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DEPARTMENT OF FORESTRY, FISHERIES AND THE ENVIRONMENT**NO. 4042****8 November 2023****PUBLICATION OF THE GAME MEAT STRATEGY FOR SOUTH AFRICA**

I, Barbara Dallas Creecy, Minister of Forestry, Fisheries and the Environment, hereby, publish the Game Meat Strategy for South Africa, 2023, as set out in schedule hereto.



BARBARA DALLAS CREECY
MINISTER OF FORESTRY, FISHERIES AND THE ENVIRONMENT

SCHEDULE



GAME MEAT STRATEGY FOR SOUTH AFRICA



**forestry, fisheries
& the environment**

Department:
Forestry, Fisheries and the Environment
REPUBLIC OF SOUTH AFRICA



FOREWORD

On 29 March 2023, the Cabinet approved the White Paper on Conservation and Sustainable Use of South Africa's Biodiversity (the White Paper) for implementation. The White Paper was developed through intense and vigorous consultation processes with the citizens of the country who interact directly or indirectly with the country's rich biodiversity daily. The White Paper serves as a policy guiding tool for government, private sector, non-government organizations, academia, researchers, and communities on the principles for conservation and sustainable use of the country's biodiversity. To this end, the White Paper has four main goals, including:

- **Goal 1: Enhance Biodiversity Conservation:** Conserve all biological diversity and its components;
- **Goal 2: Sustainable Use:** Ensure that sustainable use enhances thriving living land and seascapes and ecosystems, livelihoods, and human well-being, while avoiding, minimising, or remedying adverse impacts on biodiversity;
- **Goal 3: Equitable Access and Benefit Sharing:** Ensure that benefits are derived and shared from the use and development of South Africa's genetic and biological resources, without compromising the nation's interests;
- **Goal 4: Biodiversity Conservation and Sustainable Use is Transformative:** Gives effect to the environmental right as contained in section 24 of the Constitution, facilitates redress, and promotes transformation;

As well as two cross-cutting Enablers:

- **Enabler 1: Integrated, Mainstreamed and Effective Biodiversity Conservation and Sustainable Use:** Integrate policy and practice across government and effectively implement multilateral environmental agreements; and
- **Enabler 2: Enhanced Means of Implementation:** Expand and develop ability to effectively conserve biodiversity, to manage its use and benefits, whilst addressing factors threatening biodiversity.

South Africa is one of the mega-biodiverse countries in the world and renowned for its conservation efforts that seek to conserve nature and biodiversity for the benefit of current and future generations, while supporting innovative and sustainable use models involving our endowment to address the socio-economic ills faced by the country.

The rich biodiversity supports a vibrant wildlife sector which is prevalent in the far-flung rural areas of South Africa characterised by high levels of poverty, unemployment, and lack of economic opportunities. Whilst some of the wildlife sectors' value chain activities such as natural wildlife production and wildlife activities (primarily wildlife viewing, ecotourism activities, accommodation, and sustainable hunting) are well-developed. The wildlife products segment of the value chain comprising of activities such as natural game meat, skins and hides production remain untapped while it offers immense opportunities for Small Medium Micro Enterprises aspiring to enter the sector and it is an additional revenue stream for an established natural wildlife production.

Natural Game Meat has significant potential to contribute to the economic growth of the wildlife sector and food security in the country. Despite this potential, however, there is currently still no formalised system for recording the production, slaughtering, and processing of natural game meat. This has resulted in an inefficient market in which the product is significantly undervalued.

The Game Meat Strategy for South Africa (the Strategy) has been developed with the aim of bringing all stakeholders together to collaborate towards ensuring that the industry offers the market a product that:

- is naturally, sustainably, and ethically produced with less or no impact on the environment and biodiversity.
- contribute to conservation and rural livelihoods.
- is of high-quality; safe; traceable and produced within the regulatory framework governing the wildlife sector and food safety protocols.

To this end, the voluntary market-led sustainability certification scheme for the wildlife sector is one mechanism undertaken to encourage and incentivise industry actors to implement practices that promote conservation, sustainable use of biodiversity, reduce environmental and biodiversity risk and also support rural livelihoods.

The Strategy has been built upon the constitutional commitment to give effect to the right of citizens to an environment that is not harmful to their health or wellbeing, and to have the environment protected for the benefit of present and future generations. The Strategy is expected to unlock the full potential of the natural game meat industry, taking into account the goals of the National Biodiversity Economy Strategy (NBES); the goals of the White Paper and the National Development Plan including the need to grow the South African economy, eradicate poverty, improve the lives of all people in our country and the need for transition to a low carbon, climate resilient and just economy. It also takes into consideration multilateral agreements such as the Convention on Biological Diversity which recognises the sustainable use of biological resources. This is critical in a nation where millions of its citizens depend on our country's rich biodiversity, other natural resources, and the environment for their livelihoods. This Strategy further supports Government's commitment to putting in place tools that address Climate Change Adaptation, the Green Economy, Biodiversity Economy, the Sustainable Development Goals (SDGs) and the Kunming-Montreal Global Biodiversity Framework which seek to, amongst others:

- Effectively conserve and manage at least 30% of the world's lands, inland waters, coastal areas and oceans, with emphasis on areas of particular importance for biodiversity and ecosystem functioning and services;
- have restoration completed or underway on at least 30% of degraded terrestrial, inland waters; and coastal and marine ecosystems; and
- reduce to near zero the loss of areas of high biodiversity importance, including ecosystems of high ecological integrity.

In its implementation plan, the Strategy calls for the three spheres of government, communities and their leaders, non-governmental organizations, the private sector, funders (domestic and international), academia, and research institutions to work together. It is through these partnerships that effective implementation of the Strategy will contribute towards the conservation and sustainable utilisation of our biodiversity while addressing economic, social and environmental problems such as poverty, zoonotic diseases, climate change, and food insecurity, for the benefit of our people.



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Abbreviations

B-BBEE	Broad-Based Black Economic Empowerment
CAE	Certificates of Adequate Enclosure
CPA	Communal Property Associations
DALRRD	Department of Agriculture, Land Reform and Rural Development
DFFE	Department of Forestry, Fisheries and the Environment
DoH	Department of Health
DTIC	Department of Trade, Industry and Competition
EU	European Union
FMD	Foot and Mouth Disease
GDP	Gross Domestic Product
HS	Harmonised System
IMF	Intramuscular Fat
NDP	National Development Plan
OIE	World Organisation for Animal Health
Pb	Lead
PDI	Previously Disadvantaged Individual
PH	Professional Hunter
PUFA	Polysaturated Fatty Acid
PPP	Public Private Partnership
ROI	Return on Investment
RTA	Rural Throughput Abattoir
SANBI	South African National Biodiversity Institute
SARS	South African Revenue Services
SEDA	Small Enterprise Development Agency
SEFA	Small Enterprise Finance Agency
SETA	Sector Education and Training Authorities
SMME	Small Medium and Micro-Enterprise
SO	Strategic Objective
SOE	State Owned Enterprises
SPS	Sanitary and Phytosanitary
SPV	Special Purpose Vehicle
SUFA	Saturated Fatty Acid
T	Tons
TVET	Technical and Vocational Education and Training
USP	Unique Selling Proposition
VPH	Veterinary Public Health
WCO	World Customs Union

DEFINITIONS**TERM****DEFINITION**

Animal well-being	The holistic circumstances and conditions of an animal or population of animals which are conducive to their physical, physiological, and mental health and quality of life, including their ability to cope with their environment. (DFFE, 2023).
Commercial use	The primary purpose of the activity is to obtain economic benefit, including profit in cash or in kind, and is directed towards trade, exchange or another form of economic use or benefit (Scientific Authority report, 2018)
Community	A group of persons, in particular historically disadvantaged persons, with interest or rights to land, resources, and/or property pertaining to biodiversity conservation and sustainable use, and/or a particular land or seascape on which the members have or exercise communal rights in terms of an agreement, custom or law, and includes any group of persons whose customary rights are derived from shared rules determining access to resources held in common by such group and includes part of any such group (DFFE, 2022)
Conservation	Protection, management, care, sustainable use, maintenance, rehabilitation, restoration, and recovery of ecological and evolutionary processes, biological diversity, and its components, for their intrinsic and instrumental value, to improve the well-being of people and nature (DFFE, 2023)
Culling	The selective slaughter of game because of sale, salvage, or death. It is defined in the National Environmental Management: Biodiversity Act, No.10 of 2004: Threatened or Protected Species Regulations, 2007: (a) in relation to a specimen of a listed threatened or protected species in a protected area, means an operation executed by an official of, or other person designated by, the management authority of the area to kill a specific number of specimens of a listed threatened or protected species within the area in order to manage that species in the area in accordance with the management plan of the area; or (b) [Para. (b) deleted by GN R69/2008] (c) in relation to a specimen of a listed threatened or protected species on a registered game farm, or communal land means an operation executed by the landowner or other person designated by the land owner, to kill a specific number of specimens of a listed threatened or protected species within the registered game farm in order to manage that species on the farm; [Para. (c) amended by GN R69/2008]

TERM	DEFINITION
Duty of care	The obligation to take reasonable measures to prevent harm from occurring to biodiversity within the environment and ecosystems that they are part of, allowing consideration and various options when harms that cannot reasonably be avoided or stopped, be minimised and rectified (DFFE, 2023).
Food security	Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit, 1996)
Game meat	Refers to meat obtained from wild, free-roaming, non-domesticated terrestrial animals harvested or culled for commercial purposes.
Harvesting	“Harvesting” or “harvest” means all the activities involved in the legal shooting, killing, bleeding, and harvesting inspection of game animals to obtain partially dressed game carcasses (Draft Game Meat Regulations).
Humane	Any activities, methods, or actions involving wild animals that avoid or minimise pain, stress, suffering, or distress, and consider their well-being (DFFE, 2023).
Hunting	“hunt” means (a) to intentionally kill a specimen by any means, method or device whatsoever; (b) to capture a specimen by any means, method or device whatsoever with the intent to kill; (c) to search for, lie in wait for, pursue, shoot at, tranquillise or immobilize a specimen with the intent to kill; or (d) to lure by any means, method or device whatsoever, a specimen with the intent to kill, but excludes the culling of specimens in a protected area or on a registered game farm or the culling of a specimen that has escaped from a protected area and has become a damage-causing animal; (Threatened or Protected Species Regulations, 2007)
Informal market	The informal sector may be broadly characterised as consisting of units engaged in the production of goods or services with the primary objective of generating employment and incomes to the persons concerned. These units typically operate at a low level of organisation, with little or no division between labour and capital as factors of production and on a small scale. Labour relations – where they exist – are based mostly on casual employment, kinship or personal and social relations rather than contractual arrangements with formal guarantees (OECD, 2002).
Intensive and selective breeding	Refers to the deliberate selection of and breeding for selected animal traits, usually in controlled conditions (Scientific Authority Report, 2018)
Organic game meat	Refers to game meat that has been kept in a natural environment, living in a free range and not induced with hormones, medicine and other unnatural things (Peter Hasulyo et al, 2019).

