coverage in farming areas seems to be less of a challenge (29.4%).

### Would your business invest in the development of AI farming capabilities for primary production?



### Main restrictions to the use of AI farming capabilities



## What can agribusinesses do?

Increased pressure on the profitability of farming and agricultural business activities is forcing the agricultural sector to be an early adopter of new technologies in order that it may improve the productivity and profitability of the sector. As a player higher up in the value chain, agribusinesses have an important role in developing and supporting primary production. To this end, the following enablers can assist primary producers and agribusinesses alike to improve their productivity:

- a) Consumer access** – To increase revenue, it is key to build consumer loyalty through marketing, packaging, taste enhancement and variety, without compromising safety and quality.
- b) Storage technology** – New storage technologies have led to increased competition, as seasonality of production is now irrelevant.
- c) Transport technology** – Improved transport technology has resulted in increased competition among countries. This has highlighted the distorting effect of trade barriers and the impact thereof on agricultural commodities.
- d) Information technology** – Through the implementation of information technology, the concept of precision farming has evolved. This has led to the optimisation of seed, fertiliser, herbicide and pesticide application, with resulting increases in production following fewer inputs. It has also evolved to incorporate the manufacturing of smart machinery like planters that plant different genetics, milking machines that milk cows on their own, etc.
- e) Biological farming practices** – This is the implementation of biology in all spheres of production, for example, the amount of biological material in soil and the effect thereof on bacteria, water retention and the aeration of soils, and the use of natural predators to control pests.
- f) Genetic technology** – The fact that we can read genes has had the most significant effect on agriculture and has led to production increases. These, in turn, have been further enhanced by GMO crop production. The full effect of this technology has not been realised yet and farmers will have to adapt to these new technologies to remain competitive in the future.
- g) Economy of scale** – The effect of economy of scale should not be underestimated, especially if a certain threshold is exceeded. Marginal improvements are obtained through bulk buying and selling as well as the capability to use new technology due to size, with a resulting generation of free cost.

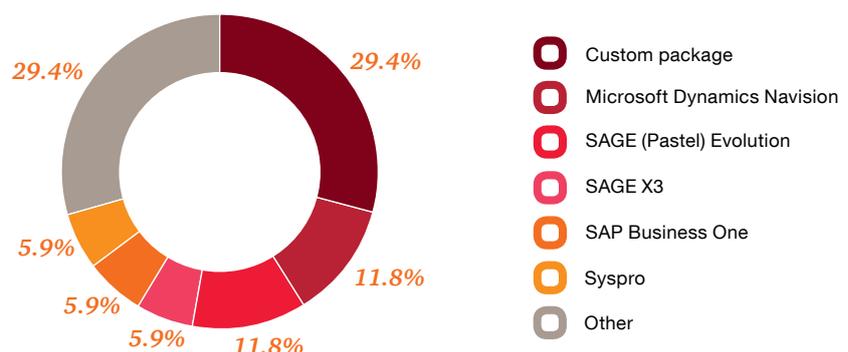
(Absa, 2015)

## Software package selection

A focus on innovation and fit-for-the-business is crucial when selecting software packages. Special attention to new product development is important to obtain and maintain a competitive edge.

In line with the previous year's results, the majority of respondents (29.4%) are using custom software packages. Other software packages/ERFP systems specified were Accpac, KTS, SAP banking and IBM AS400.

### What software package/ERP system is your agribusiness currently using?





“Agriculture not only gives riches to a nation, but the only riches she can call her own.”

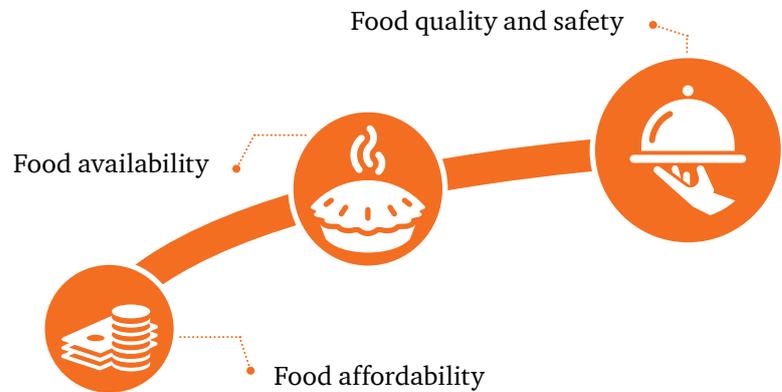
– Samuel Johnson



## Population growth and food security

All respondents indicated that they feel a responsibility towards food security and they plan to make a difference in the following ways :

Survey respondents ranked their plans to contribute to food security in the following way:



