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The Complex Nature of Food and Nutrition Security

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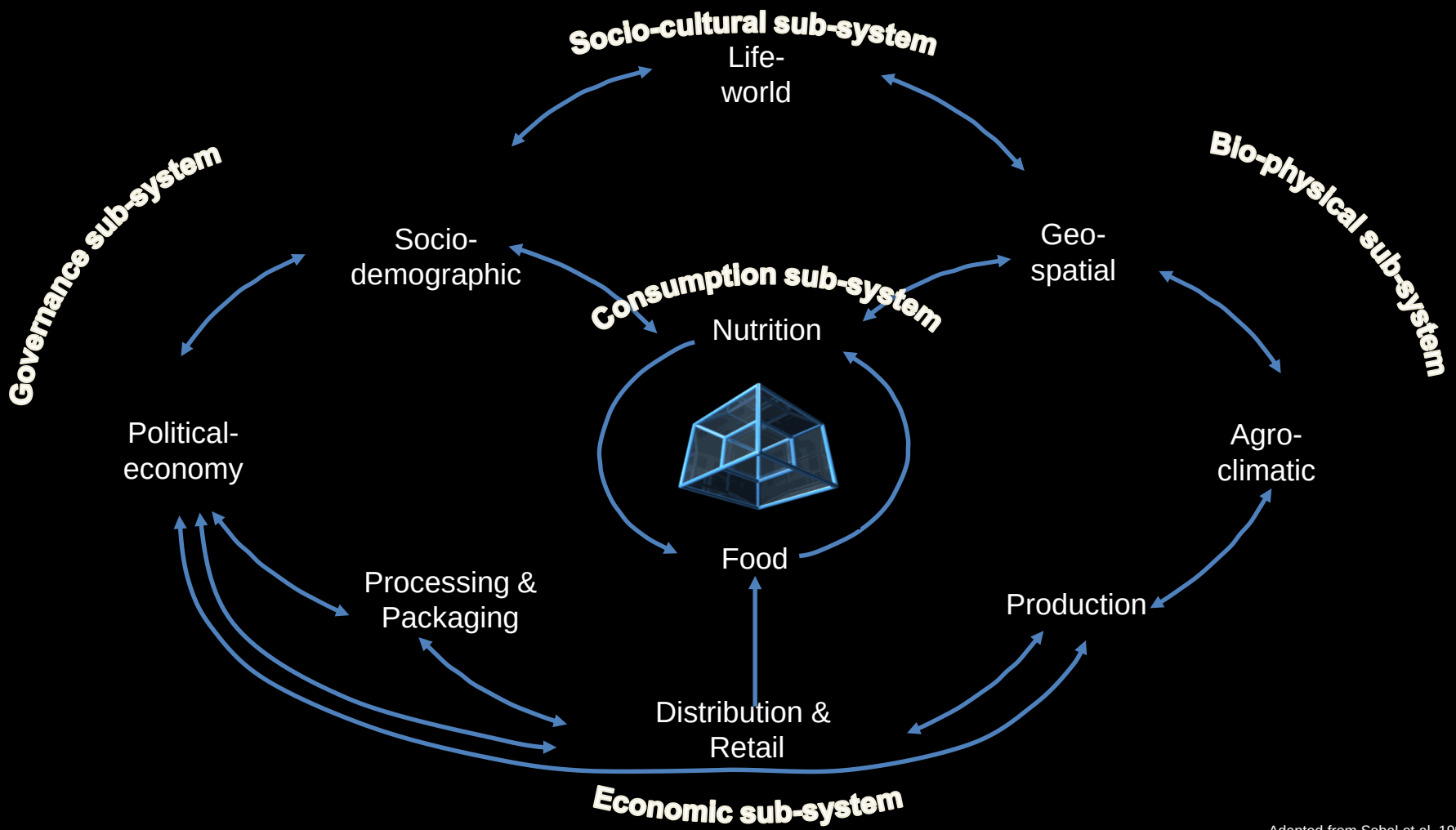
Cape Town International Convention Centre 2
3rd December, 2017