TERM	DEFINITION
Previously disadvantaged individual (also known as historically disadvantaged individual)	Is defined as a South African citizen – a) who, due to the apartheid policy that was in place, had no voting rights in the national elections prior to the introduction of the Constitution of the Republic of South Africa, 1983 (Act No. 100 of 1983) or the Constitution of the Republic of South Africa, 1993 (Act No. 200 of 1993) ("the interim Constitution"), and/or b) who is a woman, and/or c) who has a disability. With the understanding that any person who received South African citizenship on or before the introduction of the interim Constitution, will not be deemed to be previously disadvantaged individual.
Slaughter	The killing of an animal and the performance of the usual accompanying acts in connection therewith in order to obtain meat and animal products (Meat Safety Act, 2000).
Sustainable use	The use of any component of biodiversity in a manner that: a) is ecologically, economically, and socially sustainable; b) does not contribute to its long-term decline in the wild or disrupt the genetic integrity of the population; c) does not disrupt the ecological integrity of the ecosystem in which it occurs; d) ensures continued benefits to people in a manner that is fair, equitable, and meet the needs and aspirations of present and future generations; and e) ensures duty of care towards all components of biodiversity for thriving people and nature (DFFE, 2023).

EXECUTIVE SUMMARY

South Africa (SA), renowned internationally for its abundant wildlife provides an experience of Africa's unique landscape, the variety of our game species and then most importantly, market opportunities that could derive from the natural production, processing and selling of game meat and related value-added products.

This report formulates the strategy to expand, differentiate and formalise the game meat industry in SA which has shown considerable potential for growth. If developed appropriately, in the context of a biodiversity conservation and sustainable use perspective, this market could contribute favorably to economic development, job creation, food security and sectoral transformation. The size, scale, scope and performance of the wildlife sector including the game meat industry is limited due to the lack of research, data and statistics to accurately inform decision making. Nonetheless, researchers such as Taylor et al (2016) estimate that in 2016, the number of animals culled in SA was 176 969, the total carcass mass from international hunting, domestic hunting and harvesting was 40 150 tons; the total carcass mass available for sales was estimated at (excludes meat from biltong hunting) 12 943 tons and the total value of game meat produced (excludes meat from biltong hunting) was estimated at R 0.612 billion (R612 Million). On an international level, research shows that in 2019 SA was only able to export just over 3000 tons of Ostrich, Crocodile and Zebra meat to the European Union, Chinese and to the United Arab Emirates markets. Export of cloven-hoofed animals was limited due to the ban imposed on exports as a result of the outbreak and insufficient controls of the Food and Mouth Disease (FMD).

The growing market of consumers who are health-conscious, looking for sustainably sourced products that contribute to biodiversity conservation, community development and pose less risk to the environment is evident. The South African game meat industry is well-placed to service this growing market domestically, regionally, and internationally. However, this would require all stakeholders within the industry to collaborate in addressing challenges that continue to impede on the growth of the industry.

Given the developmental process of the strategy, 256 industry stakeholders were consulted to obtain their inputs and perceptions about the industry. Some reasons that attributed to the industry being under-developed, informal, untransformed, and not recognised as a contributor to food security, are as follows:

- Misalignment of legislative and regulatory frameworks;
- Existing misconceptions about the taste and quality of game meat;
- The lack of knowledge and information about the health-related benefits of game meat;
- General perception that game meat is tougher and drier than red meat;
- Negative perceptions about preparation requirements of game meat; and
- Some consumers perceive game meat as only available during winter months (typically referred to as the 'hunting season').

Furthermore, Joubert (2022) identified the following factors which have an impact in limiting trade in game meat:

- There is not enough certainty about what "game meat" is;
- The Harmonisation Code (HS) up to 6 digits do not provide enough granularity to accurately determine the size of the wildlife sector and the species being traded, harvested and exported through trade statistics;
- There are persistent concerns about administrative capacity within regulatory bodies (veterinary and animal health related, especially in the harvesting phase);
- There are recurring animal health diseases that inhibit the ability to export certain categories of meat (e.g., the inability to export cloven hoofed animals as a result of FMD export restrictions); and
- There is a vacuum in the legal framework of clear, concise, and specific regulation of game meat as a harvestable set of products for local, regional and export purposes.

This strategy was developed in line with the National Environmental Management Act, 107 of 1998 (NEMA) principles and the principles in the White Paper on Conservation and Sustainable Use of South Africa's Biodiversity, namely transformation; sustainable development; good governance; evidence-based decision making; and duty of care. This strategy sets out various guiding principles which were considered based on extensive stakeholder engagement, namely to:

- Develop a feasible, competitive and sustainable game meat value chain in South Africa that contributes to the country's developmental goals, specifically in relation to the economic potential of the industry, the potential to create additional employment opportunities and to contribute to food security;
- Create a conducive environment that enables the development of the game meat value chain in South Africa including attracting investment as well as creating local, regional and international market opportunities;
- Invest in the integrity of the game meat value chain which encapsulates increased compliance to laws and regulations, amongst others, to increase meat safety and product quality;
- Recognize that there is a need to improve on the status quo which implies that behavioral change is necessary to create a win-win situation that catalyses the potential of the industry and to ensure that there is an enabling environment for growth, sustainability and that meaningful transformation is achieved;
- Shift from informal sector where game meat production and harvesting is secondary to hunting, to formal commercial ventures focused on natural game meat production and the associated full value chain.
- Adopt an industry model that promotes economies of scale necessary for substantial and sustainable growth of the sector.
- Develop larger natural game production systems, including in community areas, that can consistently meet increased consumer demand.
- Ensure meaningful ownership of commercial game meat based ventures by previously disadvantaged individuals.
- Where possible, consider and improve the ease of doing business for wildlife ranchers, outfitters, professional hunters, hunters, processors and other value chain actors, ranging from streamlined and aligned legislation, permitting system to creating value for money for the consumer;
- Increase the volume of game meat sales, as a commodity, in the local, regional and international market;
- Leverage the knowledge and experience of industry to assist with the implementation of this strategy; and
- Promote an industry that enhances biodiversity conservation and poses less risk to the environment.

In SA the game meat industry performs predominantly in the informal market whilst only about 10% of game meat enters the retail market following the formal (compliant) related processes. The industry in general, is fragmented. The aim of this strategy is thus to create a formalized game meat industry and achieve economies of scale necessary for commercial ventures based primarily on natural game meat production, harvesting, processing, distribution marketing and sales.

The game meat industry is largely untransformed, and there is a very low participation rate of Previously Disadvantaged Individuals (PDIs). In addition, there are large areas of community owned land that are suitable for plains game, and which provides opportunity for community-based enterprises to drive rural socio-economic development. There are, however, high barriers to entry which needs to be addressed.

A major constraint faced during the strategy development process was the lack of information related to the size, scale, and performance of the wildlife sector, with specific reference to animal numbers (game census), game meat volumes and the flow of game meat into the market. Information available in the public domain is fragmented and does not provide accurate data that quantifies the amount of game meat in the formal and / or informal markets.

The Game Meat Strategy for South Africa promotes natural game meat referred to as meat obtained from wild or extensive wildlife systems, free-roaming, non-domesticated terrestrial animals specifically plains game such as Springbok, Kudu, Gemsbok, Ostrich, Eland, Blesbok, Wildebeest species, Zebra species, Impala etc. obtained through hunting, culling and harvesting processes following the necessary domestic and international environmental, agricultural and food safety legislative frameworks and protocols.

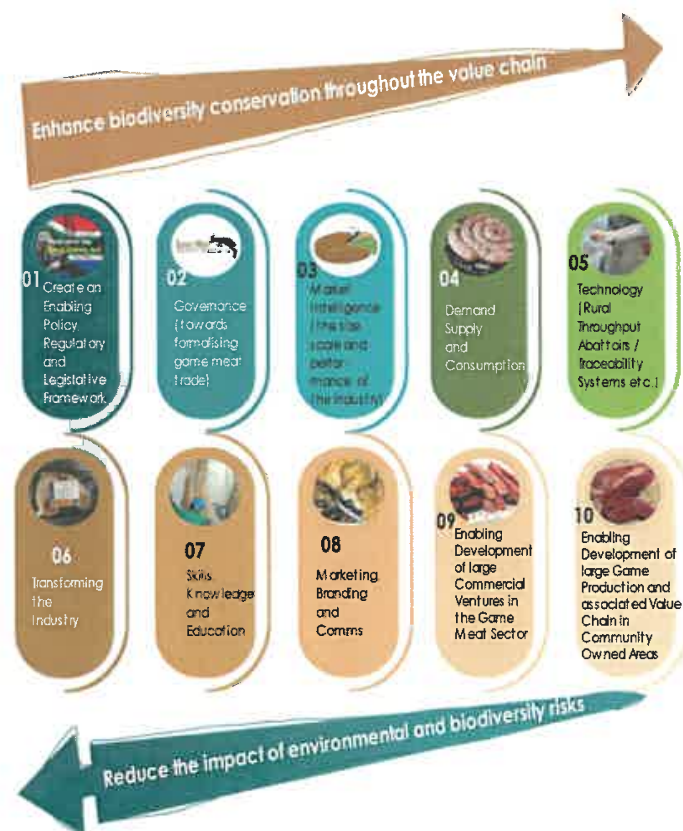
The vision of the Game Meat Strategy for South Africa is *"A formalised and transformed game meat industry in South Africa that supports thriving rural economies and nature, contributes to food security and inclusive socio-economic growth, conservation and sustainable use of biodiversity, while reducing environmental risks"*.

This strategy sets out to achieve the following strategic goals:

- Goal 1:** Increase game meat production from the current 59,184 tons per annum to 100,000 tons per annum by 2030.

- Goal 2:** Increase compliance (meat fit for human consumption) of game meat from the current 10% to 85% by 2030.
- Goal 3:** Increase the number of thriving PDI's, women and youth wildlife manager and other Game Meat Value Chain Actors from the current <4% to >25% by 2030.
- Goal 4:** Grow job opportunities in the game meat sector by 10% per annum by 2030.
- Goal 5:** Shift from an informal byproduct of hunting to commercial natural game meat production, processing and marketing industry with >30 large production enterprises, >5 large harvesting enterprises, and >10 large processing enterprises by 2030.
- Goal 6:** 1 million hectares of community owned land brought into natural game meat production with associated localised value chains by 2030.
- Goal 7:** The game meat industry becomes consumer demand driven by 2030.
- Goal 8:** Reduce the impact of environmental and biodiversity risks associated with game meat production throughout the value chain by 2030.
- Goal 9:** Game meat producers striving to contribute to biodiversity conservation by 2030.

