



AGRO-PROCESSING SECTOR STANDARDS DEVELOPMENT AGREEMENT

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DRAFT

1. INTRODUCTION

The South African Bureau of Standards (SABS) is the National Standardisation Body (NSB) of South Africa, established in terms of the Standards Act (No 29 of 2008) as amended, providing the mandate of SABS to develop, promote and maintain standardisation services and quality in connection with commodities and the rendering of related conformity assessment services. The strategic direction of SABS in developing a standardisation framework that serves as an articulation of the Standards Act of 2008, in relation to standardisation activities to be carried out by the organisation. The standardisation framework will be developed in the form a Standards Development Agreement (SDA), which is a normative document that has been agreed to by an interest group or sector and published by the SABS. Its purpose is to direct the trajectory of the standards development programme in terms of the need for new standards and improvement of existing standards, as well as to focus the standardisation agenda towards a shared goal as articulated in the National Development Plan (NDP) and supporting policies such as the Industrial Policy Action Plan (IPAP).

The SDA is developed in collaboration with key industry, government, academic and civic society stakeholders. In addition to providing recommendations based on meaningful analysis of standards and conformity assessment data, the SDA provides valuable platform for stakeholder consultation and engagement. A national standards body has the responsibility of leading the standardisation programme of a sovereign. An SDA will enable the SABS to articulate the course and purpose of such a programme. The SDA illustrates how the standards will support industry and socio-economic development goals of the country in the medium to long term. By mapping-out key standards-related considerations and conditions affecting specific industries, the SDA provides for a national standardisation framework that can adequately support national ambitions and plans.

This SDA therefore seeks to guide standardisation in the agro-processing sectors by highlighting standards-related focus areas that are aligned to national priorities and the future outlook of the industry. To achieve this, the SDA investigates the current standards available in the different agro-processing sub-sectors and highlight areas where gaps exist, and propose standardisation solutions to support development in these areas.

2. AGRO-PROCESSING SECTOR OVERVIEW

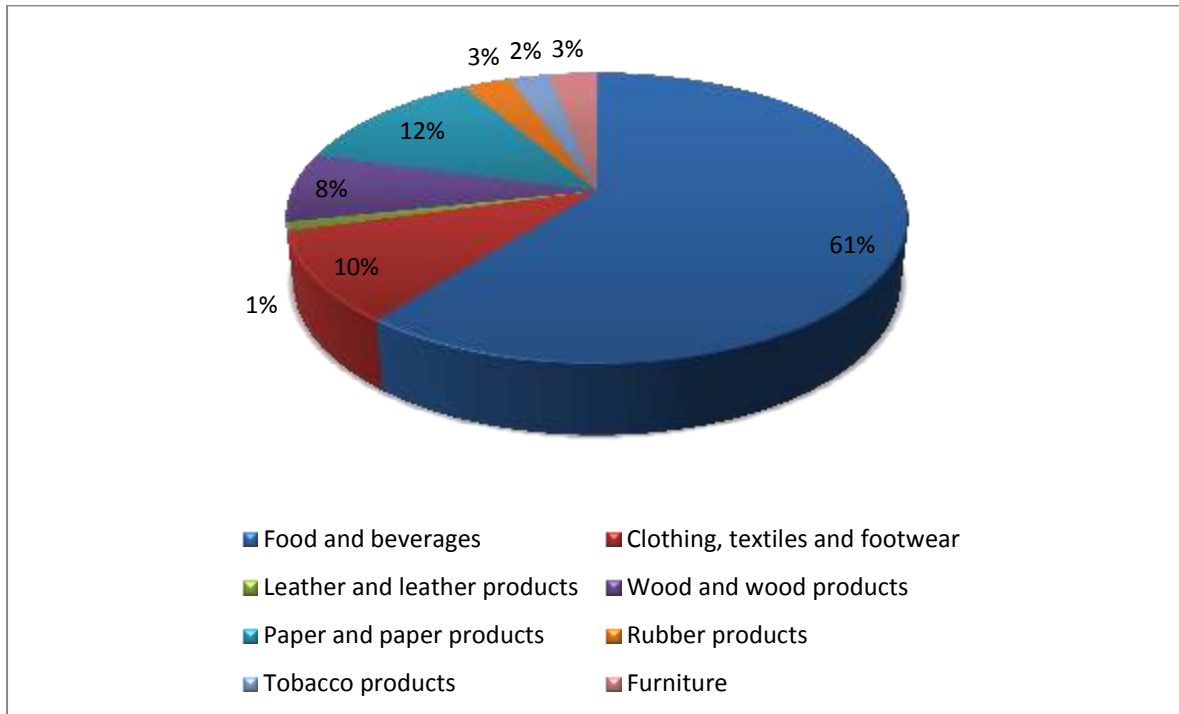
"The agro-processing industry covers a broad area of postharvest activities, comprising artisanal, minimally processed and packaged agricultural raw materials, the industrial and technology-intensive processing of intermediate goods and the fabrication of final products derived from agriculture."¹ The agro-processing sector is among the sectors identified by Industrial Policy Action Plan (IPAP), and other key government policies aimed at bringing about growth and development and create jobs in the South African economy. The Agro-processing sector was identified for its potential to spur growth and create jobs because of its strong backward linkage with the primary agricultural sector².

¹ DAFF, 2012

² Department of Agriculture Forestry & Fisheries; Brief – Status of Agro-processing industry in SA

In terms of composition, the food and beverages sub-sector (61 per cent) is the largest within the sector, followed by paper and paper products (12 per cent) and clothing, textiles and footwear (10 per cent) as illustrated on Figure 1 below. Tobacco products and the leather and leather products account for the smallest shares at 2 per cent and 1 per cent respectively.