Food Security

"when all people at all times have **access** to **sufficient**, **safe and nutritious food** to maintain a healthy and active life"

Global challenge

- Regional disparities



Adapted from Sobal et al, 1998)

Special Issue on Food and Nutrition Security

Food Research International 76 (2015) 879–881

Contents lists available at ScienceDirect

Food Research International

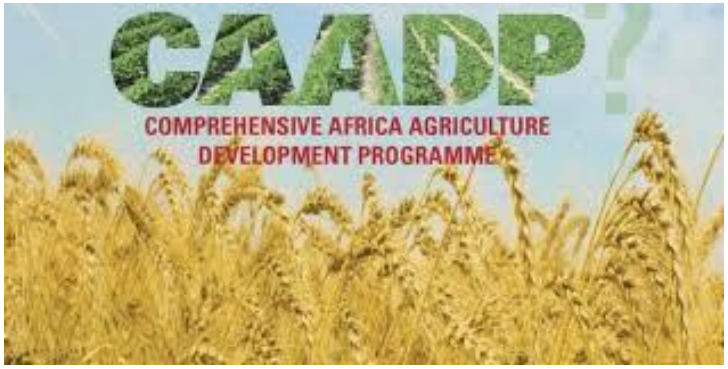
journal homepage: www.elsevier.com/locate/foodres

Editorial

Introduction to the special issue *Food and Nutrition Security*: Can science and good governance deliver dinner?

The end of this year (2015) marks the target date for achieving the Millennium Development Goals (MDGs) set by world leaders at the United Nation General Assembly in the year 2000. One of these goals is to reduce the proportion of hungry and undernourished people in the world by half. A significant reduction in global hunger has indeed reported as threats to food safety as a consequence of the rising pressure to rapidly increase food production. Projections indicate that the world's population is likely to reach close to 9 billion by the year 2050 (FAO, IFAD & WFP, 2014). It is estimated that as much as 60–70% more food will be required in order to feed a population of that magnitude (FAO,

Research based policy implementation towards Food Security



NEPAD
TRANSFORMING AFRICA

IAPRI
Indaba Agricultural Policy Research Institute

ZIMBABWE AGENDA FOR SUSTAINABLE
SOCIO-ECONOMIC
TRANSFORMATION (ZIM ASSET)

October 2013 - December 2018

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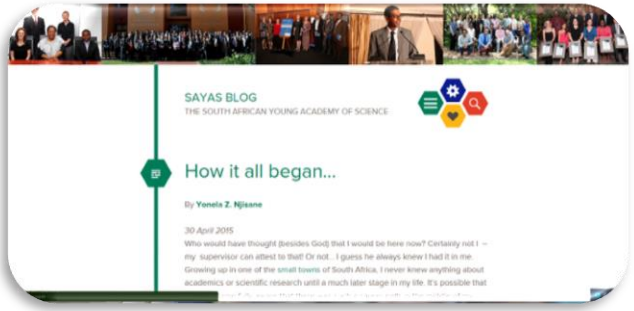
Oct 2015 WHO meat report

- Magazines
- Blogs
- TV interviews (etv)



Upcoming Special Issue

Balanced diets in food systems: emerging trends and challenges for human health and wellbeing

Aims to contribute to the pool of epidemiological evidence surrounding nutrition, human health and the multi-faceted, inter-related influential factors impacting on these

Emerging trends

Nutrition transition

- shift towards replacing fibre and grain-rich traditional diets with a greater proportion of processed foods high in fat and sugar in developing countries

Double burden - undernutrition vs obesity & disease non-communicable diseases

- overweight, obesity and diet-related chronic diseases on one hand, while micronutrient deficiencies lower immunity leading to infectious diseases on the other