Ten distinctive strategic objectives were identified to grow and transform the Game Meat Industry in South Africa whilst enhancing biodiversity conservation and reduce risks that would impede on the environment and biodiversity across the value chain. These objectives are depicted on the diagram below:



This document consists of two main parts, the first part contains the strategy to grow the game meat industry of South Africa and the second part in a form of Appendices contains the Situational analysis and Legislative Frameworks. The actual strategy for growth and transformation lists interventions with an aim to overcome current and potential future challenges, as well as to achieve goals towards expanding the footprint of game meat in the local, regional, and where possible, in the international market. The situational analysis gives a global economic perspective of the game industry looking at the world trade data and the market share for South Africa in the global game meat market. It goes into details of analysing the South African game industry looking at the industry actors and their roles, analysis of various business models and wildlife production system being implemented, and legislative frameworks guiding the industry. Moreover, a Social, Technology, Environmental, Economic and Political (STEEL analysis) and strengths, weaknesses, opportunities, and threats (SWOT analysis) for the industry looking at the sum of all external and internal factors that influences an industry is analysed.

1. THE STRATEGY TO GROW THE GAME MEAT INDUSTRY OF SOUTH AFRICA

1.1 Introduction

A strategy for growth and transformation encapsulates an industry-wide plan that lists interventions with an aim to overcome current and potential future challenges, as well as to achieve goals towards expanding the footprint of game meat in the local, regional and where possible, in the international market. **Figure 1** depicts a Theory of Change which gives a high level of how the challenges inhibiting the growth of the game meat industry will be addressed through the activities identified. Consequently, the key outcomes and impact of implementation of the activities are outlined.

Figure 1: Theory of change



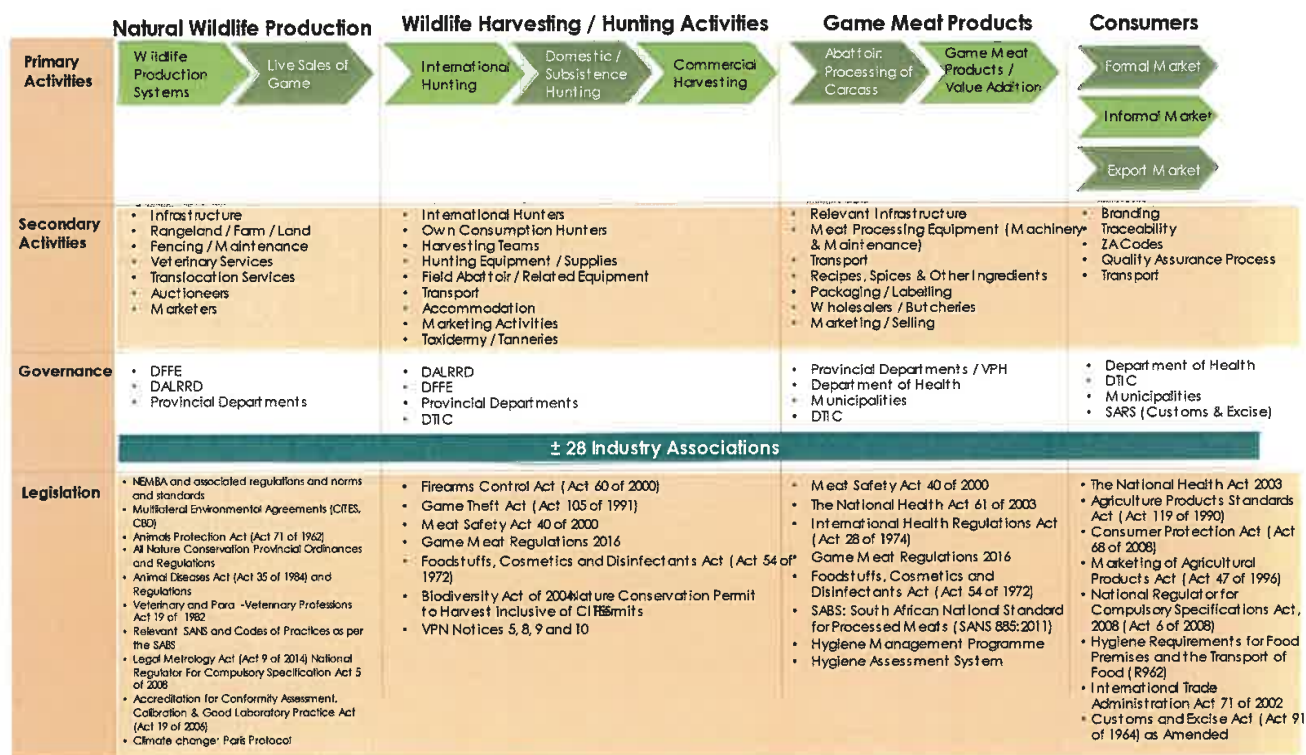
1.2 The Game Meat Value Chain

The significance of embarking on a value chain analysis lies in the value added during each step of the chain. From a definitive perspective value chains are used for the following purpose:

- As a first step to conduct an industry analysis to determine the basis for competitive advantage;
- To codify and define a particular industry which is useful in building a 'common language' amongst stakeholders;
- To identify potential sources of economic advantage by dividing the activities performed in each step of the value chain and to understand how companies or an industry can gain advantage through differentiation from competitors; and
- To provide insight into the core functions and actors within the industry that could contribute towards sectoral growth.

Based on the aforementioned, the current Game Meat Value Chain is depicted in **Figure 2**.

Figure 2: Game Meat Value Chain



Source: Stakeholder Consultation process, 2021

1.3. LEGISLATIVE AND POLICY FRAMEWORK

1.3.1 Constitutional Context

The Constitution of the Republic of South Africa (1996) forms the regulatory foundation for all sustainable development-related activities which are directly or indirectly dependent on the environment, as underpinned by the environmental rights in Section 24 with the following provisions:

S24. Everyone has the right –

- a) to an environment that is not harmful to their health or wellbeing; and*
- b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that –*
- c) prevent pollution and ecological degradation;*
- d) promote conservation; and*
- e) secure ecologically sustainable development and the use of natural resources while promoting justifiable economic and social development.*

All three spheres of government share common constitutional duty. In terms of the Constitution, passing of legislation dealing with the conservation and sustainable use of biodiversity are functional areas of concurrent national and provincial legislative competence. At a national level, the function is located within the Department of Forestry, Fisheries and the Environment.

In terms of the Constitution, local government/municipalities are required to promote a safe and healthy environment, and to deliver services in an environmentally sustainable manner. Local government play an important role in biodiversity conservation as they have land that includes important biodiversity features (i.e wildlife or game animals), and areas that support biodiversity and ecosystem functioning; these need to be conserved and used sustainably, while encouraging and facilitating involvement of communities and community organisations, promoting social and economic development.

The same concurrent competence arrangements and local government specific roles applies to Agriculture, Health, Industrial Promotion and Consumer Protection, where these functions are located within the Department of Agriculture, Land Reform and Rural Development (DALRRD), Department of Health (DoH), and Department of Trade and Industry and Competition (DTIC). These functional areas of competence are relevant to the South African Game Meat Industry.

The implementation of national legislation is guided by relevant policies, such as, the National Development Plan: Our Future – Make it Work (NDP 2030). The primary objective of the NDP is to eliminate poverty and reduce inequality by 2030. Chapter 5 and 6 of the NDP envisions ensuring environmental sustainability and an equitable transition to a low-carbon economy; and an integrated and inclusive rural economy, respectively.

1.3.2 Global Policy Context

South Africa is a party to the Convention on Biological Diversity (CBD). This convention aims for:

- ↳ the conservation of biological diversity;
- ↳ the sustainable use of its components; and
- ↳ the fair and equitable sharing of benefits arising from the use of genetic resources.

Apart from the CBD providing the 14 Addis Ababa principles for sustainable use of biological resources, in 2018, the CBD has adopted voluntary guidelines for sustainable wild meat sector in the context of wild meat, food security and livelihoods. The guidelines aimed at enhancing governance for a sustainable, participatory, and inclusive wild meat sector. These guidelines are further prioritized and incorporated in the actions to improve sustainability in the Kunming-Montreal Global Biodiversity Framework, in particular Targets, 5, 9, 10 and 15.

The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES), to which South Africa is a member, has recently concluded Thematic Assessment of Sustainable Use of Wild Species. The assessment considered various approaches to enhance the sustainability of the use of wild species with the aim to reduce and eventually eliminate unsustainable and illegal use within the ecosystems that they inhabit and to strengthen related practices, measures, capacities and the conservation that arises from such use.

South Africa is also a Party to Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). This convention serves the purpose of regulating the trade of endangered species to conserve them. Species are differentiated into the various Appendices of the threat which determines the type and level of trade which is allowed. CITES has a crucial role to play in the Game Meat Industry of South Africa as it dictates, through the national CITES Regulations. South Africa is a Party or Member to the following other multi-lateral environmental agreements in relation to biodiversity:

- a) The Nagoya Protocol on access to genetic resources and the fair and equitable sharing of benefits arising from their use to the Convention on Biological Diversity (Nagoya Protocol);
- b) The UN Convention to Combat Desertification (UNCCD);
- c) The UN Framework Convention on Climate Change (UNFCCC);
- d) The Convention on the Conservation of Migratory Species of Wild Animals (CMS);
- e) Commission on Genetic Resources for Food and Agriculture (CGRFA)
- f) The International Union for Conservation of Nature (IUCN).

Africa's regional economic communities also play a significant role in coordinating the development of Africa's subregions in a way that is compatible with regional development and conservation objectives. South Africa is a member state of the African Union (AU), as well as the Southern African Development Community (SADC), under which there are agreed Biodiversity Protocols. South Africa subscribes to the African Union Agenda 2063 for a prosperous Africa as a member of the AU, which is Africa's plan for sustainable development on the continent. South Africa is also a party to SADC's biodiversity-related protocols.

The Game Meat Strategy for South Africa is a contribution to the achievement of the 2030 Sustainable Development Goals.