FIGURE 1: COMPOSITION OF THE AGRO-PROCESSING SECTOR, REAL OUTPUT - 2016

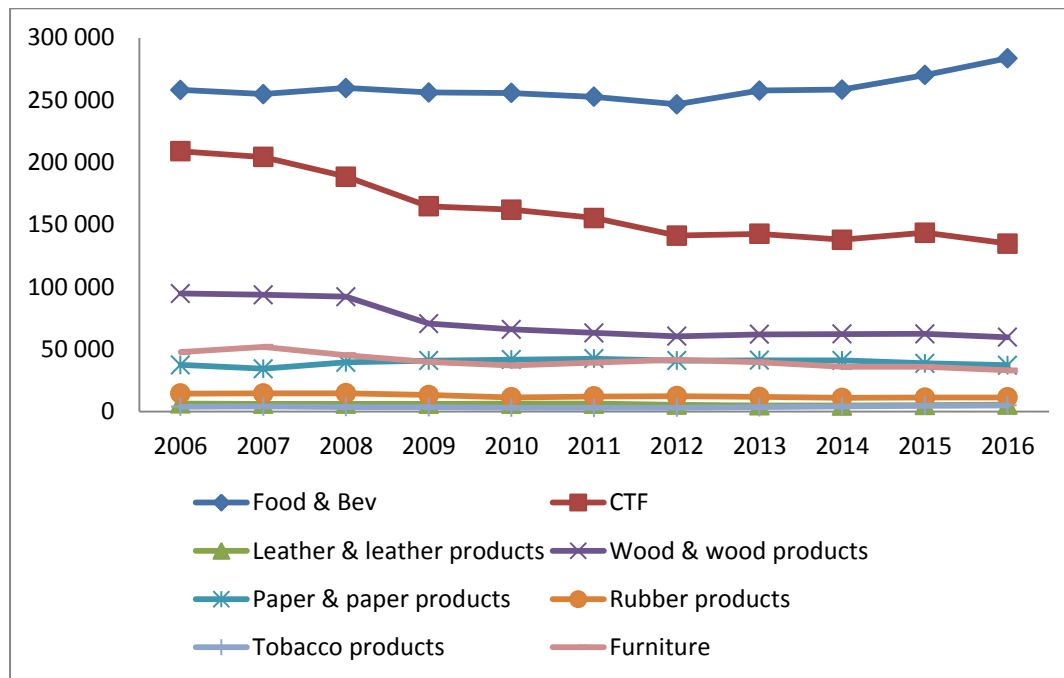


Source: Quantec Easydata (2016)

Employment trends

Figure 2 below shows employment contribution of each agro-processing sub-sector for the ten-year period between 2006 and 2016. Employment per sub-sector followed a similar as sector output contribution, with food and beverages being a major employment contributor in the sector, followed by clothing, textiles and footwear, and wood and wood products. Employment in the food and beverages sub-sector remained resilient despite the shocks, i.e. global economic downturn, that affected the sectors in the economy in this period, resulting in downward employment trends.

FIGURE 2: EMPLOYMENT SECTOR TRENDS, 2006 - 2016



Source: Quantec Easydata (2016)

3. SOUTH AFRICAN POLICY CONTEXT

This SDA is being developed to provide a standardisation response which can support national priorities as articulated in various government policies and plans aimed at growing the economy and creating employment. Consideration of the various sector-specific policy interventions planned for the medium to long-term will help build an appropriate standardisation response, where all stakeholders within the agro-processing value chain participate.

3.1 National Development Plan (NDP)

The National Development Plan (NDP) aims to eliminate poverty and reduce inequality by 2030. According to the plan, South Africa can realise these goals by drawing on the energies of its people, growing an inclusive economy, building capabilities, enhancing the capacity of the state, and promoting leadership and partnerships throughout society.³ The different sectors of society (public and private sectors, other agencies and the community at large) have a role to play and must contribute towards the implementation of the Plan.

Key proposals within the plan relating to agriculture and agro-processing include growing the industry through:

- Support to small-scale manufacturers (SMMEs) within the agro-processing value chain;
- To ensure food security, food fortification should include foods for young children. Fortified mixes and low-cost fortified spreads or powders should be widely available.
- Technology development to increase agricultural production.

³ National Planning Commission: National Development Plan (2012)

3.2 Agro-processing strategy

DAFF's Agro-processing strategy of 2012 identified six strategic interventions aimed at supporting the SMEs agro-processing in South Africa. These strategic interventions are⁴:

- a. Contribute towards and to facilitate access to public incentives and support packages to stimulate entrepreneurship by SME agro-processors;
- b. Contribute towards and facilitate investment in infrastructure to enable establishment and growth of value adding businesses;
- c. Facilitate value-chain linkages to ensure that agriculture, forestry and fisheries commodities find a market, while ensuring that at the same time ensuring reliable supply for SME agro-processors;
- d. Support technical and managerial training of SME entrepreneurs;
- e. Facilitate access to appropriate technologies to enable productive activities by SMEs; and
- f. Facilitate access for SME agro-processing to business development services such as legal, accounting and related services.

The Strategy is specifically geared towards providing the necessary support to the SMEs where there are opportunities for growth or expansion. It is estimated that more than 90 per cent of the world's businesses are SMEs and are said to be, on average, the businesses that are generating growth, creating jobs, growing faster and innovating more.⁵ Therefore the Strategy seeks to unleash the potential of the SME agro-processing sector to contribute to the much needed growth and employment creation.

3.3 National Policy on Food and Nutrition Security

The NDP sets out various methods and targets to eradicate poverty, reduce unemployment and eliminate inequality by 2030. It makes reference to a number of steps to improve food security as an intervention to eradicate poverty.⁶ A National Food and Nutrition Security Policy was therefore needed to align sector policy with Vision 2030 of the NDP. The strategic goal of the Policy is to ensure the availability, accessibility and affordability of safe and nutritious food at national and household level, thereby contributing towards poverty eradication as envisaged in the Plan.

One of the food security response mechanisms proposed in the National Food and Nutrition Security Policy is the formation of a centralised food safety and quality controlling system for South Africa. The mandate of the body will be to, amongst others, harmonise the domestic food safety standards with international standards.⁷ The roadmap needs to align with the interventions proposed in this national policy to ensure standardisation activities programme of work respond to these objectives.