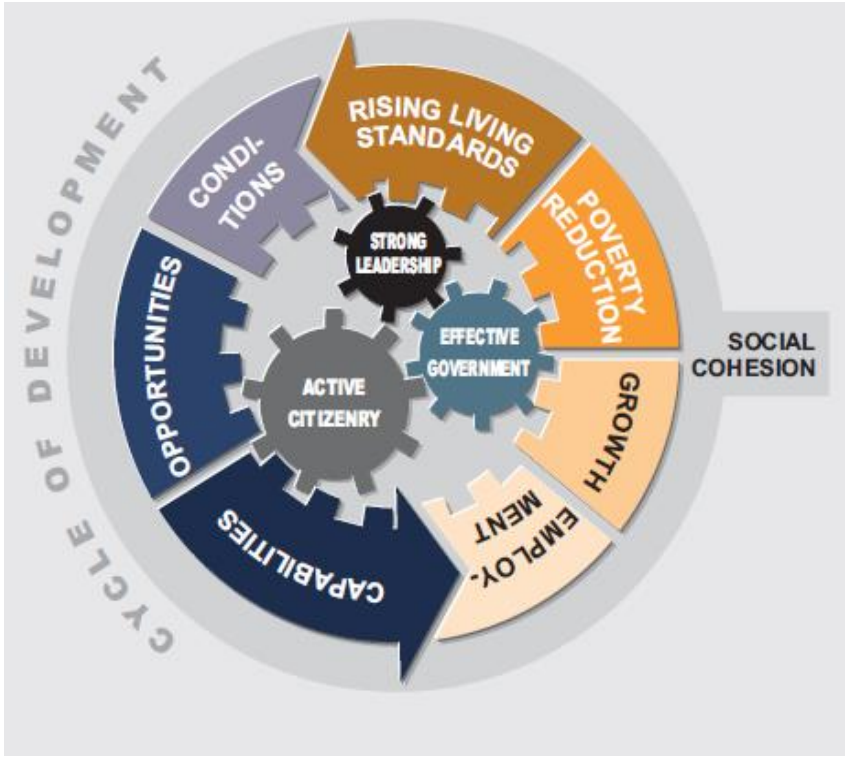
South African Journal of Animal Science

Special Issue: Golden innovations for sustainable animal agriculture

The National Development Plan of South Africa (NDP)

- The National Development Plan of 2013 <u>targets a future that will be beneficial for South Africans as a whole</u>

- Aim - To eliminate poverty and reduce inequality in South Africa by 2030 (NPC, 2012)



Towards a Food Secure 2030: Unpacking the National Development Plan

Highlights

- NDP - long term strategy

  - Circumstances continue to emerge on the food production front (climate change, drought, disease outbreaks, natural disasters)

  - Socio-economic and political environments that have implications on it's effective implementation.

  - Efficient response to emerging challenges
    - ➢ re-strategizing short term goals and targets accordingly to stay on track

The challenges we face are far bigger than what single country, sector or organization can solve

Collaborative research initiatives by Austratralian and African Universities linked to Food Security