**Food security in sub-Saharan Africa is continuously improving. Here are a few points on food security in Africa from the Food and Agricultural Organisation (FAO, 2015):**

- The prevalence of undernourishment in Africa declined from 33% (in the period of 1990–1992) to 23% (in the period from 2014–2016). However, the total number of undernourished people has increased from an estimated 175.7 million in 1990–1992 to 220 million in 2014–2016.
- Western Africa has managed to decrease the proportion of hungry people by 60%.
- Food availability in sub-Saharan Africa has increased by nearly 12% over the past two decades.
- The poverty rate decreased by 23% between 1993 and 2011, and many countries are on course to meet the Millennium Development Goal (MDG) of halving the number of people living on less than \$1.25 per day by 2015.
- The number of underweight children in sub-Saharan Africa has declined significantly over the last two decades and there is a trend towards more overweight children under the age of five years.
- High-level leadership and good governance are required to translate government policies and strategies into concrete actions in all the relevant sub-sectors: agriculture, health, water and sanitation, social protection and education.
- It will be necessary to effectively track food security in the future in order to ensure a sustained strategic approach towards the eradication of hunger.
- Public-private partnerships will be of critical importance in developing capabilities, introducing innovations, and providing technical assistance and knowledge to small producers.
- Besides the need to adopt an integrated approach, the sustained implementation of a mix of complementary and comprehensive food security and nutrition policies and programmes is required over time to effectively make an impact on hunger, food insecurity and malnutrition in sub-Saharan Africa.

### The Global Food Security Index (GFSI)

Of the 28 countries in sub-Saharan Africa, 82% recorded GFSI score increases between 2014 and 2015, and the region as a whole saw a score improvement of 1.5 points.

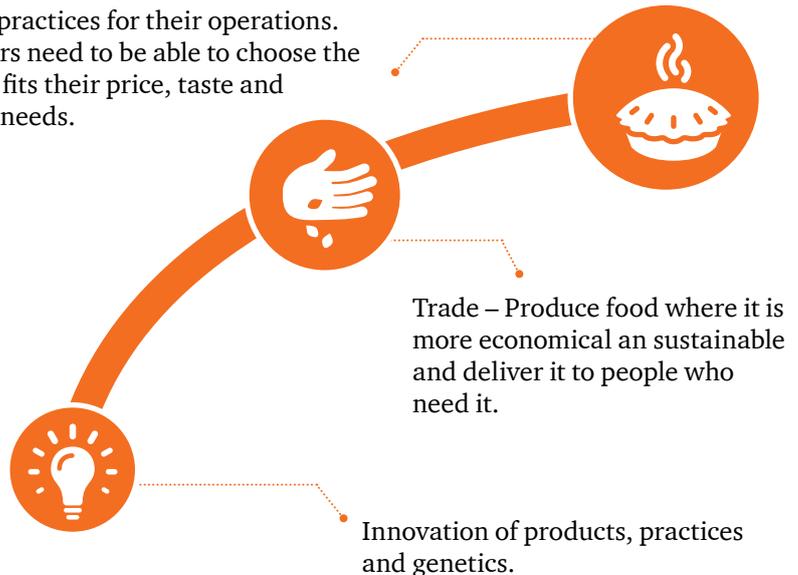
The GFSI regional ranking for sub-Saharan Africa:

1. South Africa
2. Botswana
3. Ghana
4. Côte d'Ivoire
5. Uganda
6. Benin
7. Senegal
8. Cameroon
9. Kenya
10. Ethiopia /Mali



### Solutions for food security were ranked by survey respondents in the following way:

**Choice** – Farmers need to be able to choose the right practices for their operations. Consumers need to be able to choose the food that fits their price, taste and nutrition needs.