3.4 Industrial Policy Action Plan (IPAP)

In 2007 the government adopted the National Industrial Policy Framework, and its associated practical implementation plan – the IPAP – as its guiding approach to industrialisation, in line with

⁴ DAFF, Agro-processing strategy , 2012

⁵ Small Businesses, ISO Focus+, Volume 4, Number 2, February 2013

⁶ Department of Agriculture, Forestry and Fisheries (2013)

⁷ Department of Agriculture, Forestry and Fisheries (2013)

the job creation strategy advocated in the New Growth Path. The IPAP is committed to realising broader national policy goals through a wide range of mutually supportive and interlocking transversal and sector-specific programmes and instruments targeting specifically the manufacturing sector of the economy.

Each iteration of the IPAP has continuously updated and refined its emphases on an annual basis, both to ensure that it remains relevant to rapidly changing global and local economic and social developments and, more recently, to align itself with the overall vision and perspectives set out in the NDP of 2012. IPAP provides the targeted actions and the continuously updated rolling implementation framework for sustained and deepening industrialisation. The actions are geared towards growing the agro-processing sector to tackle food security, and boost exports growth.

It is recommended that the alignment with the above policy and plans be amongst the focus areas of the SDA. The SABS as the national standardisation body is critical in providing the necessary standardisation infrastructure (standards, testing and certification services) to contribute towards the increased competitiveness of various industrial sectors, and help realise the objectives of the NDP and IPAP of sustained economic growth and development.

3.5 Agricultural Policy Action Plan (APAP)

The APAP is a 5-year plan which provides tangible and concrete steps to address the sector challenges identified in the Integrated Growth and Development Plan (IGDP) which serves as a sector policy for agriculture. The Plan is in its first iteration and covers the period from 2015 – 2019, and similar to the IPAP, the APAP will be updated on an annual basis. Aligning itself with the NDP, New Growth Path (NGP) and IPAP, the APAP seeks to assist the sector to achieve Outcome 4 (Decent employment through inclusive growth) and Outcome 7 (Comprehensive rural development and food security), as outlined in the MTSF (2014 -2019) which represents government's strategic plan for growth and development.⁸ The focus actions areas in the APAP are clustered into sectoral and transversal interventions across the industry's value chains, and it is critical that the roadmap aligns with these areas and devise standardisation solutions to contribute towards meeting the APAP objectives.

3.6 Regulatory framework

The South African agro-processing sector consists of food and beverages; clothing, textiles and footwear; leather and leather products; forestry, pulp and paper; rubber products; tobacco products; and furniture. The sector is regulated by the Department of Agriculture, Forestry and Fisheries (DAFF), Department of Health (DoH), Department of Trade and Industry, and the National Regulator for Compulsory Specifications (NRCS). All agro-processing sector players are also expected to comply to compulsory specifications and with requirements contained in the legislation applicable for this sector. Below is a list of some of the legislation relating to, and affecting, this sector–

- ***Food stuffs, Cosmetics and the Disinfectants Act, 1972: Regulations Relating to Labelling and Advertising of Foodstuffs:*** The FCDA Regulations make provision to establish maximum limits for pesticide residues that may be present in foodstuffs to ensure that food is safe to eat.
- ***Perishable Products Export Control Act, 1983 (Act no. 9 of 1983):*** This Act provides for the control of perishable products intended for export from the Republic of South Africa and for

⁸ Department of Agriculture, Forestry and Fisheries (2014)

the continued existence of a statutory board to bring about the orderly and efficient export of perishable products from the Republic. The Perishable Products Export Control Board is responsible for the enforcement of this Act.

- **Liquor Products Act, 1989 (Act no. 60 of 1989):** This Act provides for control over the sale and production for sale of certain liquor products, the composition and properties of such products, the use of certain particulars in connection with the sale thereof, the establishment of schemes and control over the import and export of such liquor products.
- **Agricultural Product Standards Act, 1990 (Act no. 119 of 1990):** This Act provides for control over the sale and export of certain agricultural products and other related products, with a view to the maintenance of certain standards regarding the quality of products and the packing, marking and labelling thereof.
- **Genetically Modified Organisms Act, 1997 (Act no. 15 of 1997):** The Act was implemented in 1999 and its purpose is to ensure activities relating to genetically modified organisms (GMOs) are carried out responsibly. It provides for measures to promote the responsible development, production, use and application of genetically modified organisms; to ensure that all activities involving the use of GMOs (including importation, production, release and distribution) shall be carried out in such a way as to limit possible harmful consequences to the environment; to give attention to the prevention of accidents and the effective management of waste; to establish common measures for the evaluation and reduction of the potential risks arising out of activities involving the use of genetically modified organisms; to lay down the necessary requirements and criteria for risk assessments; to establish a council for genetically modified organisms; to ensure that genetically modified organisms are appropriate and do not present a hazard to the environment; and to establish appropriate procedures for the notification of specific activities involving the use of genetically modified organisms.
- **Marine Living Resources Act, 1998 (Act no. 18 of 1998):** the purpose of the Act is to provide for the conservation of the marine ecosystem, the long-term sustainable utilisation of marine living resources and the orderly access to exploitation, utilisation and protection of certain marine living resources; and for these purposes to provide for the exercise of control over marine living resources in a fair and equitable manner to the benefit of all the citizens of South Africa; and to provide for matters connected therewith. An amendment was published in 2014 to make provision for measures relating to small-scale fishing and other amendments to the objectives, principles and technical details. It aims to grant small scale fishing communities better access to fishing rights and resources.
- **Meat Safety Act, 2000 (Act no. 40 of 2000):** The Act provides for measures to promote meat safety and the safety of animal products; to establish and maintain essential national standards in respect of abattoirs; to regulate the importation and exportation of meat; to establish meat safety schemes; and to provide for matters connected therewith.
- **Legal Metrology Act, 2014 (Act no. 9 of 2014):** To provide for the administration and maintenance of legal metrology technical regulations in order to promote fair trade and to protect public health and safety and the environment; and to provide for matters connected therewith.

The legislations listed outline requirements to which players in the agro-processing sectors, especially the food processing as the largest sub-sector, must comply with to ensure the health and safety of consumers, and the protection of the environment. The regulatory framework is complemented by policies, standards, directives and guidelines to ensure the regulatory objectives are fulfilled. Standardisation in this regards supports the legislation by setting the minimum requirements for quality and performance for the various products, to which industry can implement. This can also then be used as a measure to illustrate that legislative requirements are met.