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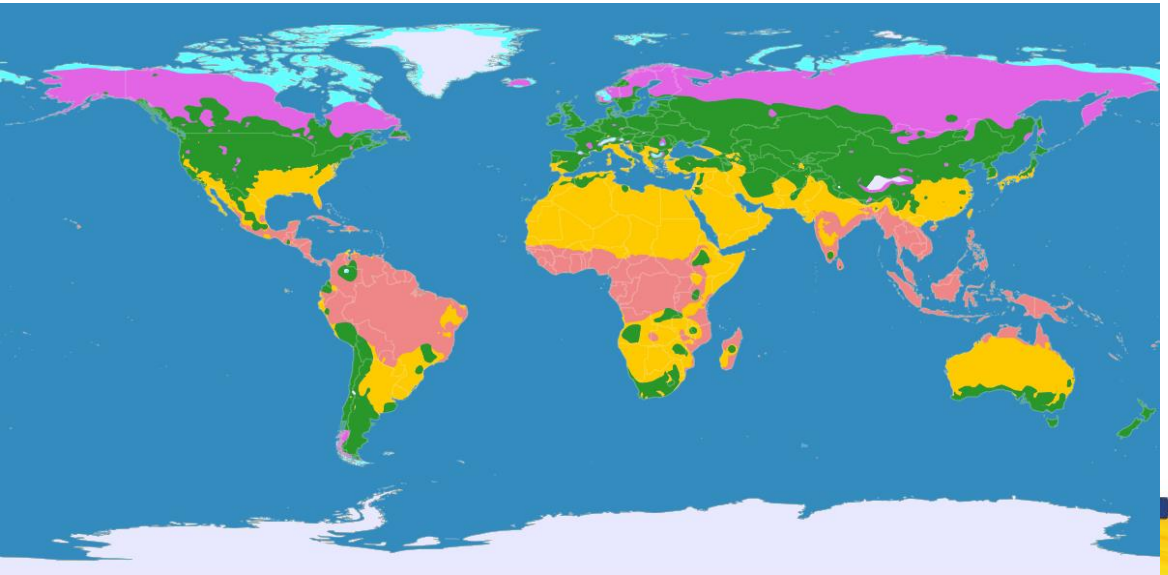
AAUN AUSTRALIA AFRICA UNIVERSITIES NETWORK

- **Australia** and **Africa** -- two Southern continents facing similar challenges

- **The AAUN** draws on the strengths of our network partners in each continent to provide sustainable solutions to our shared challenges:

  - increasing agricultural productivity
    - management of scarce water resources
      - the revolution in higher education
        - Public health in nutrition, obesity and heart disease



- **AAUN focus areas:**
- Education
- Food Security
- Mining
- Public Health
- Public Sector Reform

AAUN Food Security research highlights

Food production

- New plant breeding methods for sustainable use of genetic resources and security of food production (University of Western Australia)

- Future legumes: linking climate change and nutritional needs to agriculture (Murdoch University and AAUN member universities)

Food supply

- Food supply in the context of trade, agriculture and nutritiion (Universities of Sydney, Pretoria and Makerere)

- Minimising waste through value addition and preservation of fresh produce in Nigeria and Kenya

- Mobile-based information system for nutrition-driven agriculture (Western Sydney University)

AAUN Food Security research highlights

Food composition and nutritional value

- Investigating the nutritional value of locally harvested and processed mopane worms: an analysis of the value chain for Indigenous edible insects and their potential role in mother and child nutrition (Universities of Pretoria, Sydney, Zambia and Makerere)

- Food composition data for animal-sourced foods in sub-Saharan Africa (University of Pretoria)

- Development of millet-based functional food products for the prevention and management of obesity and diabetes (Western Sydney University, Universities of Ghana, Ibadan and Zambia)

Food safety

- Food security and antibiotic resistance in the chicken processing industry in Australia and Africa (Universities of Curtin, Pretoria, Ghana, Makerere and Nairobi)

Regional Universities Forum for Capacity Building in Agriculture

- Consortium of 85 African universities operating within 35 countries spanning the African continent

Mission: To strengthen the capacities of universities to foster innovations responsive to demands of small-holder farmers

- training of high quality researchers
- the output of impact-oriented research
- maintenance of collaborative working relations among researchers, farmers, national agricultural research institutions and governments

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African Research Universities Alliance

ARUA
African Research Universities Alliance

- Develop local research excellence through collaboration to find solutions to the development problems of Africa

- Partnerships and networking - leverage resources for greater impact

Natural Sciences
- Climate change
- Food security
- Non-communicable diseases
- Materials development and nanotechnology
- Energy
- Water conservation

Social Sciences / Humanities
- Mobility & migration
- Poverty & inequality
- Unemployment & skills development
- Notions of identity
- Good governance
- Post-conflict societies
- Urbanisation and habitable cities