1.3.3 National Policy Context

1.3.3.1. White Paper on Conservation and Sustainable use of South Africa's Biodiversity

The White Paper on Conservation and Sustainable Use of South Africa's Biodiversity was developed to promote the conservation of the rich biodiversity and ecological infrastructure that supports ecosystem functioning for livelihoods and the well-being of people and nature. It is envisaged that this will set the country on a strong path of sustainable development, considering the historical, socio-economic, and environmental context of South Africa, including the aspirations and needs of the people.

The White Paper sets forth the following vision: "An inclusive, transformed society living in harmony with nature, where biodiversity conservation and sustainable use ensure healthy ecosystems, with improved benefits that are fairly and equitably shared for present and future generations." An impact statement: "Thriving People and Nature".

The White Paper identifies the following challenges facing the sector:

- a. Fragmented conservation responsibilities, duplication of efforts and underfunded conservation mandates hamper the effective conservation and sustainable use of South Africa's biodiversity.
 - Duplication and overlap in legislation, and ineffective integration across spheres of government, results in barriers and inefficiencies.
- b. Lack of transformation in the sector, where a majority of the population are disadvantaged and disenfranchised from contributing to conservation and sustainable use.
 - The sector remains untransformed, limiting the full exercising of rights and inclusive participation by traditional leaders and traditional health practitioners, previously disadvantaged individuals (PDIs) and indigenous people and local communities in access to, and sharing of, benefits.
 - Limited participation and access of traditional leaders and traditional health practitioners, PDIs and indigenous people and local communities to natural resources, and socio-economic opportunities.

- The sector has not reached its potential in terms of its contribution to the national economy or to equitable socio-economic development.
- Complicated processes and procedures, and lack of resources, access, and awareness, hinder the unlocking of the genetic potential of biodiversity, and associated traditional and indigenous knowledge, into biotechnology value chains.

c. Inadequate efforts in addressing the global challenges of biodiversity loss, land degradation, and climate change in the context of sustainable development.

d. Proliferation of biodiversity and conservation legislation, uneven governance, limited capacity and declining allocation of resources in the management of biodiversity, and inadequate revenue generation efforts.

e. Practices within the sector that have brought the country into disrepute.

- Inappropriate and illegal practices, activities, or actions that compromise animal well-being and ecosystem and genetic integrity, have negatively affected South Africa's reputation as a world leader in biodiversity conservation.

The White Paper contains four Goals:

Goal 1: Enhanced Biodiversity Conservation: All biological diversity and its components conserved;

Goal 2: Sustainable Use: The sustainable use of biodiversity enhances thriving living land- and seascapes and ecosystems, livelihoods, and human well-being, while a duty of care avoids, minimises, or remedies adverse impacts on biodiversity;

Goal 3: Equitable Access and Benefit Sharing: Benefits are derived and shared from the use and development of South Africa's genetic and biological resources, without compromising the national interests;

Goal 4: Transformed Biodiversity Conservation and Sustainable Use: Effect is given to the environmental right as contained in Section 24 of the Constitution which facilitates redress, and promotes transformation;

As well as two cross-cutting Enablers:

Enabler 1: Integrated, Mainstreamed and Effective Biodiversity Conservation and Sustainable Use: Integrated policy and practice across government and the effective implementation of Multilateral Environmental Agreements; and

Enabler 2: Enhanced Means of Implementation: Expanded and developed ability to effectively conserve biodiversity, to manage its use and benefits, whilst addressing factors threatening biodiversity.

1.3.3.2. Environmental Regulatory System:

Various pieces of legislation provide the framework for regulating the Game Meat Industry in South Africa at various stages of game meat value-chain, namely, Natural Wildlife Production, Wildlife Harvesting/Hunting, Game Meat Products, and Consumers. This section provides a brief overview of the most relevant policies and legislations to the Game Meat Industry along the value chain. Details of the other policies and legislations is provided as an Annexure.

The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for coordinating environmental functions exercised by organs of state.

The National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; the protection of species and ecosystems that warrant national protection; the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. It also makes provision for the establishment and governance of the South African National Biodiversity Institute (SANBI), which has the

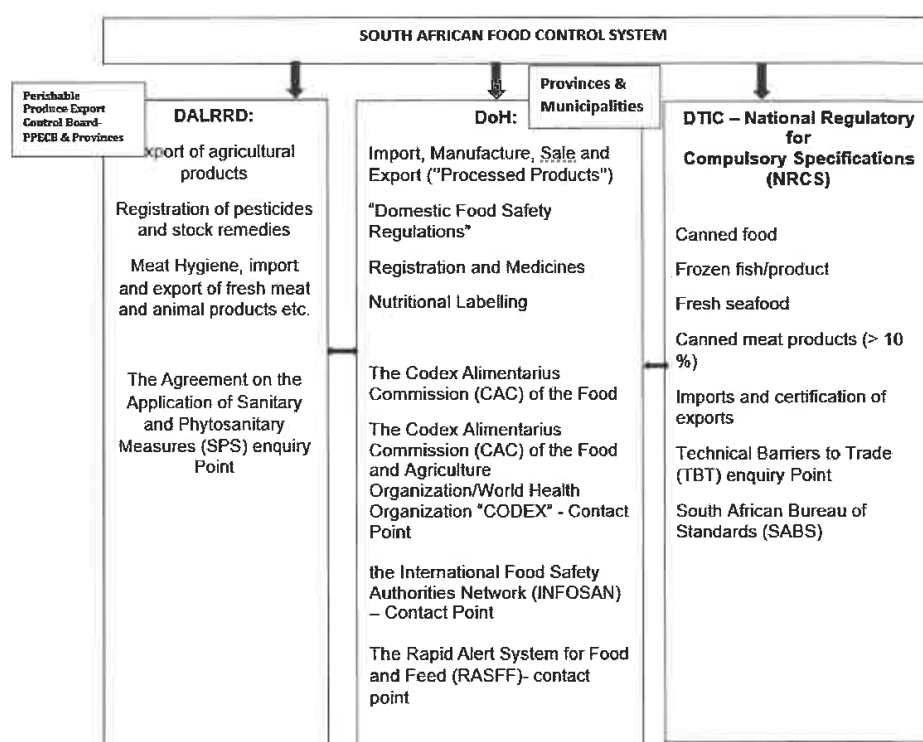
mandate of advising the Minister on issues related to biodiversity based on the best available science.

The National Environmental Management: Protected Areas Act, 2003 (Act No. 57 of 2003) (NEMPAA) provide for the protection and conservation of ecologically viable representative of South Africa's biodiversity and its natural landscapes and seascapes; for the establishment of national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental cooperation and public consultation in matters concerning protected areas.

1.3.3.3 South Africa Food Control System:

As a food source, game meat produced for human consumption must comply with food safety protocols and legislation. Food safety in South Africa is regulated by three governments departments : DOH, DALRRD and DTIC through bylaws and regulations. The departments are directly (DALRRD) or indirectly (DOH through municipal or metro Environmental Health Professional) involved in food safety enforcement, surveillance, and education. Figure 3 below depicts legislative matrix of South Africa Food Control System.

Figure 3: South Africa Food Control System.



Source: Boatemaa et.al (2019) ; Department of Agriculture, Forestry and Fisheries (DAFF) Presentation to the Joint Portfolio Committees, 2016.

1.3.3.3.1 DALRRD legislative mandate

- I. Animal Diseases Act, 1984, (Act No. 35 of 1984) - Provide for control of animal diseases and parasites, for measures to control animal health and for matters connected therewith (permit required for import of meat/meat products)
- II. Meat Safety Act, 2000 (Act No 40 of 2000) – Provide 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; (abattoirs and import/export of fresh/chilled/frozen meat)
- III. Agricultural Product Standards Act (APS), 1990 (Act No. 119 of 1990) - Provide for control over the sale and export of certain agricultural products, control over the sale of certain imported products. (quality/TBT & food safety standards for local/exports of food of plant origin)
- IV. Fertilizers, Farm Feeds, Agricultural Remedies and Stock Remedies Act, 1947 (Act No 36 of 1947) Regulate the importation, sale, acquisition, disposal or use of fertilizers, farm feeds, agricultural remedies and stock remedies; to provide for the designation of technical advisers and analysts; and to provide for matters incidental thereto.

1.3.3.3.2 DOH legislative mandate

- I. National Health Act, 2003 (Act 61 of 2003): Regulates hygiene requirements for transportation and premises handling food. Monitoring of Imported foodstuffs is the responsibility of the Port Health Services of the 9 provinces. In terms of National Health Act, 2003 (Act 61 of 2003), Municipality Health services (MHS) of the 8 Metro's and 44 District municipalities are responsible for monitoring of foodstuffs produced, manufactured and sold locally.
- II. Foodstuff, Cosmetics and Disinfectants Act (Act 54 of 1972): Regulate food ingredients, additives and labelling; regulates hygiene requirements for transportation and premises handling food (R962 of the 23 rd Nov 2012) and also regulates maximum limits for veterinary medicine and stock remedy residues that may be present in foodstuffs. (R1809) 12 (DoH) control of imported foodstuffs, delegated to national Director: Food Control. In terms of the FCD Act (Act 54 of 1972), 8 Metro's and 44 District municipalities authorised by the Minister in terms of Section 23., once the meat leaves the abattoirs under the control of DALRRD, it enters the custody of the other statues/ Departments (DoH). Butcheries, local meat processing plants, retailers are not regulated by DARLLRD , thus DALRRD does not have inspectors in these facilities.
- III. The DOH is also responsible for incorporating the Codex Alimentarius Commission standards, guidance and codes of practices into national food safety policies. These include the Sanitary and Phytosanitary (SPS) Agreement, and the Hazard Analysis and Critical Control Point (HACCP) food safety management system. These include the Sanitary and Phytosanitary (SPS) Agreement, and the Hazard Analysis and Critical Control Point (HACCP) food safety management system

1.3.3.3.3 DTIC legislative mandate

- I. The National Regulator for Compulsory Specifications (NRCS) -an entity of DTIC- enforces Compulsory Specifications for canned meat & frozen/canned fish and fishery products and canned meat. Exercises import/export control over these products.
- II. Legal Metrology is responsible for regulations that fall under the Legal Metrology Act. Consumer Protection Act No. 68 of 2008.
- III. National Consumer Commission (NCC) is established in terms of section 85 of the Consumer Protection Act No. 68 of 2008.
- IV. South African National Accreditation System (SANAS)- gives formal recognition that Laboratories, Certification Bodies, Inspection Bodies, Proficiency Testing Scheme Providers and Good Laboratory Practices (GLP) test facilities are competent.

Other legislation that applies or have implications to the conservation and sustainable use of biodiversity including game meat strategy in South Africa include but not limited to:

- Game Theft Act, 1991 (Act No. 105 of 1991), which regulate the ownership of game.
- Broad-based Black Economic Empowerment Act, 2003 (Act No. 53 of 2003) which establishes a legislative framework for the promotion of black economic empowerment.
- Spatial Planning and Land Use Management Act, 2013 (Act No. 16 of 2013), which have implications for conservation planning.