4. STANDARDISATION TRENDS

4.1 South African National Standards in Agro-processing

The SABS is responsible for the development of South African National Standards (SANS) which cover an extensive area in the food industry - food safety, food quality and control, thus consisting of Food Safety Management systems, food product specific standards as well as test methods used to assess food quality, safety and control measures. DAFF, Department of Health (DoH) and the NRCS function as regulators in the food industry, which is major sub-sector within the agro-processing sector. These departments compile regulations and are important stakeholders in the development of national standards in the different SABS Technical Committees (TCs). Other areas of the industry, mainly agricultural products (crop and livestock production) are within the ambit of DAFF through the sanitary and phytosanitary (SPS) measures.⁹ Part of DAFF's implementation strategy in the next five-year period (2015/16 – 2019/20) is strengthening the regulatory and policy frameworks for agricultural production, health and food safety, and to maintain coherent participation in international standards setting-setting forums. Standards development in the other agro-processing sub-sectors is a sole responsibility of the SABS, where stakeholders from the entire value chain are encouraged to participate.

Local participation in standards development

The SABS has 22 technical committees (TCs) and 25 sub-committees (SCs) in the field of agro-processing. A total of 650 standards have been developed in the various areas to support the local industry (to improve product quality and boost exports), and preserve health and safety of consumers. The table below summaries the TCs and SCs per sub-sector and the details of each committee are listed in Annexure A.

⁹ Measures to safeguard the health and safety of human beings in line with the WTO

TABLE 1: NATIONAL TECHNICAL COMMITTEES (TCs) AND SUB-COMMITTEES (SCs) FOR AGRO-PROCESSING

Agro-processing sub-sector	No. of TCs	No. of SCs
Food and beverages	9	10
Clothing, textiles and footwear (CTF)	6	5
Leather and leather products	1	0
Wood and wood products	3	6
Paper and paper products	1	3
Rubber products	1	1
Tobacco products	0	0
Furniture	1	0
Total	22	25

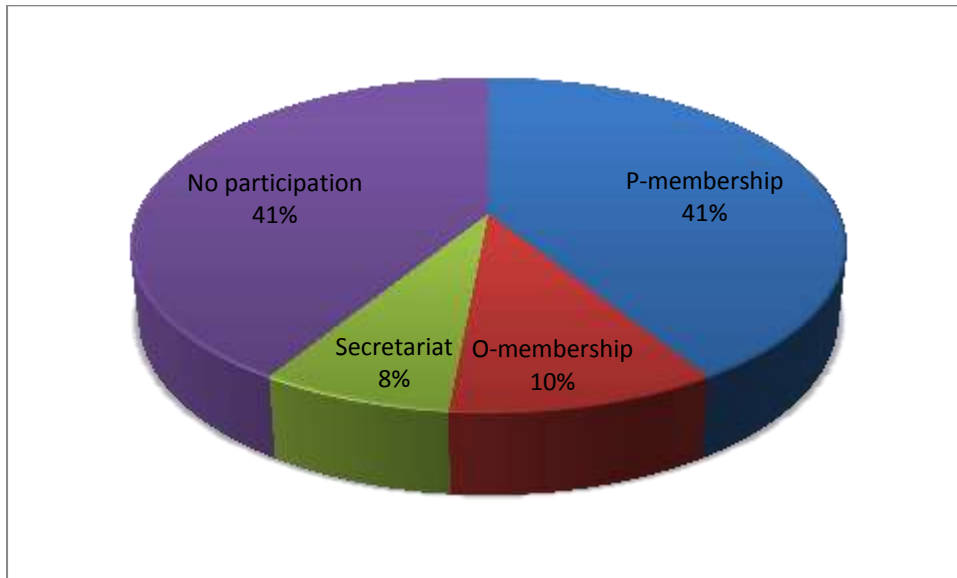
Majority of the committees are in the food and beverages, CTF, and wood and wood products sub-sectors which constitute larger segments of the agro-processing sector. Of critical importance is the participation of smaller players in the standards development activities within the various agro-processing sub-sectors, a role which has been to a great extent dominated by established large companies. This is evident from the limited participation for SMMEs in the standards development activities. This trend increases the risks of uncompetitive behaviour in the form of small players being locked through the setting of stricter requirements and costly test procedures/ methods that these players are unable to meet.

The exposure of the South African food industry to the rest of the world following the removal of sanctions (democratic transition) led to a growing awareness of the need to improve quality in order to be more competitive in the global and local markets.¹⁰ It is critical for the country to participate in the development of international standards (e.g. food safety management systems) as these are internationally recognised as proof of good quality. For South Africa to maintain its strong export markets in, for example, the prepared food stuffs product group, its active participation in the international standardisation arena will ensure these are maintained. The same applies to the other agro-processing sub-sectors to increase their competitiveness and improve market access.

4.2 International participation

At ISO level, standardisation in the field of agro-processing consists of 68 Technical Committees (TCs) and Sub-committees (SCs) where member countries can participate. South Africa through its TCs holds various membership levels (i.e. participating member, observer member and secretariat) in these international committees for the different agro-processing sub-sectors. Although Figure 3 below shows that South Africa holds a significant P-membership (41 per cent), there areas where there is no participation also amount to the same share. However, the country holds a few secretarial positions which are an indication of expertise in those fields, these are in food; leather; and clothing, textiles and footwear. Annexure B provides a breakdown of the international participation per agro-processing sub-sector.