UNIVERSITY of the WESTERN CAPE

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

DST-NRF Centre of Excellence in Food Security

- Virtual organisation
- Numerous South African and international institutions and over 100 researchers
- Multidisciplinary research:

Food Creation
Production, processing & preservation

Food Distribution
Markets, livelihoods & value chains

Food Consumption
Health, nutrition, choice & behaviour

Food Governance
Safety, standards, policy & rights

DST-NRF
Centre of Excellence
in Food Security

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Institutional Food Security niche areas / research groups

- Producing more food in sustainable ways
- Food safety
- Exploiting the health-promoting properties of foods to improve nutrition
- Influencing what people eat
- Investigating the impact of policies on food security

Institute for Food, Nutrition and Well-being

Initiated Sept 2011, launched May 2012.

Celebrating 5 years of success:

- 85 associated researchers from 35 academic disciplines
- 5 Post Doctoral fellows
- Over 120 associated postgraduates
- Over 210 journal papers published
- 17 seed funded projects
- 55 externally funded projects leveraged
- 39 local partners
- Over 45 African and international partners
- Co-host of the DST/NRF CoE in Food Security
- Partner to three Feed the Future Innovation Labs (Food Processing, Food Security Policy and Sorghum and Millets)

Make today matter.

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www.up.ac.za

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Future Africa

- **Campus - Africa's leading scientists and scholars from across the world**
- Transdisciplinary research - adress grand challenges that face Africa and the world
  - Research programmes
  - Science leadership programmes

African Doctoral Academy

Vision: to support, strengthen and advance doctoral training and scholarship on the continent

- to support knowledge production in Africa by increasing the number and the quality of doctoral graduates

- Summer and Winter Doctoral Schools - bi-annual, two week long
  Open to doctoral candidates, supervisors and researchers in general
  - high impact research and methodology training
  - academic development
  - career development

African Women in Agricultural Research and Development

Career Development
- AWARD fellowships (science, leadership and mentoring skills)

Institutional transformation
- Gender Responsive Agricultural Research and Development

Gender in Agribusiness
- Gender in Agribusiness Investments for Africa

Training
- building mentoring, leadership, scientific research skills

NEXT EINSTEIN FORUM

An AIMS initiative in partnership with the Robert Bosch Stiftung

- Brings together leading thinkers in science, policy, industry and civil society in Africa to leverage science to solve global challenges

"We believe the next Einstein will be African. We are working to make Africa a global hub for science and technology."

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Food security and Safety - North West University

- collaborating with the National Department of Agriculture, Forestry and Fisheries (DAFF) - in support of DAFF's implementation of the Zero Hunger Strategy

Food Security Initiative of Southern Africa - Stellenbosch University

- the emergence of a resilient, sustainable food system for Southern Africa

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- Food Security and Sustainable Agriculture
- Agricultural and Rural Development Research Institute (ARDRI)
- Risk and Vulnerability Science Centre (RVSC)
- Meat Science and Food Security - DST-NRF SARChI Meat Science

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DST-NRF SARChI Chair in Meat Science: Genomics to Nutriomics

- **Research - benefit commercial and communal farmers, and the meat industry globally**
- Conservation and animal welfare
- Meat quality, shelf-life and processed products
- Pre-harvest quality determinants
- Quality attributes of meat from novel species