1.4 Problem Statement

Current hunting practices (specifically on private land) are an important factor in the wildlife sector that generate economic profits from extensive wildlife systems, funds conservation efforts and contribute towards sustainable ecological management of SA's biodiversity – producing a by-product in the form of game meat. Game meat could be an alternative healthy source of protein to South African, specifically from a food security perspective and sustainability of wildlife systems as it provides an opportunity to diversify income streams. However, this market is not yet optimally developed.

Furthermore, large volumes of proteins such as chicken, beef, etc. are imported – which could imply rising costs, increasing risks to food security if supply chains are disrupted amongst other global geopolitical and economic factors resulting in the sale of imported goods where a unique locally produced source of protein could have been successfully positioned in the local market.

Given this background, the problem statement is multifold in nature:

1. It is estimated that about 8% to 10% of total game meat produced is sold in the formal SA market, which implies that about 90% of game meat in the market does not conform to directives as detailed in the Draft Game Meat Regulations. Whilst the current regulatory framework aims to promote meat safety, disease control and the conservation of biodiversity, the complexity of various permitting and licensing systems, overlapping departmental mandates and the unique challenges presented by game meat harvesting, as opposed to livestock production, inhibits sectoral growth and compliance.
2. The industry is fragmented, ranging from non-integration between government departments, as well as other governance structures such as industry associations, across the game meat value chain. This factor may inhibit the formalisation, compliance and control of the game meat value chain — and thus the growth of the industry as a whole.
3. Limited available market intelligence on the supply, demand and consumption of game meat impacts the ability to develop strategic direction or for informed decision making. Data related to the local market is not available in a single repository.
4. Inconsistent supply of game meat could be the main reason why game meat is not available in retail stores on a continuous basis.
5. As a result of the FMD ban on game meat exports from South Africa only Ostrich, Crocodile and Zebra meat are currently exported to the EU, China and to the UAE (in total just over 3 000 tons of game meat were exported in 2019). The knowledge of the potential export market size and demand for game meat products is constrained.
6. FMD controls are poor and affecting trade in the regional and international markets.
7. Due to lack of data, it is unclear how current practices within the game meat industry contribute to biodiversity conservation, food security and job opportunities.
8. The lack of adequate and appropriate technology and equipment, such as Rural / Low Throughput Abattoirs and cold chain transportation, due to a combination of limited capital investment and its commercial feasibility as well as bureaucratic processes for approval of permits (compliance), place significant constraints on developing the game meat market to its full potential whilst simultaneously ensuring the integrity of the product.
9. With many Small-Medium and Micro- Enterprises (SMMEs) operating in isolation and often focused on other wildlife value-chains, there is a lack of economies of scale necessary for effective game meat commercialization.
10. The game meat industry is not representative of the South African demographic profile. Various barriers to enter

the game meat market, such as the capital required and the meat volumes needed to ensure economically feasible operations, have been some of the main contributors that slows transformation in the game meat industry, with only about 4% of all value chain actors being PDI. Similarly, the complex and laborious compliance and bureaucratic processes to deliver game meat to the formal market, as well as limited training and capacity building specifically aimed at game meat production among new entrants, further serves as a barrier to entry. This could result in other land-use options, such as subsistence farming, livestock production or tourism, often being preferred or conducted under transformation programmes, where game meat production might have presented significant potential on SA marginal agricultural land often facing drought conditions.

11. There is also an imbalance in the geographic distribution of natural wildlife production and associated value chains, being predominantly associated with white lands and large communal areas are excluded.
12. A lack of skills, awareness and knowledge throughout the value-chain, from best practice during harvesting, to meat inspection, to consumer awareness and culinary skills impact on the production and consumption of game meat is evident.
13. Consistent and effective marketing and sales of game meat is currently lacking, impacting the ability to build a strong local game meat brand.

1.5 A Case for Change

From the Status Quo and Situational Analysis through to the Strategy Development Process, the following core points within the Game Meat Industry were apparent:

1. The game meat industry is fragmented without a common and developmental-orientated goal.
2. The regulatory environment is not understood and deemed complex, tedious and impractical by industry.
3. The perceived market demand, consumption and market needs are not known.
4. A value chain approach with special emphasis on unlocking the game meat opportunity is needed to create cohesiveness within the industry.
5. There is a lack of transformation in the game meat industry.
6. There is low participation of communities, or use of their land, for natural game meat production and value add.

A definite need exists for a robust business case to increase value that would greatly transform the Status Quo to ensure:

1. Increased compliance, specifically related to meat safety.
2. A consumer-focused retail market for game meat products.
3. Incentive for game ranchers to convert to a more formal business approach with economies of scale.
4. Transformation of the sector to ensure substantial participation by Historically Disadvantaged Persons.
5. Transformation of the areas of game production for large scale harvesting from Communal Traditional Authority areas.

1.6 Goals that could Enable Growth in the Game Meat Industry

Specific goals to ensure growth in the South African game meat industry are:

- | | |
|----------------|---|
| Goal 1: | Increase game meat production from the current 59,184 tons per annum to >100,000 tons per annum by 2030. |
| Goal 2: | Increase compliance (meat fit for human consumption) of game meat from the current 10% to 85% by 2030. |
| Goal 3: | Increase the number of thriving PDI's, women and youth wildlife managers and other Game Meat Value Chain Actors from the current <4% to >25% by 2030. |
| Goal 4: | Grow job opportunities in the game meat sector by 10% per annum by 2030. |
| Goal 5: | Shift from an informal byproduct of hunting to commercial natural game meat production, processing and marketing industry with >30 large production enterprises, >5 large harvesting enterprises, and >10 |

large processing enterprises by 2030.

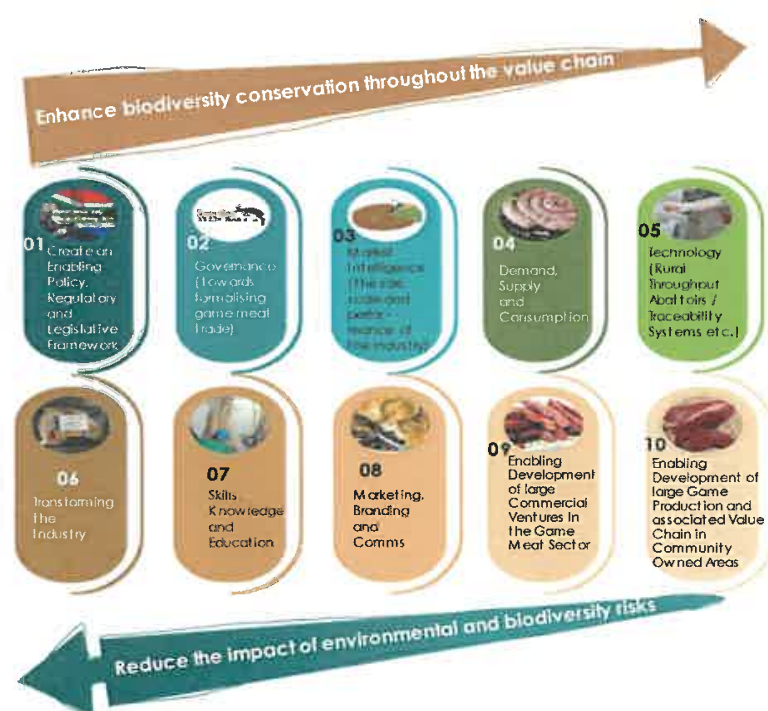
- Goal 6:** 1 million hectares of community owned land brought into natural game meat production with associated localised value chains by 2030.
- Goal 7:** The game meat industry becomes consumer demand driven by 2030.
- Goal 8:** Reduce the impact of environmental and biodiversity risks associated with game meat production throughout the value chain by 2030.
- Goal 9:** Game meat producers striving to contribute to biodiversity conservation by 2030.

1.7 Strategic Objectives

Given the elaborate stakeholder engagement process undertaken to extract the challenges that currently impede on sectoral growth, ten strategic objectives were identified. Enhancing biodiversity conservation while reducing environmental, health and risk to diversity are cross-cutting and imperative for the strategy and will be addressed in each strategic objective.

These will form the baseline for steering the strategic direction of the game meat industry into a growth trajectory, as depicted in **Figure 4**.

Figure 4: Strategic Objectives



The next section outlines the problem statement, the aim and interventions for each Strategic objective.

1.7.1 SO 1 Enabling Policy, Legal and Regulatory Environment

The first Strategic Objective (SO) is to create an enabling Policy, Legal and Regulatory Environment.

1.7.1.1 Strategic Objective 1: Problem Statement

The current policy, legal and regulatory framework inhibits sectoral growth. The permitting system is not optimal and consists of varying processes and systems deployed in each Province.

1.7.1.2 Strategic Objective 1: Aim

To harmonise and create an enabling policy, legal and regulatory framework that will bolster growth of the game meat industry – whilst ensuring meat safety, quality and compliance.

1.7.1.3 Strategic Interventions for SO 1

Based on the Game Meat Strategy deliverable, the following strategic interventions were identified.

- a) *Intervention 1.1: Align legislation, policies, regulations and strategies of DALRRD, DFFE, DoH, DTIC, MAs and other relevant SOE's in the Wildlife Sector, including Game Meat Value Chain to facilitate coordination and integration.*
- b) *Intervention 1.2: Clarification Workshops of the (gazetted) Game Meat Regulations*
- c) *Intervention 1.3: Implementation of the Wildlife Economy Certification Scheme.*
- d) *Intervention 1.4: Develop Industry Standards for Game Meat to ensure Product Safety / Quality*
- e) *Intervention 1.5: Streamlined, aligned and integrated permitting and licensing systems*
- f) *Intervention 1.6: Regaining World Organization for Animal Health Food and Mouth Disease Free Zone Status and exploration of trade opportunities irrespective of official status*

1.7.2 SO 2: Governance of the Game Meat Industry

The second SO addresses governance of the game meat industry.

1.7.2.1 Strategic Objective 2: Problem Statement

The Game Meat Industry is fragmented. The fragmentation could lead to the demise of an industry with vast growth potential.

1.7.2.2 Strategic Objective 2: Aim

To establish an effective governance structure for the game meat industry.

1.7.2.3 Strategic Interventions for SO 2

The following strategic interventions were identified.