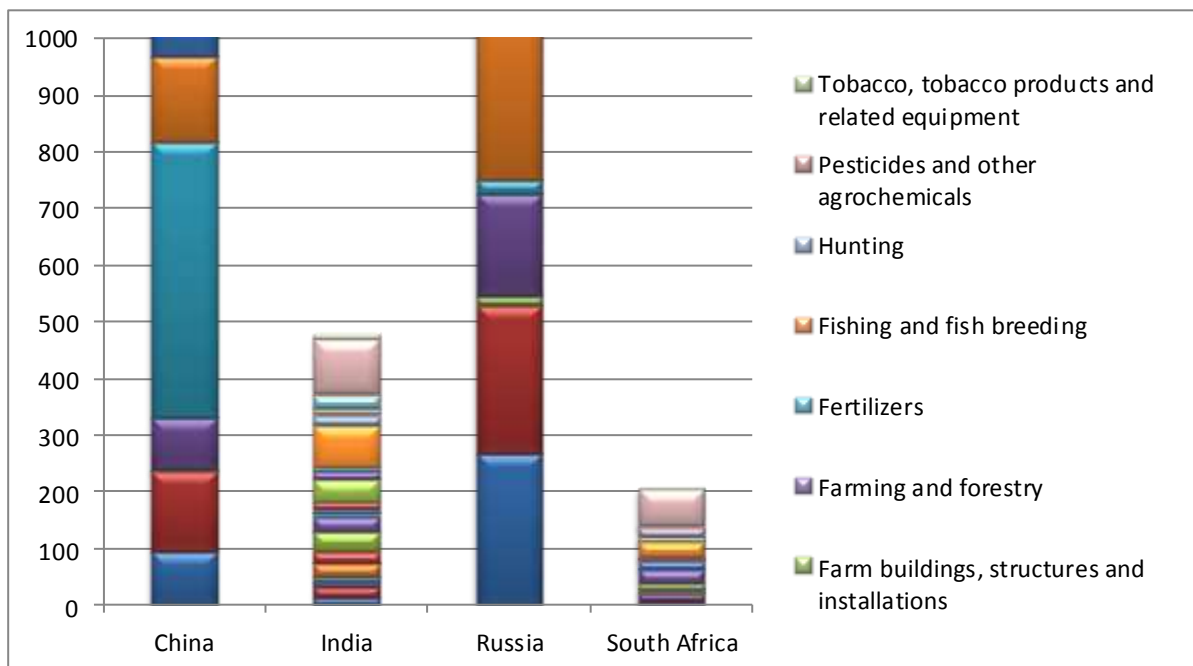
¹⁰ Mbendi (b) (n.d.)

FIGURE 3: SECTOR PARTICIPATION AT ISO

4.3 Global standardisation trend

The food industry constitutes the largest portion of the South African agro-processing sector and analysis of standards at a global level shows that South Africa has room to expand its standard development in the field of food. At a global level, a comparison between South Africa and other top food producing countries in the world shows that these countries have high volumes of standards to support their food and agriculture industries. Countries, such as China and India are also experts in the field of food standardisation heading (chairperson) certain food products committees at ISO. It should however be noted that the low volumes in SANS could be due to some areas of standardisation falling under DAFF.

FIGURE 4: FOOD PRODUCTS STANDARDS – TOP PRODUCING COUNTRIES VS SOUTH AFRICA



5. GLOBAL TRENDS

5.1 Increasing food demand and changing food consumption patterns

World population is projected to reach 9.3 billion in 2050, and the majority of the population increase is expected to occur in developing countries. About 67 per cent of this world population is expected to be concentrated in urban areas by the same period.¹¹ Food production will have to increase to meet global food demand driven by increasing population, economic growth and urbanisation, especially in developing countries. The increasing global food demand is also driven by changing consumption patterns towards, with a growing emphasis on more healthy foods with higher nutritional qualities, such as fish and fish products. These changes have a strong influence on agriculture, natural resources and food security, especially in rural areas.

Trends in food systems show that developing countries place growing emphasis on food safety and quality standards, and these are expanding in developing countries as well.

5.2 Environmental concerns in global wood industry - particularly climate change

Environmental concerns relating to climate change have an impact on the global wood industry and this has resulted in policies aimed at mitigating these impacts on the global industry. These are

¹¹ Food and Agriculture Organisation (2011)

policies, regulations and customer preferences linked to climate change which impact on the industry in various ways. One way is when such policies encourage the use of wood products instead of other materials that yield more greenhouse gas emissions during the course of their production, when in use and at disposal.¹² For instance the promotion of energy-efficient and renewable construction materials could boost global demand for construction timber. This will however depend on how green buildings standards set or formulated to influence the preference for sustainable wood products over competing materials, based on GHG emissions. Another effect on the global industry is the development and use of bio-energy and bio-fuel as an energy source, resulting in increased demand for wood as an energy source, i.e. the use of wood pellets as a substitute for fossil fuel in small-scale heating and electricity production. Although this is a sustainable energy option, it is likely to increase raw materials costs for traditional forest-product manufacturers and reduce the competitiveness of these products with substitute materials which costs less to produce.

6. STANDARDISATION ROADMAP

The roadmap focus areas are informed by strategic plans and sector-specific policies within national government, including NDP, 2014 – 2019 Medium-Term Strategic Framework (MTSF), DAFF Strategic Plan, DAFF Integrated Growth and Development Plan (IGDP), DAFF Agro-processing Strategy (2012), National Food and Nutrition Security Policy (NFSP). These policy objectives will be implemented in the medium- to long-term to meet the country's developmental goals. Technology advancement is critical in assisting the local food and agriculture sectors to adequately respond to the growing demand for food, in a sustainable manner. Current and emerging technologies in the industry are an important contributor towards development and sustainability in food production.

6.1 Sustainable agriculture

Growing population and limited arable land requires sustainable approaches to agricultural production to ensure stability of food supply. Risks such as climate change and the use of land for non-agricultural activities led to loss of land for food production. In the period between 1994 and 2009, the overall area for food production in South Africa declined by 30 per cent.¹³ Sustainability approaches such as climate smart agriculture will aid the country's management of the natural resources, without damaging the environment.

Climate Smart Agriculture

To aid in the sustainable management of the country's natural resources, an ecosystem-based management (EBM) will be adopted. Climate Smart Agriculture (CSA) seeks to increase sustainable productivity, strengthen farmers' resilience, reduce agriculture's greenhouse gas emissions and increase carbon sequestration. It strengthens food security and delivers environmental benefits.¹⁴ CSA practices enable farming communities to:

- sustainably and reliably increase agricultural productivity and incomes;
- adapt and build resilience to extreme weather events and a changing climate; and

¹² Jonsson (2011)

¹³ Department of Agriculture, Forestry and Fisheries (2013)

¹⁴ Department of Agriculture, Forestry and Fisheries (2011)

- where appropriate, contribute to reducing greenhouse gas emissions and concentrations.