Prof Louw Hoffman

Prof Voster Muchenje

SARChI MEAT SCIENCE
GENOMICS TO NUTRIOMICS

UNIVERSITEIT STELLENBOSCH UNIVERSITY

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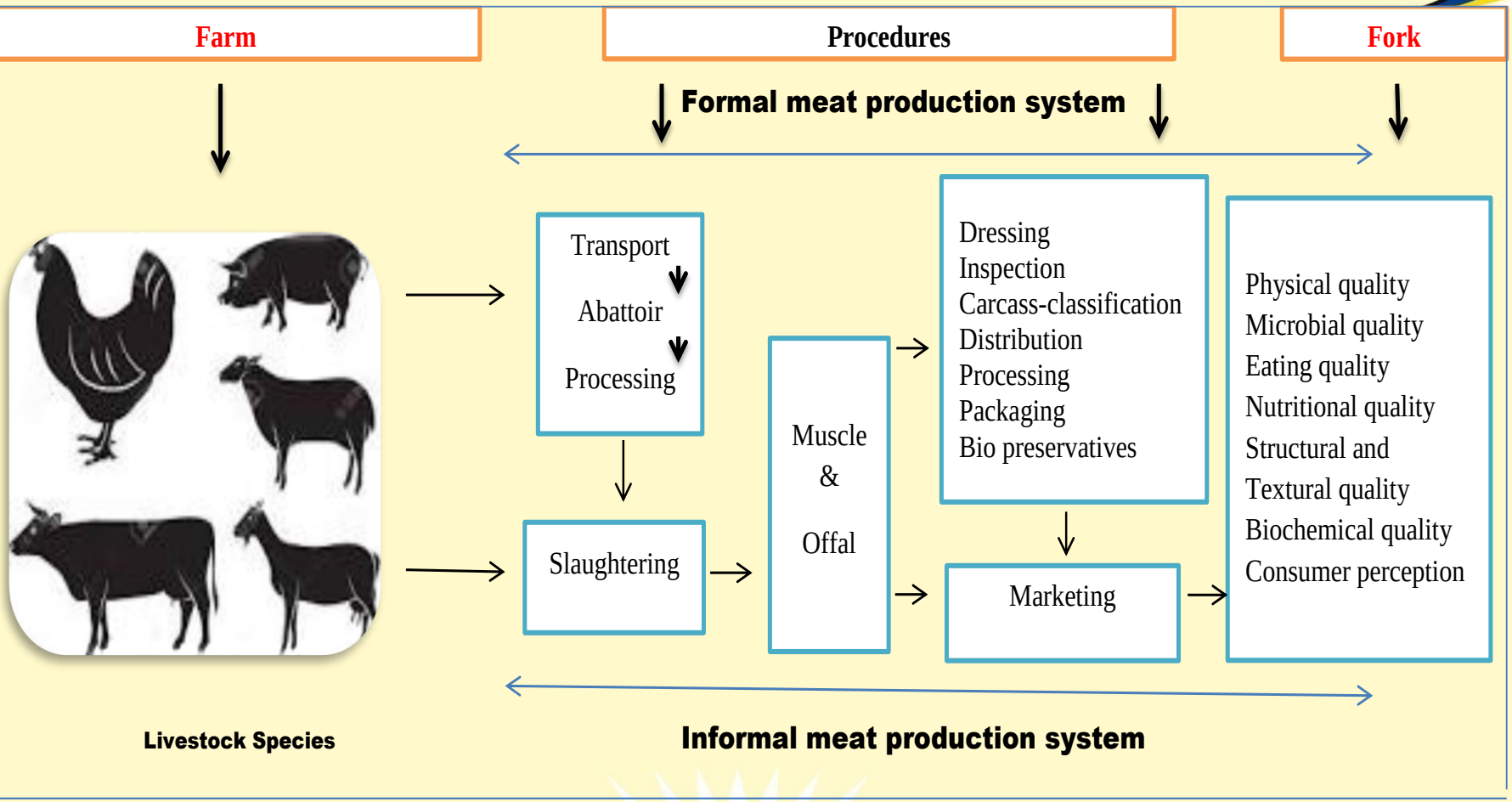
Farm to fork


Farm
Procedures
Fork
Formal meat production system
Transport
Abattoir
Processing
Slaughtering
Muscle
&
Offal
Dressing
Inspection
Carcass-classification
Distribution
Processing
Packaging
Bio preservatives
Marketing
Physical quality
Microbial quality
Eating quality
Nutritional quality
Structural and
Textural quality
Biochemical quality
Consumer perception
Livestock Species
Informal meat production system