- a) *Intervention 2.1: Establish a voluntary Game Meat Industry Association*
- b) *Intervention 2.2: Establish a sub-committee of the Wildlife Forum to promote the success of the game meat strategy.*

The functions of the voluntary Game Meat Industry Association is mainly to provide advisory, risk management, marketing, liaison with government, drive transformation, promote compliance to legislations and food safety measures, and undertake other market related functions to build and govern the game meat industry. To complement this structure, it will be valuable for industry associations to create, build and foster closer collaboration and integration of functions. The Sub-committee of the Wildlife Forum would promote efficient collaboration between Government and Industry and increase the profile of natural game meat production across the sector.

1.7.3 SO 3: Market Intelligence

The third SO attends to market intelligence within the Game Meat Industry in SA.

1.7.3.1 Strategic Objective 3: Problem Statement

The informal and fragmented nature of the Game Meat Industry creates information gaps which makes it particularly difficult to develop and implement strategic direction, to define an accurate baseline and ultimately to make informed decisions.

1.7.3.2 Strategic Objective 3: Aim

The aim of this SO is to obtain reliable game meat industry intelligence and information to inform planning, effective implementation, monitoring, control and evaluation.

1.7.3.3 Strategic Interventions for SO 3

The strategic interventions were identified and follow.

- a) *Intervention 3.1: Collation of Data for the Game Meat Industry.*
- b) *Intervention 3.2: Short term determination of the Size and Scale of the Game Meat Industry (incollaboration with Industry Associations).*
- c) *Intervention 3.3: Determine the performance / economic value of the Game Meat Industry aspart of the Biodiversity Economy Satellite Account.*
- d) *Intervention 3.4: Obtain Industry Wide Trade Data and Statistics.*
- e) *Intervention 3.5: Obtain data related to the number of game meat approved abattoirs and game meat butcheries in SA.*
- f) *Intervention 3.6: Obtain relevant data on the number of game ranches, CAE ranches andhectares used per ranch in SA.*
- g) *Intervention 3.7: Develop a database of value chain actors and service providers.*

1.7.4 SO 4: Demand, Supply and Consumption

The fourth SO deals with demand, supply and consumption of game meat products within SA.

1.7.4.1 Strategic Objective 4: Problem Statement

Without knowledge about demand, supply and consumption it becomes onerous to inform decision making, for instance, with regards to offtakes. There is demand for game meat products, however, no empirical research could be found that quantifies demand adequately. The same applies to supply and consumption. The question thus remains – which game meatproducts are mostly favoured by consumers and why, complemented by how much of the meat products should be produced to cater for demand.

1.7.4.2 Strategic Objective 4: Aim

The aim of this SO is therefore to obtain sufficient demand, supply and consumption related data to direct the strategic direction of the game meat industry as well as to source retail market opportunities.

1.7.4.3 Strategic Interventions for SO 4

Strategic interventions were identified and follow:

- a) *Intervention 4.1: Initial Market Analysis to determine Demand, Supply and Consumption.*
- b) *Intervention 4.2: Detailed Market Analysis to determine Consumption and Consumer Behaviour.*
- c) *Intervention 4.3: Empirical research on game meat health benefits.*

- d) *Intervention 4.4: Product Development.*
- e) *Intervention 4.5: Product Quality.*
- f) *Intervention 4.6: Increase Supply (natural game meat production).*

1.7.5 SO 5: Innovation, Research and Development

The fifth SO focuses on innovation, research and development.

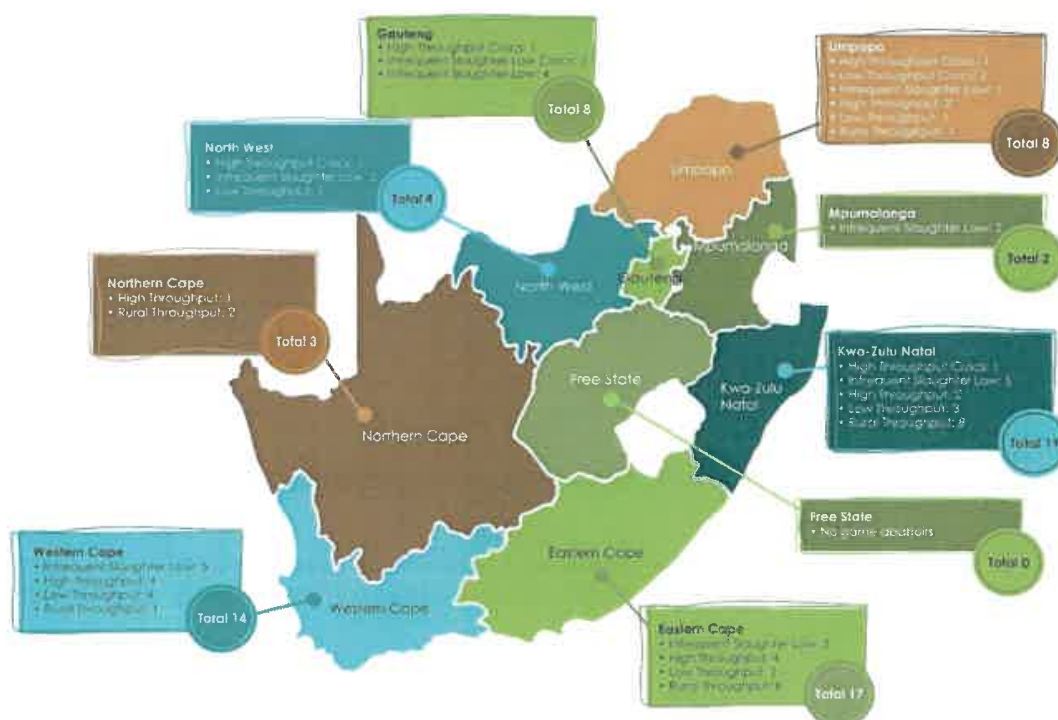
1.7.5.1 Strategic Objective 5: Problem Statement

One of the major constraints faced by the game meat industry is the lack of adequate technology and equipment, for example approved abattoirs and cold chain transportation which are brought about by various factors such as practical or feasible access to these infrastructure, or the lack of capital to invest into infrastructure, bureaucratic processes towards licensing, approval of an abattoir, laborious meat safety compliance processes as well as traceability systems to increase the integrity and value of game meat.

1.7.5.2 Strategic Objective 5: Aim

The aim of this SO is to ensure an increase in economic and practical compliance / more safe game meat that enters the formal retail market through the enablement of technological improvements through financially feasible operations. Given the current context, SA has 575 registered abattoirs of which 65 relates to the game meat industry, and as depicted in **Figure 5**.

Figure 5: Game Meat Abattoirs in SA



1.7.5.3 Strategic Interventions for SO 5

The strategic interventions identified follow.

- a) *Intervention 5.1: Feasibility to construct and institute Game approved abattoirs in SA- compliance with domestic and/or international standards*
- b) *Intervention 5.2: Traceability / Transparency Systems to improve game meat quality.*
- c) *Intervention 5.3: Peripheral Technological Opportunities.*
- d) *Intervention 5.4: Establishment of a center of excellence for game meat*

1.7.6 SO 6: Transformation and Inclusive Participation

The sixth SO addresses transformation and inclusive participation within the game meat industry.

1.7.6.1 Strategic Objective 6: Problem Statement

The Game Meat Industry is not representative of the demographics of South Africa. Apart from the lack of inclusivity, transformation is more than just demographic representation. Transformation also revolves around the need to generate new value, to unlock new opportunities, to drive new growth and to deliver new efficiencies which will require change throughout the value chain.

1.7.6.2 Strategic Objective 6: Aim

To encourage natural game meat production as a form of land use among PDI's, women and youth by creating an enabling environment and to grow the number of successful and sustainable PDI's, women and youth in the Game Meat Industry.

1.7.6.3 Strategic Interventions for SO 6

The strategic interventions to ensure transformation and inclusive participation follow.

- a) *Intervention 6.1: Capacity development of New Entrants, CPAs, Traditional Authorities, PDIs, Women and Youth.*
- b) *Intervention 6.2: Mobilise resources from all sources, including identification of innovative financial mechanisms, to enhance industry transformation.*
- c) *Intervention 6.3: Funding schemes to enhance transformation for CPAs and Traditional Authorities.*
- d) *Intervention 6.4: Ensure inclusivity through a mentorship programme.*

1.7.7 SO 7: Skills, Knowledge and Sector Awareness

The seventh SO caters for skills, knowledge and the creation of industry or sectoral awareness.

1.7.7.1 Strategic Objective 7: Problem Statement

A lack of skills, knowledge and sector awareness had in the past, and still does, cause harm to the wildlife economy, conservation and hunting related activities. Apart from the aforementioned, a lack of consumer education, awareness and game meat culinary skills are also prevalent.

1.7.7.2 Strategic Objective 7: Aim

Increase skills, knowledge and awareness from hunting to meat inspection and then throughout the value chain, to serve respective markets, to prepare wholesome game meat meals as **knowledge is power!**

1.7.7.3 Strategic Interventions for SO 7

The strategic interventions identified were:

- a) *Intervention 7.1: Skills development to ensure meat integrity, safety and quality.*
- b) *Intervention 7.2: Consumer awareness campaigns, marketing and education.*
- c) *Intervention 7.3: Education related to Game Meat Processing.*
- d) *Intervention 7.4: Establish capacity building programmes aimed at promoting sustainable natural game meat production that enhances broader biodiversity conservation and sustainable use.*

1.7.8 SO 8 Marketing, Branding, Sales and Communications

SO eight caters for marketing, branding, sales and communications to grow the game meat industry.

1.7.8.1 Strategic Objective 8: Problem Statement

Currently marketing, inclusive of sales functions and branding are done by individual companies or operations that service the needs of their respective market(s) through their respective brand(s). Furthermore, consumer perceptions and communications are done in- effectively or do not adequately address the benefits and nutritional value of game meat products. Misperceptions about the industry are also a cause of concern.

1.7.8.2 Strategic Objective 8: Aim

The aim of this SO is to devise a focused marketing, branding, sales and communications strategy that will encourage consumers to purchase more game meat products (thus increased volumes).

1.7.8.3 Strategic Interventions for SO 8

The strategic interventions were identified and are detailed below.

- a) *Intervention 8.1: Branding Business Case.*
- b) *Intervention 8.2: Interventions related to marketing and communication.*
- c) *Intervention 8.3: Marketing Campaign to Create Consumer Awareness.*
- d) *Intervention 8.4: Develop a National Game Meat Sales Plan.*
- e) *Intervention 8.5: Game Meat Marketing Events / Exhibitions.*
- f) *Intervention 8.6: SPV to Create an Incubation Fund.*

1.7.9 SO 9: Enabling Development of Large Commercial Ventures in the Game Meat Sector

The ninth SO caters for the development of large commercial ventures in natural production, harvesting, and processing of game meat.