6.2 Food security considerations

The Bill of Rights guarantees every citizen the right to have access to sufficient food and water, and that the State must take reasonable legislative and other measures, within its available resources, to achieve the progressive realisation of these rights.¹⁵ Through the National Food and Nutrition Security Policy (NFSP), government provides a broad framework for the fulfilment of this Constitutional imperative. The Policy has been developed to serve as a guide to national, provincial and local government in pursuing food security at all levels. Food security is defined by the NFSP, based on Food and Agriculture Organisation (FAO) and World Bank definitions, as “access to and control over physical, social and economic means to ensure sufficient, safe and nutritious food at all times, for all South Africans, in order to meet the dietary requirements for a healthy life”.

The NDP identifies food and nutrition security as a key element to eradicating poverty and eliminating inequality by 2030. The Plan outlines a number of interventions that will improve food security, including the expansion of irrigation infrastructure, security of land tenure, technology development and the promotion of nutrition education. This commitment to achieve food security also dates back to the 1996 Rome Declaration on World Food Security, where South Africa pledged to ensure that technology development, farm management, trade and growth policies, and distribution systems foster food security.¹⁶ Meeting these objectives will require efforts from all role players to address the challenges currently facing food security in South Africa and these include:

- Inadequate knowledge and information to enable citizens to make optimal choices for the consumption of safe and nutritious food;
- Rising input costs, especially electricity and fuel, and labour costs, which undermine the ability to sustain food production;
- Climate change and poor land management (over grazing and other practices), loss of high agricultural potential land to non-agricultural activities such as mining and urban development, pose a threat to domestic food production;
- Limited opportunities and platforms for smallholder farmers to gain access to markets;

Food quality and safety

One of the critical dimensions of food security is the quality and safety of food, to which the technical infrastructure, i.e. standards development and conformity assessment services, has a critical role to play in supporting the regulatory objectives of food safety. According to the NFSP, an assessment of Food Security in South Africa showed that nutritional standards and food safety standards were among the highly rated factors in the assessment suggesting that the country is tackling food security. Food Safety implies “the absence of, or acceptable and safe levels of contaminants, adulterants, naturally occurring toxins or any other substance that make food injurious to health on an acute or chronic basis”. The 2015 SDGs (SDG 2) highlights and supports access to safe food for the benefit of healthy diets, improved knowledge for food choices, stronger

¹⁵ The Constitution (1996)

¹⁶ Department of Agriculture (2002)

resilience of food systems to economic, climatic and human-made shocks, and remediation of food-borne threats to consumers.¹⁷

Priority areas for food security/ Food security response mechanisms include:

- Increase household food production and trading;
- Improve nutrition and food safety
- A centralized food safety control system

6.3 Aquaculture

The South African aquaculture sector consists of freshwater and marine aquaculture. Technology and services in this sector are well-established for certain species (e.g. trout, abalone, oysters, prawns, etc), while still lacking for species such as tuna, seaweed, cob, etc.¹⁸ Government's main interventions in this area include establishment of the sector through institutionalisation of support, key services, and the regulatory framework.¹⁹ To boost the aquaculture sector, DAFF aims to develop, maintain and promote quality, safety, and traceability standards. The sector is also among the nine sectors identified as key priorities for South Africa's Oceans Economy. The contribution of the aquaculture sector to the GDP is expected to reach R10 billion to R16 billion in 2033 from R7 billion in 2010. In terms of job creation a contribution of 170 000 to 250 000 is estimated by 2033.²⁰

6.4 Food processing technologies

Technology is seen as the greatest driver to future growth in the global food industry to help cope with increasing populations, changing consumer tastes (i.e. towards healthy diets) and climate change and sustainability (i.e. food grown and produced in ways that do not damage environmental resources)²¹. Below is a review of the existing and emerging technologies identified in the global food industry.

6.4.1 Nanotechnology in food processing, packaging, and food safety

Nanotechnology is invading the food industry and is establishing a great potential. During **food processing**, nanoparticles have been applied to improve nutritional quality, flow properties, flavour, colour and stability or to increase the shelf life. The technology will also help in development of healthier food with lower fat, sugar and salts to overcome many food-related diseases.²²

The critical role of nanotechnology in **food packaging** is the use of nanoparticles to help in the production of new food packaging materials with improved mechanical, barrier and antimicrobial properties to increase shelf life. In addition, nanoparticles can also be used vehicle to deliver

¹⁷ University of Johannesburg (2016)

¹⁸ Department of Agriculture, Forestry and Fisheries (2012)

¹⁹ Department of Agriculture, Forestry and Fisheries (2014)

²⁰ Operation Phakisa (2014)

²¹ Avery, M.L., Kreit, B., Falcon, R. (2011)

²² Berekaa (2015)

antioxidants, enzymes, flavours, anti-browning agents and other materials to extend shelf life even after opening.²³

Nanotechnology in **food safety** – nanosensors and nanosieves – the use of nanoparticles to develop nanosensors for detection of food contaminant and pathogens in food system is another potential use of nanotechnology. This is help preserve the safety of food, for example nanosensors are used to ensure safe drinking water.

Despite the benefits of nanotechnology application in food industry, highlighted concerns include the health and safety impact of nanoparticles to human health as well as environmental effects. Therefore the development of safe nanotechnology is critical, to avoid the potential toxicity of nanoparticles to consumers. Due to the health implications of nanoparticles that enter the body, an assessment of potential risks to human health is critical.²⁴ Safety standards should therefore be developed, and the necessary tests conducted, prior to introducing nano-food to the market.

The future of food nanotechnology

Nanotechnology application in food industry is gaining momentum, particularly in the global markets, as food manufacturers seek ways to produce foods that meet consumer taste and have a longer shelf life. In South Africa, Nanotechnology application is used in the field of health, green industries (in photovoltaics mostly), additive manufacturing, and in water purification where innovative approaches are being developed with techniques such as nano-filtration already implemented at pilot stage²⁵.