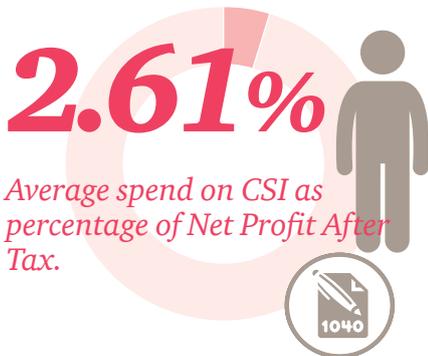
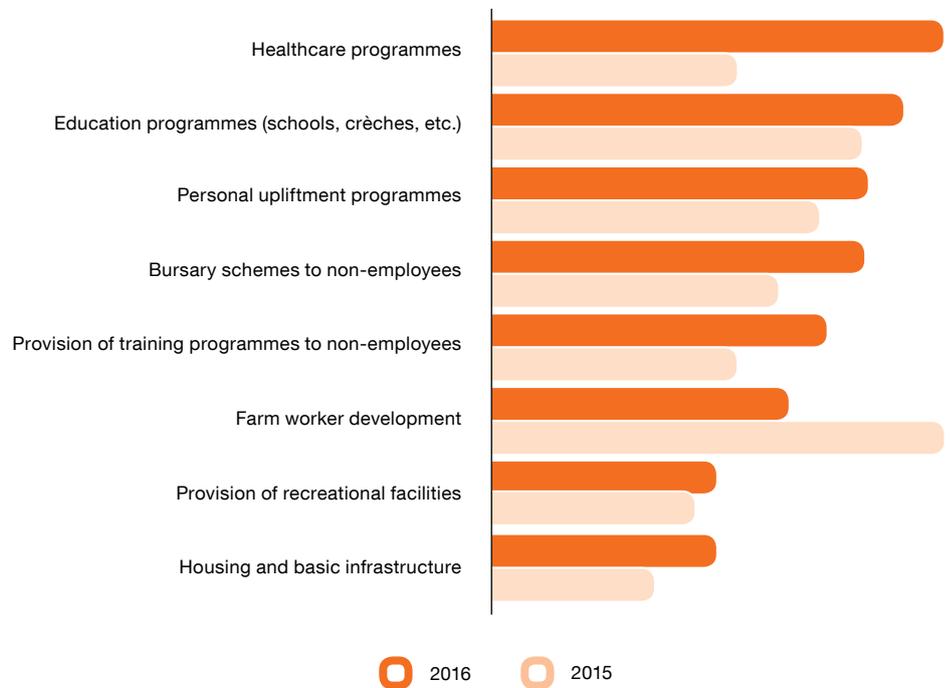


## Social impact

It is once again comforting to report that all respondents indicated that their agribusinesses contribute towards corporate social investment (CSI). The top three areas of investment are:



### Corporate social investment – focus areas



It is interesting to note that, compared to the previous year's survey, health care programmes have replaced farm worker development as the top priority in terms of CSI.

*Section* **3**  
*Q&A*







## Q&A with Jason Brantley, MD of sub-Saharan Africa at John Deere

### 1. Can you briefly describe your role within your agribusiness?

I am the managing director of John Deere sub-Saharan Africa, and in that role I work with our customers and dealers here. Our main office is located in Boksburg, South Africa, and we also have a large parts distribution centre in Kempton Park with regional offices in Nairobi (Kenya) and Accra (Ghana), which I am also responsible for. Our focus is to ensure that we have the right people, the right skills, the right solutions and the right infrastructure in place in order to support our customers and dealers.

### 2. Why do you feel agriculture is an industry that you would personally like to be in currently?

It has been my life; I grew up in an agriculturally inclined family, both in farming and the equipment business. When you look at agriculture, for me personally it's very rewarding, because everywhere you go in the world you find a real commonality in people in the agricultural industry. There is something about people who are connected to the land and the passion and understanding that they have that is universal.

### 3. Did you grow up on a farm?

I grew up on farmland and surrounded by farming. My uncles all farmed and my dad went into the farm equipment business for many years before taking up farming.

### 4. What is the biggest step towards technological innovation that your agribusiness has taken in the past year?

In the last year we've made great advances in precision agriculture and the solutions that we're bringing to market. We've enhanced software packages and solutions that bring real value to our customers. But you have to step back from that and look at the ecosystem that we are building for our customers. John Deere has been very focused on bringing partners together to help provide solutions and services to our customers globally to improve their profitability and enhance agricultural outputs. It is something that has been talked about for a while and if you think about the last year, you can really see that moving forward.

### 5. What challenges did you experience during the journey?

When we looked at moving our business forward within precision agriculture, the first challenge was making sure that the problems we are solving are the most significant and important problems for our customers. Customers have lots of problems to resolve or things they would like to do better, and there are many potential solutions with technology, so it is important to go after the ones that make the biggest difference for our customers first. Other challenges are familiar to business in general, including getting the right partners, testing your solutions to make sure that they are robust and working as intended, and training dealers and customers to be able to get the full benefit. These were the challenges we focused on in order for our customers to get the complete solution and the complete experience.

Outside technologies are impacting agriculture more and more with things like smartphones and tablets. Large commercial farmers are using technology increasingly to manage their farming operations, but at the same time our focus is on how technology could become more affordable and readily available to a broader spectrum of farmers. In fact, this year we have introduced mobile-based technology that supports farmers and contractors in planning and managing their business. We have also brought new lower-cost telematics solutions into some markets. We see these trends continuing.