1.7.9.1 Strategic Objective 9: Problem Statement

The current model for the game meat industry is based on meat as a by-product of other activities in the wildlife industry, such as hunting, and is informal rather than a formal business model. There are challenges with economies of scale, and with large and consistent production. Enterprises are individual based, with insufficient "muscle" to influence distributors and major retail chains.

1.7.9.2 Strategic Objective 9: Aim

Demonstrate feasibility for large business enterprises along the game meat value chain, to draw investment funding, and initiate large new businesses.

1.7.9.3 Strategic Interventions for SO 9

The strategic interventions are:

- a) *Intervention 9.1: Develop generic business plans for large enterprises for natural production in agro-ecological and extensive wildlife systems, harvesting, and game meat processing.*
- b) *Intervention 9.2: Facilitate access to venture capital to initiate enterprises, especially led by PDIs, women and youth, including from government sources, development agencies, and the private sector.*
- c) *Intervention 9.3: Identify and remove barriers to initial success for ventures.*

1.7.10 SO 10: Enabling Development of Large Game Production and associated Value Chain in Community Owned Areas

The tenth SO caters for the development of large commercial ventures in community owned areas that are not necessarily based on game reserves.

1.7.10.1 Strategic Objective 10: Problem Statement

The wildlife industry in general is largely untransformed and based on white owned private farms. There are large areas of community owned land that would be able to support large herds of plains game but were denuded through historical hunting. These areas may be marginal in terms of livestock production, and are poverty stricken.

1.7.10.2 Strategic Objective 10: Aim

Demonstrate feasibility for large areas of community owned land for reintroduction of plains game in sufficient numbers to provide a basis for large scale harvesting for game meat, and for development of associated value chains.

1.7.10.3 Strategic Interventions for SO 10

The strategic interventions identified are:

- a) *Intervention 10.1: Undertake strategic land-use planning to identify five potential community areas for reintroduction of large herds of plains game, where this is ecologically viable, and will maximize return on investment for socio-economic development.*
- b) *Intervention 10.2: Develop generic business plans for large enterprises for natural game meat production, harvesting, and processing in these five areas.*
- c) *Intervention 10.3: Facilitate access to venture capital for initiating enterprises, especially led by PDIs, women and youth, including from government sources, development agencies, and the private sector.*
- d) *Intervention 10.4: Identify and remove barriers to initial success for ventures.*

APPENDICES

Appendix A: SITUATIONAL ANALYSIS

1. The Game Meat Industry in South Africa

1.1. The Evolution of the Game Meat Industry in South Africa

Wildlife in South Africa (SA) was previously classified as *res nullius*, meaning that it did not belong to anybody, including the owner of the land on which it occurred, unless it was brought under physical control, such as by killing an animal during a hunt. In 1991, however, the South African Government promulgated the Game Theft Act (No. 105 of 1991), which gave legal ownership of wildlife to landowners who obtained a Certificate of Adequate Enclosure (CAE). This meant that an animal that escaped onto a neighbouring property could be reclaimed, as long as sufficient proof of ownership could be provided. This lowered the risk for wildlife managers who wanted to own expensive species such as Sable or Bontebok. In this case, the wildlife to be owned was defined as "game", which included all species kept or held for commercial or hunting purposes, including the meat, skin, carcass or any portion of the carcass of that game.

A CAE could be applied for after erecting a suitable game fence around a property, the dimensions and quality of which were determined by each province according to the species to be enclosed. The CAE also exempted landowners from many conservation regulations and gave them the right to capture and keep most species without having to apply for separate permits, to hunt at any time of the year and to market, sell or donate animal commodities at will. The Game Theft Act gave financial value to wildlife, which became a legally protected asset that could result in bank loans, credit, and novel tradeable and insurable commodities. As a result, wildlife species prices increased and wildlife utilisation on private land surged. Whilst legal ownership of wildlife is permitted, owners are required to comply to regulations for certain activities, such as hunting or translocation. The right of ownership of wildlife, combined with a growing understanding that wildlife ranching was ecologically and financially sustainable, significantly reduced subsidies for conventional agriculture. Increasing financial incentives for commercial wildlife ranching has led to a tremendous increase in game numbers over the past 30 years and the establishment of a formal wildlife sector in South Africa (Taylor et al , 2016) .

Wildlife in SA can be found on state land, on tribal and/or community land as well as on private land. State protected areas cover approximately 7.5 million hectares (ha), while the private sector has approximately 20.5 million ha under conservation. South Africa's total land size is approximately 122.2 million ha. The 2013 Absa Agriculture Outlook suggests that the farming segment of the wildlife game market encompasses more than 9 000 wildlife ranches (from about 3 500 in the year 1992), utilizing more than 20 million hectares of land. Commercial wildlife ranches cover 16.8% of the country's landmass, with about 50% of the wildlife ranches found in the Limpopo Province. The Northern Cape housed approximately 19.5% of South Africa's wildlife ranches, while the Eastern Cape is home to 12.3%. South Africa hosts about 20 million game animals, 16 million of which could be found on private land and the remaining 4 million on state-owned land. More than sixty indigenous animal species are traded in the ranching/farming wildlife market of the country.

The wildlife sector value chain in SA is centred on the utilisation of undomesticated animals and the ecosystems in which they live to produce goods and services for human benefit with activities such as wildlife/ game ranching, game farming (stocking, trading, breeding), hunting (international, harvesting, subsistence/domestic/recreational) and commercialisation of by-products of undomesticated animals such as meat, skins, hides, bones, fats, horns, taxidermy and other activities required to support the value chain such as accommodation, recreational, translocation of animals, veterinary services etc. (DEA, 2016). The key drivers of this value chain include domestic hunters, international hunters and a growing retail market demand for

wildlife products such as game meat and taxidermy products. The hunting industry is fairly developed, while game products and ecotourism are somewhat under-developed (DEA, 2016).

The SA domestic game meat market is not well developed, and it is estimated that only about 8 to 10% of processed game meat is sold in the formal retail market. Game meat was perceived as an inferior product in the past and given to wildlife rangelands workers as part of their remuneration. The evolution of the health-conscious consumer changed the image of game meat as this consumer group favour the fatty-acid composition of game meat. Over the past few years, the consumption of game meat evolved to become a delicacy amongst urban people as they pay higher prices than rural consumers for the same meat (Niewiadomska et al, 2020).

Game meat is considered a healthy source of protein due to its low-fat content. The increase in demand encouraged game meat producers in rural areas as well as commercial harvesters to increase harvesting or to hunt more animals to serve market demand. Advances in hunting technologies such as better hunting rifles, accessories and equipment allowed hunters greater penetration to wild animal habitats which have accelerated game meat off-takes.

Likewise, increased transport and market access are associated with the expansion of infrastructure which attracted large numbers of workers, hunters and traders as well as their families into previously undisturbed areas. This development opened doors for more game meat consumption locally, regionally and internationally (Coad et al, 2018). Game meat is particularly important in SA as it can contribute to the country's effort towards food security and encouraging health alternatives to domestic meat consumption. In addition to a growing local game meat market, South Africa also has an opportunity to export game meat regionally and internationally given the competitive advantage of vast landscapes, diversity of species, conducive ecological infrastructure etc. Growing the domestic game market and SA's market share in regional and on international scale is an initiative of the National Biodiversity Economy Strategy and its implementation plan developed in 2014 and 2016 respectively by the DFFE.

1.2. The economies of the game meat industry in South Africa

The true scale and scope of the wildlife sector is restricted due to limited research and data (Taylor et al., 2016). Nonetheless according to the Scientific Authority (2018) there is agreement that the wildlife sector in its entirety was growing at probably more than 6% per annum (pre-covid pandemic), notwithstanding that the wildlife products segment of the value chain specifically game meat remaining untapped. The table below provides an overview of the value of each segment of the wildlife sector value chain:

Table 1: Value of the wildlife sector

General statistics	Number of exempt wildlife ranches in South Africa	6 734
	Total number of wildlife ranches in South Africa (including exempt and open ranches)	8 979
	Area of all wildlife ranches in South Africa (km ²)	170,419
	Total number of herbivores on all wildlife ranches	5.987 million
Intensive breeding	Percentage of area under intensive breeding	6.0%
Live sales	Number of animals sold in South Africa	225,500
	Total revenue generated (turnover) from live sales (includes private sales and auctions)	R4.328 billion
International hunting	Number of animals hunted in	130,186

	South Africa	
	Total revenue generated (turnover) from animals trophy hunted	R1.956 billion
Domestic/local hunting	Number of animals hunted in South Africa	277,027
	Total revenue generated (turnover) from animals hunted for biltong	R0.651 billion
Game meat production	Number of animals culled in South Africa	176,969
	Total carcass mass from trophy hunting, biltong hunting and culling (tonnes)	40,150
	Total carcass mass available for sale (excludes meat from biltong hunting) (tonnes)	12,943
	Total value of game meat produced (excludes meat from biltong hunting)	R0.612 billion
Jobs and salaries	Total number of jobs created by wildlife ranching sector Salaries	65,172
	Median salary of employees	R3,441

Source: (Taylor et al, 2016)

It is important to note that in relation to trophy hunting the primary products obtained from this activity are skins, horns and tusks which are often retained by the client (hunter) to be displayed as mounted trophies (DEA, 2016). When the species hunted is an ungulate, the meat from the carcass is normally considered to be a secondary product and left by the client for local consumption (DEA, 2016). Furthermore, according to DEA (2016), the retail and export game meat market was estimated at R230 million in 2013. Game meat is mainly sourced from seven species, namely Springbok (*Antidorcas marsupialis*), Kudu (*Tragelaphus strepsiceros*), Gemsbok (*Oryx gazella*), Impala (*Aepyceros melampus*), Eland (*Tragelaphus oryx*), Wildebeest (*Connochaetes species*) and Ostrich (*Struthio camelus*).

Like any sector, the wildlife sector was severely affected by the covid pandemic given that in many wildlife rangelands the key target market are international visitors (Clements et al., 2022). According to research conducted by Clements et al (2022) to understand socio-economic responses of diverse wildlife working lands to COVID-19, most protected areas lost more than 75% of their revenue during 2020 while most agricultural farms lost less than 10%. The impact on wildlife rangelands was more varied: rangelands with more diverse activities, particularly mixed wildlife–agriculture systems, lost less revenue, shifting their activities from those heavily impacted (international ecotourism, trophy hunting) to those less affected (for example, game meat, livestock).