At international level, standardisation in the field of nanotechnology is conducted by ISO TC 229 – Nanotechnologies, which develops standards for terminology and nomenclature; metrology and instrumentation (including specifications for reference materials); test methodologies; modelling and simulations; and science-based health, safety, and environmental practices. The work is split across 6 subcommittees/working groups. To date a total of 63 international standards have been published in this field which cover terminology and vocabulary (to common understanding of concepts and principles), classification and categorisation of nanomaterials, characteristics and measurements of nanomaterials, risk evaluation of nanomaterials, voluntary labelling of consumer products containing manufactured nano-objects, test methodologies, etc. As the field is a complex specialised area it is difficult to determine specific standards for food industry application (i.e. in food processing, packaging and safety).

6.4.2 Genetically Modified Organisms (GMOs) in food products

GMO crops have been adopted globally due to the socio-economic and environmental benefits they offer. These include: (i) food security, sustainability and climate change; (ii) conserving biodiversity – biotech crops are a land-saving technology; contributing to the alleviation of poverty and hunger; helping mitigate climate change and reducing greenhouse gases; and reducing agricultural environmental footprint.²⁶

²³ Berekaa (2015)

²⁴ Berekaa (2015)

²⁵ Department of Science and Technology (n.d.)

²⁶ AfricaBio (2013)

In South Africa, genetically modified (GM) maize, cotton and soybean have been commercially available since 1998, with estimated an 86 per cent of maize, and over 90 per cent of soya and 100 per cent of cotton is GM.²⁷ This makes South Africa the largest GM producer in Africa, and the 8th largest producer in the world.²⁸ With legislation to regulate the technology enacted as early as 1997, to embrace this biotechnology in the country's agriculture and food industries. There's a variety of food products sold in the market which could contain GM maize or soy. These could include products such as bread, chocolate, chips, porridge, soy milk, soy milk powders, vegetarian soy products, corn flakes, etc. Food ingredients such as soy derivatives, maize derivatives, canola, cotton derivatives, potatoes and vegetable oils could also contain GMO.²⁹ This illustrate that GM foods are part of South African consumers' diet today.

The future of GM foods

The future prospects of biotechnology crops (or GMO crops) seem encouraging as a number of new developing countries are expected to plant GMO crops, including African countries. For instance the first biotech based drought tolerant maize is planned for release in Africa by 2017.³⁰ Despite anti-GMO activism, it appears food products will continue to feature GM crops due to the benefits offered this technology.

International standardisation in the field of GMO falls within the scope of ISO/TC 34/SC 16 – Horizontal methods for molecular biomarker analysis. To date the committee has published only 5 international standards directly linked to GMO analysis. South Africa is not a member of this ISO committee, however locally national standards for GMO foods have been produced by SABS TCs 1088: Genetically Modified Organisms (only 1 standard) and 1044: Identity Preservation of Non-Genetically Modified Foods (5 standards). These support the regulatory framework set up to manage the development, production and application of GMOs in the country.

6.4.3 3D printed foods

Technology innovations include development of synthetic meat/laboratory grown meat – this technology still at research and development stage and trial stage, and not yet commercialised. It is recommended that South Africa participates in this global platform to monitor developments and possible future application locally.

The future of 3D printed foods

Internationally, 3D food printing still face major obstacles due to high costs associated with this technology and the level of complexity required to create quality food is said to be still far from being viable. Although 3D food printers are not yet producing tasty food, the initial experiments currently being conducted are paving a way for a shift in the current food consumption to make this a viable option in future. At this stage, the real impact of 3D printing in the food processing industry is more discreet and only occurs in industrial processing experimental stages.

No standards envisaged at this point as technology still at R&D phase in South Africa. The R&D investments in additive manufacturing, which includes 3D printing, has developed strong

²⁷ AfricaBio (2013)

²⁸ <https://www.loc.gov/law/help/restrictions-on-gmos/south-africa.php>

²⁹ <http://www.shoporganic.co.za/gmo/185-genetically-modified-products-in-south-africa>

³⁰ AfricaBio (2013)

capabilities in these technologies which will assist in transforming the country's manufacturing industry. It is recommended that the local TC investigate the feasibility developing standards in this area, and to also support the possible commercialisation of this technology going forward.

Although this technology promise to enable the food industry to feed a growing population, the introduction of any new technologies would need to adequately address any possible safety issues and allow for early informed input from consumer representatives.³¹ Standards are critical in this regard, where all stakeholders from industry, academia and consumer organisations undergo a consensus-based process to develop standards that help preserve health and safety of consumers.

6.4.4 Modified Atmosphere Packaging (MAP)

Longer shelf life MAP packages allow food processors, food manufacturers, food distributors and food retailers to better control product quality, availability and costs. Food manufacturers are able to take advantage of extended replacement cycles to reduce production replacement demands. Manufacturing capacity can be more profitably utilised by developing and offering new products. However, although MAP offer such benefits, food producers must bear the costs associated with this technology, i.e. capital cost of gas packaging machinery, cost of packaging materials, cost of quality assurance systems, etc.

The future of Modified Atmosphere Packaging

The technology is currently applied in South Africa and various food chains to increase the shelf life of products and preserve product quality. This type of food packing technology is mainly used by major food manufacturers and retailers to extend the shelf life of food products. Currently there are no national standards on this type of food packaging.

6.5 Processing

6.5.1 Footwear, leather and leather products - vegetable tanning

Vegetable tanning is a process of producing leather using tannins that occur naturally in the bark and leaves of many plants. The natural tannins can be extracted from different part of plants including woods, barks, fruits, fruit pods and leaves.³² The most common tannins are obtained from: Chestnut wood (*Castanea sativa*), Quebracho wood (*Schinopsis lorentzii*), Tara pods (*Caesalpinia spinosa*), Catechu (*Acacia Catechu*), Chinese gallnut (*Rhustypina semialata*), Turkish gallnut (*Quercus infectoria*), Gambier (*Uncaria gambir*), Myrobalan (*Terminalia chebula*), Oak wood (*Quercus* sp), Sumac (*Rhustypina coriaria*), and Valonia Oak (*Quercus macrolepis*). These natural tannins bind to the collagen proteins in the hide and coat them, causing them to become less water-soluble, more resistant to bacterial attack and also a bit more flexible. The end applications of vegetable tanned leather include luggage, furniture, footwear, belts and other clothing accessories.