**6. Do you have any advice for agribusinesses that would like to embark on a technological innovation journey?**

Yes, I'd really reiterate one point from above. The most important aspect that is required for innovation is a deep understanding of your customers' needs and the opportunities and problems that they are focused on solving. If you look at innovations that don't go anywhere, it's usually because they solved the wrong problem. John Deere has had significant success with products like AutoTrak automatic steering technology because it delivers a great value proposition and solves meaningful problems that farmers have. You read a lot about self-driving cars in the media these days; I like to point out that farmers all across Africa have had access to self-driving John Deere tractors for years.

**7. How is your innovation driven throughout the John Deere organisation?**

One way is that within John Deere we have a network called the Global Technology Innovation Network, which is a network of R&D centres throughout the organisation. This network is connected with the R&D organisations on our product platforms as well. We work closely with our customers on a regional basis to understand their needs and problems in order to derive innovative solutions in real time. These solutions are shared across the John Deere network. The key is really to maintain the coordination between the corporate innovation focus and the individual innovation that happens within the network and to share the learnings and leverage from one another to provide solutions in as short a time as possible.

**8. Do you want to further expand into other African countries? Which countries, and why?**

Firstly, we have been in South Africa since 1962. South Africa continues to grow and develop, and remains a key market for John Deere. There is a lot of innovation in South Africa that is driven by farmers and South Africa will continue to be an important market within Africa from a food security and export standpoint.

When we look beyond South Africa and into the rest of sub-Saharan Africa, we have grown quite a bit since 2009. We have expanded our dealer network and we now have 32 authorised dealers with 129 outlets across 28 countries, staffed with trained agriculture mechanisation professionals and stocked with spares. We see that growth will continue, with opportunities for us to provide solutions for even more customers. Another interesting development over the years is growth in the smaller-scale farmers who are moving towards mechanisation, which is primarily driven by the growth in small contractors offering services. We continue to focus on how we support and develop these emerging contractors and farmers while we serve our large commercial customers who are also found across Africa.



When we work with smaller farmers, we make use of a Deere-developed programme referred to as the “S.M.A.R.T.” approach, which can be broken down as follows:

S – Smallholder and small contractor solutions, which provides the right portfolio for Africa

M – Mechanisation for yield improvements of two to three times or more

A – Access to finance to empower farmers and contractors to grow

R – Reliability and low overall cost of operation to maximise profits

T – Training and Technology to ensure customers have the knowledge they need.

This S.M.A.R.T. campaign was developed from several years of experimentation and pilots, and we have found it to work. It’s an “ecosystem” that helps people start profitable businesses, improves food security and uplifts the standard of living for our customers.

### **9. What do you see as the most significant barriers to doing business in Africa?**

Infrastructure remains a significant barrier for all industries, perhaps none more so than agriculture. Improvements in the ease of doing business between countries would really benefit agriculture as well. There are real opportunities to improve access to education and information that would directly improve food security and rural prosperity. Agriculture is growing rapidly in many areas, and lessening these barriers would accelerate it even more.

### **10. How important is a relationship with the governments of the countries in which your portfolio of companies operate, and what do you need from these governments?**

We focus, of course, on relationships and open communications with government, and I think equally important is our focus on sharing a perspective on the role mechanisation plays in sustainable food security and rural prosperity. Lately when we sit down with agricultural ministers and others in government we are talking a lot about our S.M.A.R.T. approach and the needs of large commercial farmers and letting that drive a dialogue about what customers and communities need and how we can help.

**11. Are your portfolio companies' operations subject to external audits or reviews required by customers, certification bodies or standard setters, that include sustainability issues such as energy consumption, water consumption, chemical usage, and health and safety?**

At John Deere we are quite proud of our actions and achievements in these areas. We publish a Global Citizenship Report annually that shows our performance in philanthropy and volunteerism, safety, the environment, and the employee experience.

Specifically around the subject of the environment, John Deere has set eco-efficiency goals globally to reduce energy use by 15%, reduce water use by 15%, increase recycling to 75% of total waste, and integrate life-cycle engineering into our products to reduce environmental impact. These environmental goals are third-party audited to ISO 14064-3 assurance standards.

**12. How do you think an agribusiness should contribute to food security? Where should their focus be: quality, affordability or availability?**

Agribusiness should not focus on any of these matters in isolation. One should have a balance between providing a responsibly produced good-quality product which should be readily available to consumers at an affordable price. It is important to keep a balance between these elements as too much focus on one element could have a detrimental impact on the others. Getting more food from the same or less amount of inputs is a part of this balance. Mechanisation and precision-farming technologies are an essential part of achieving that.

**13. Looking into the future, what role will Africa play in the overall global food basket?**

I have no doubt that Africa's role in the global food basket can only increase over time. Given the abundance of land and resources and the expected population and income growth, the continent is set to play a more significant role in global agriculture. This will create more opportunities for both small and large farmers. At John Deere we are very excited about the future prospects and opportunities Africa holds for the global agriculture industry.

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