Innovative research on production and adaptation

Breed-based research and meat science
-The Nguni Cattle Project

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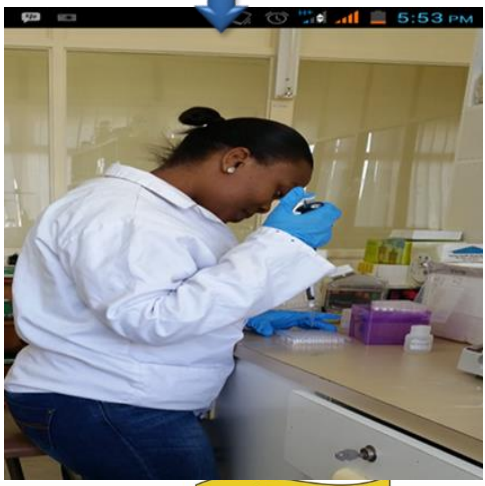

"Sex and breed affected plasma glucose, lactate, cortisol, meat quality but not muscle glycolytic potential of Dorper and Merino lambs"

National Research Foundation

Stempa *et al.*, 2016 in Animal Production Science
Stempa et al. Review in Meat Science

1916-2016

The effects of distance, lairage duration and animal-related factors on pre-slaughter stress indicators, carcass characteristics, HSP, microstructure and technological properties of beef

Dr Chulayo A.Y

Department of Livestock and Pasture Science, Faculty of Science and Agriculture, University of Fort Hare, Private Bag X1314, Alice 5700, South Africa

Chulayo, A. Y. & Muchenje V. 2016. Activities of some stress enzymes as indicators of slaughter cattle welfare and their relationship with physic-chemical characteristics of beef. Animal. **In Press**

Chulayo, A. Y and Muchenje V. 2016. The effect of animal class, genotype and sex on the nanostructure of beef and meat quality. **South African Journal of Science**, 112: 105-113.

Chulayo, A. Y., Bradley, G. and Muchenje, V. 2016. Effects of transport distance, lairage time and stunning efficiency on cortisol, glucose, HSPA1A and how they relate with meat quality on cattle. **Meat Science**, 117: 89-96.

Chulayo and Muchenje, V. 2015. A balanced perspective on animal welfare for improved meat and meat products: A review. **South African Journal of Animal Science 45:** 452 - 469.

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SASAS BRONZE MEDAL

Publications

Z. Soji. & V. Muchenje#. 2016. Effect of genotype and age on some quality characteristics of beef carcasses subjected to the South African classification system, *Meat Science, 117: 205-211*

Z. Soji, D. Chikwanda, A. T. Chikwanda, I.F. Jaja, B. Mushonga & V. Muchenje#. 2015. Relevance of the formal red meat classification system to the South African informal livestock sector. *South African Journal of Animal Science, 45 (3)263-277*

Z. Soji, S. P. Mabusela & V. Muchenje#. 2015. The associations between animal traits, carcass classification and carcass traits in a selected high throughput abattoir in the Eastern Cape Province, South Africa, *South African Journal of Animal Science*, 45 (3) 278-288

Classification of South African red meat

A 0 Permanent Incisors	AB 1 – 2 Permanent Incisors	B 3 – 6 Permanent Incisors	C > 6 Permanent Incisors	age
AAA	ABAB	BBB	CCC	rollermark
PURPLE	GREEN	BROWN	RED	colour of rollermark

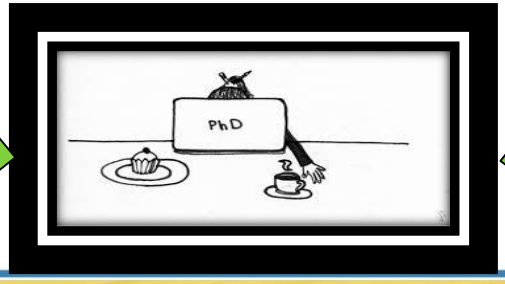
0 no fat | 1 very lean | 2 lean | 3 medium
4 fat | 5 slightly overfat | 6 excessively overfat — fat classification