The future of vegetable tanning of leather

Vegetable tanning is not commonly used in South Africa with only one manufacturer currently utilising this method, but has prominence internationally. It is the most natural and environmentally friendly technology. This is due to the use of natural tanning materials (i.e. vegetable extracts), and

³¹ Jonsson (2011)

³² Life Fit for Reach, European Union

that the vegetable tanned leather products can be recycled. This technology however creates any opportunity for the leather industry to shift towards more sustainable methods of processing leather.

6.5.2 Nanotechnology in wood products

Advances in nanotechnology can enhance properties of wood products and lead to the creation of new materials, for example ceramic nanoparticles can be injected into wood to improve their mechanical properties and fire resistance. Nanotechnology applications are also utilised in the production of new construction materials based on wood fibre/plastic composites which are an energy-efficient alternative for the construction industry.³³

The future of nanotechnology in wood products

International standards development in the area of nanotechnology includes developing standards for: terminology and nomenclature; metrology and instrumentation, including specifications for reference materials; test methodologies; modelling and simulations; and science-based health, safety, and environmental practices. The development of standards for nanotechnology applications in wood products will benefit the local construction industry by ensuring that these new construction materials meet durability and performance requirements in construction applications.

6.5.3 Wood biomass for energy/bio-energy

Technological improvements in wood processing has led to an increase in production of wood chips from sawmills, which are also used for bio-energy. Bio-energy and bio-refinery processors are therefore key features in the creation of a 'green economy', by reducing dependence on fossil fuels.³⁴ Despite the potential economic benefit of cleaner energy, the increased utilisation of wood biomass also increases the risk of unsustainable production which may prove costly to ameliorate negative impacts to the environment.³⁵

The future of wood biomass for energy

The use of wood for electricity generation and heat in modern technologies had grown rapidly in recent years, and the potential to continue to do so. This form of bio-energy, combined with other forms - biofuel and bio-gas, are currently the largest source of modern renewable energy worldwide accounting for an estimated 5.1 per cent of total final energy consumption in 2014.³⁶

7. CONCLUSION

The agro-processing sector is one of the key manufacturing sectors supporting the country's growth. The SDA identified technology areas currently driving the agro-processing sub-sectors and the opportunities they present to industry players and the economy as a whole. In the food sub-

³³ Jonsson (2011)

³⁴ Jonsson (2011)

³⁵ Institute for Commercial Forestry Research (n.d.)

³⁶ Brack (2017)

sector for instance, adhering to food safety standards, while increasing food security, is critical towards the successful implementation of the NDP and other policy imperatives in the industry. Standardisation infrastructure, i.e. standards and necessary conformity assessment services, are required to support sustainable growth in the agro-processing sector which paving a way for the advancement of existing technologies driving the sector and future ones likely to direct development in the long-term . Of critical importance is the participation of smaller players in the standards development activities within the various agro-processing sub-sectors, a role which has been to a great extent dominated by established large companies.

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Annexure A: National TCs and SCs in the field of Agro-processing

TC and SC number	Committee name	Number of standards
TC 34	Food products	13
TC 34/SC 05	Dairy	23
TC 34/SC 09	Microbiological foods test methods	60
TC 34/SC 10	Animal feeding stuffs	3
TC 34/SC 11	Animal and vegetable fats and oils	6
TC 34/SC 13	Pet food	0
TC 34/SC 14	Wax coating for fruit	1
TC 34/SC 17	Hygiene practices in the food industry	12
TC 34/SC 20	Honey production and processing	0
TC 147	Water	60
TC 147/SC 04	Microbiological and biological treatment and assessment of water	36
TC 147/SC 06	Water sampling and analyses	85
TC 234	Fisheries and aquaculture	8
TC 1024	Yeasts and sorghum products	6
TC 1027	Canned and processed meat products	4
TC 1037	Non-alcoholic beverages	3
TC 1044	Identity preservation of non-genetically modified foods	5
TC 1050	Gases	1
TC 1088	Genetically Modified Organisms (GMOs)	1
TC 1194	Personal safety	0
TC 1194/SC 01	Personal safety - foot protection	6
TC 1194/SC 02	Personal safety - protective clothing	9
TC 133	Clothing and sizing systems - size designation, size measurement methods and digital fitting	31
TC 216	Footwear	57
TC 038	Textiles	37
TC038/SC 01	Textiles - test methods for textiles	187
TC 038/SC 02	Textiles - textile products	79
TC 038/SC 03	Textiles - medical textiles	24
TC 137	Footwear sizing designations and marking systems	1
TC 1188	Personal safety equipment - personal flotation devices and swimming aids	14
TC 120	Leather	68
TC 006/SC 01	Paper, board and pulps - stationery paper and board products	7
TC 006/SC 02	Paper, board and pulps - packaging, paper and board	15

TC and SC number	Committee name	Number of standards
TC 006/SC 03	Paper, board and pulps - paper, tissue	10
TC 218	Timber preservation	3
TC 218/SC 01	Timber preservation - process and preservative treatment performance requirements and methods of test	15
TC 218/SC 02	Timber preservation - wood preserving chemicals and analysis	11
TC 218/SC 03	Timber preservation - material and physical requirements	7
TC 1008	Wood and associated products	32
TC 1008/SC 01	Wood and associated products - sawn timber	0
TC 1008/SC 02	Wood and associated products - reconstituted timber	0
TC 1008/SC 03	Wood and associated products - doors	0

Annexure B: International participation – ISO

Sub-sector	P-membership	O-membership	Secretariat	No participation	No of TCs/SCs
Food and beverages	9	2	1	15	27
Clothing, textiles and footwear	12	2	3	5	22
Leather and leather products	1	0	1	1	3
Wood and wood products	0	1	0	3	4
Paper and paper products	2	0	0	0	2
Rubber products	4	0	0	1	5
Tobacco products	0	1	0	3	4
Furniture	0	1	0	0	1
Total	28	7	5	28	68