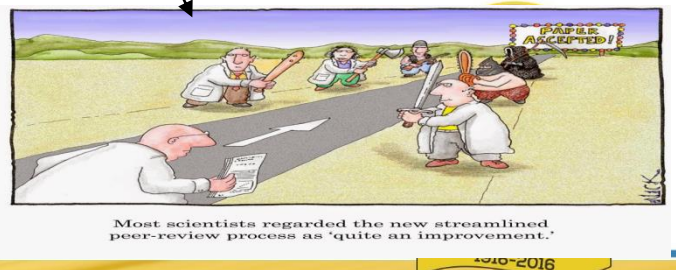
?

I wonder how's the quality of this meat

PEER REVIEW

Z. Soji. & V. Muchenje. Should the South African red meat classification system be revised or maintained?: A review, *South African Journal of Animal Science*



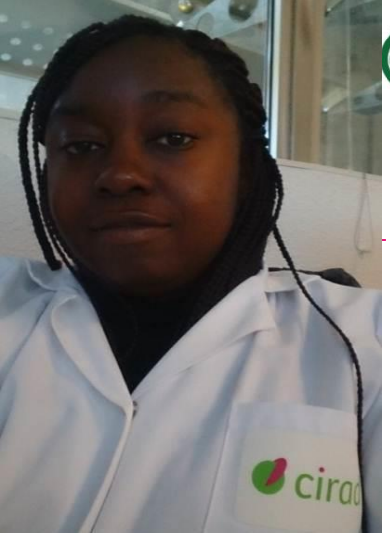


French South-African Institute of Agriculture (F'SAGRI)

- Initiated by the South African and French governments

- **Aim**: Contribute to addressing food security and rural development issues in South Africa
  - Curriculum development and implementation- Food Science and Technology - scarce skill
  - Agribusiness and food processing

F'SAGRI
French South-African Institute of Agriculture



F'SAGRI French South-African Institute of Agriculture

NRF National Research Foundation

AWARD African Women in Agricultural Research and Development

"Processed meat is classified as carcinogenic to humans (Group 1)"

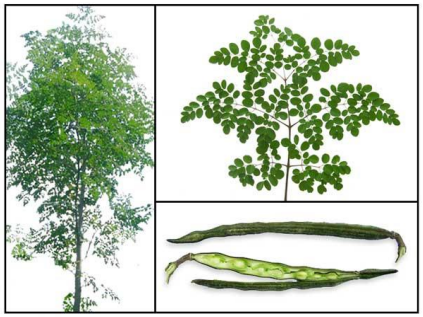
-International Agency for Research on Cancer (IARC) & WHO

World Health Organization

Bouvard *et al.*(2015) - *Lancet Oncology, http://dx.doi.org/10.1016/S1470-2045(15)00444-1.*

➢ **Developing functional meat products to↑ health benefits**

- **Highly nutritious**
- **Antioxidant**
- **Antimicrobial**



Moringa oleifera ***Droëwors processing***

- Collaborations : UFH, US, CIRAD-QualiSud, F'SAGRI

Developing research capacity

Non-conventional Meat species

Non-conventional feed sources/additives (Plants)

Tobacco

Acacia Karroo

Moringa Oleifera

Canola

Elephantorrhiza elephantina

Aloe Ferox

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More medicinal than nutritive

Non-conventional feed sources/additives (Insects)

Mopane worms

Earthworm

Black Soldier fly larvae

Tenebrio molitor larvae

Concluding remarks

How can science and good governance deliver dinner?

Science
- Research, Information, Problem identification, Innovations

Governance
- Adoption, Implementation, Legislation, Policies

Dinner
- Transformation of food production, accessibility, consumption, quality = food security

- Collaboration, innovation, sustainable succession plan

Acknowledgements