1.3. Statistics of game meat in South Africa

When discussing game meat in SA, there are three broad categories that this analysis covers:

- Ostriches;
- Other game (e.g. the meat of Impala, Kudu, Springbok, Kudu, Gembok, Ostrich, Eland, Blesbok, Wildebeest species, Zebra species etc); and
- Trade statistics for game meat.

In discussing the production and/or origin of game meat, reference is made to both the StatsSA Census of Commercial Agriculture (CCA) (StatsSA, 2020), as well as game meat statistics recorded by the Food and

Agriculture Organisation of the United Nations' Statistics (FAOStat) within their Livestock Primary database (FAOStat, 2021).

With regards to the StatsSA CCA, a total of 40 122 farms were contacted for the census, of which only a subset were game ranches. The Department of Agriculture, Land Reform and Rural Development (DALRRD) provided statistics stating that there are about 13 000 game ranches, of which more than 6 300 are fenced properties or CAE. It is unlikely that all game ranches were contacted for the StatsSA CCA. Thus, the information presented for the StatsSA CCA should be taken as indicative of the wildlife sector – rather than a comprehensive view which would require a separate study of all wildlife rangelands including nature reserves and parks (both private and public) in SA.

When discussing exports and imports, however, reference is made to the proprietary information provided by the South African Revenue Services (SARS) for the purposes of drafting this strategy – specifically to provide the best possible trade statistics for game meat entering and leaving SA. For the purposes of drafting a viable and realistic game meat strategy, it was important to consider competitors both from a regional and an international perspective. For the purposes of statistical comparisons, Namibia was identified as a regional competitor while New Zealand was identified as the largest producer and supplier of venison in the international market¹

For the local, regional and international comparison, an export-import lens of the three countries under analysis (South Africa, Namibia and New Zealand) were provided using data obtained from the UN Comtrade datasets (UN Comtrade, 2021). The UN Comtrade only records legal wildlife trade, which is also suitable in the context of this research as illegal trade is entirely excluded. Using a single source allows for a fairer comparison between the three countries, however it implies that the data obtained from UN Comtrade may not necessarily align to the numbers received from South African Revenue Services (SARS). When considering game meat, the consulting team focused on the following Harmonised System codes at the 6-digit level (HS6) and definitions when analysing the data from various sources:

Table 2: HS6 codes, definitions and applicable source(s)

HS6 Code	HS6 Definition	Applicable source(s)
'010613	Live camels and other camelids [Camelidae]	SARS, StatsSA CCA**
'010619	Live mammals (excluding primates, whales, dolphins and porpoises, manatees and dugongs, seals, ...)	SARS, StatsSA CCA
'010620	Live reptiles "e.g. snakes, turtles, alligators, caymans, iguanas, gavials and lizards"	SARS, StatsSA CCA**
'010633	Live ostriches, and emus [Dromaius novaehollandiae]	SARS, StatsSA CCA
'010639	Live birds (excluding birds of prey, psittaciformes, parrots, parakeets, macaws, cockatoos, ...)	SARS, StatsSA CCA**
'010690	Live animals (excluding mammals, reptiles, birds, insects, fish, crustaceans, molluscs and ...)	SARS, StatsSA CCA
'020850	Fresh, chilled or frozen meat and edible offal of reptiles "e.g. snakes, turtles, crocodiles"	SARS, UN Comtrade
'020890	Fresh, chilled or frozen meat and edible offal of pigeons, game, reindeer and other animals ...	SARS, StatsSA CCA, FAOStat, UN Comtrade
'021093	Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of reptiles	SARS, UN Comtrade
'021099	Meat and edible offal, salted, in brine, dried or smoked, and edible	SARS, UN Comtrade

¹ 1. **Disclaimer: New Zealand's production systems differ from SA's given that in New Zealand, Deer is farmed while in SA game meat is extensively bred. The use of New Zealand in this case is therefore solely for the purposes of comparing international trade data and does not imply that the game meat strategy promotes the intensive production of game meat.**

	flours and meals of meat ... of other animals	
'160290	Prepared or preserved meat, offal or blood (excluding meat or offal of poultry, swine and bovine ...	SARS, UN Comtrade

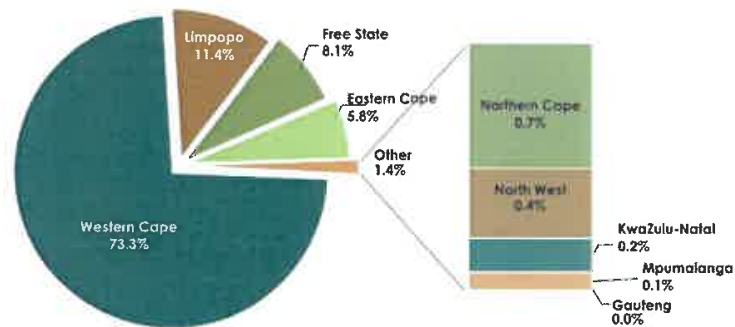
* Animals under these codes are likely misclassified and belong in another applicable codes but have been included to ensure correlation with the SARS data.

** The StatsSA CCA could potentially cover these codes in its definition of 'other live game'.

1.3.1. Ostriches

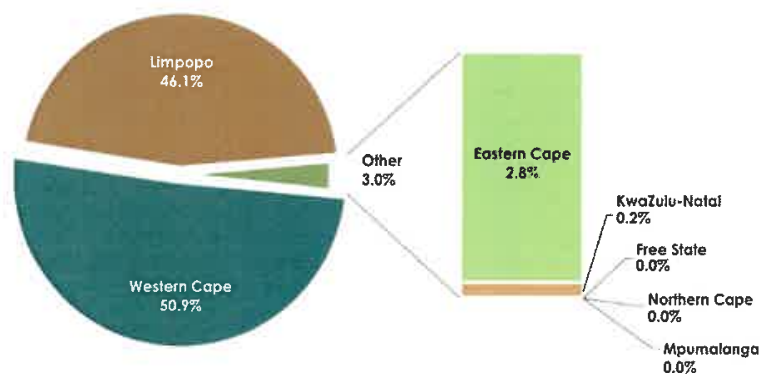
SA has the largest market share of ostriches in the world — as around 70% of the world's ostriches are located in SA and exports around 90% of ostrich products, according to the Profile of the South African Ostrich Market Value Chain 2019 published by the former Department of Agriculture, Forestry and Fisheries (DAFF). The largest concentration of ostriches in South Africa was in the Western Cape, which contained over 73% of all ostriches in 2017 (StatsSA, 2020). Limpopo, Free State and Eastern Cape contain another 25%, with the remainder spread across the other five provinces (*Figure 6*).

Figure 6: South Africa's Ostriches Per Province in 2017 (% StatsSA CCA)



Despite the concentration of live ostriches in the Western Cape, however, production of ostrich meat was split almost evenly between the Western Cape and Limpopo (StatsSA, 2020). This implies that the ostriches raised in Limpopo are more likely raised for meat production, whilst there is a demand for a broader range of products from ostriches farmed in the Western Cape (*Figure 7*).

Figure 7: South Africa's ostrich meat production per province in 2017 (% StatsSA CCA)



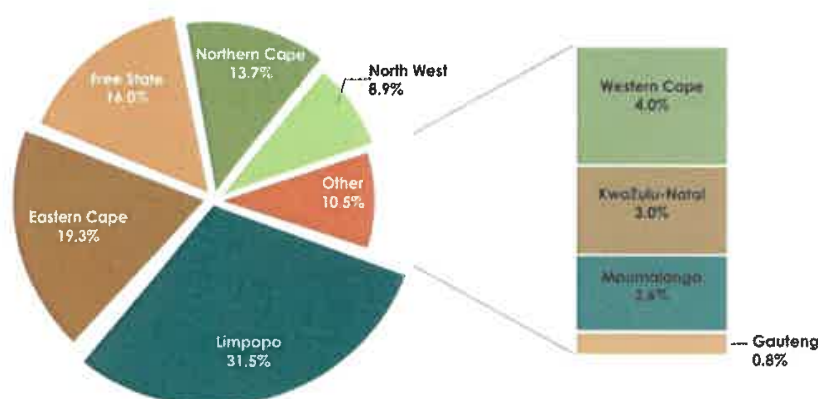
According to the Ostrich Market Value Chain 2019 publication, South Africa has been self-sufficient in terms of production for local consumption since 2008 (DAFF, 2019). This became especially prominent during the EU export sales ban from 2011 to 2014 due to an Avian Influenza outbreak, when exporters turned to growing local demand for ostrich meat to compensate for the export ban. Despite the subsequent outbreak again in 2017, South Africa remains the primary export country for ostrich meat on a global scale and it remains a major player due to its sheer production volumes.

1.3.2. Game Meat (excluding Ostriches)

Game meat suffers from a number of stigmas that potentially dissuade casual consumption. One of these stigmas involves it being classified as 'other meat', potentially something 'exotic' unlike the standard protein sources such as beef, pork, lamb and chicken. However, game hunting is only one facet of the wildlife sector. The sector consists of other components such as different wildlife production systems, wildlife tourism and wildlife products, of which the largest component of wildlife products is game meat (Janovsky, 2015).

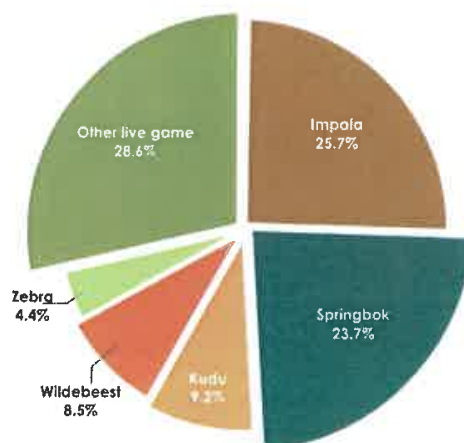
Game in SA comprises of a number of different animal species spread across the nine provinces of the country. The largest concentration of game in 2017 was in the Limpopo province, followed by the Eastern Cape, Free State, Northern Cape and North West (Stats SA, 2020). These five provinces accounted for over 80% of the game population in South Africa, with the other four provinces captured the remaining game population as stipulated in **Figure 8** below:

Figure 8: South Africa's live game per province in 2017 (% , StatsSA CCA)



Game, despite its ubiquitous classification of 'other animals' in the HS classification system of South Africa, is largely dominated by a few classification types. According to StatsSA (2020), in 2017 the largest components of game were dominated by plains game such as Impala, Springbok and Kudu, who together, accounted for almost 60% of game numbers in the Census (**Figure 9**). Including Wildebeest and Zebra, brings the individually defined game population to over 70% of the wildlife rangelands under consideration StatsSA (2020).

Figure 9: South Africa's live game per species in 2017 (% , StatsSA CCA)

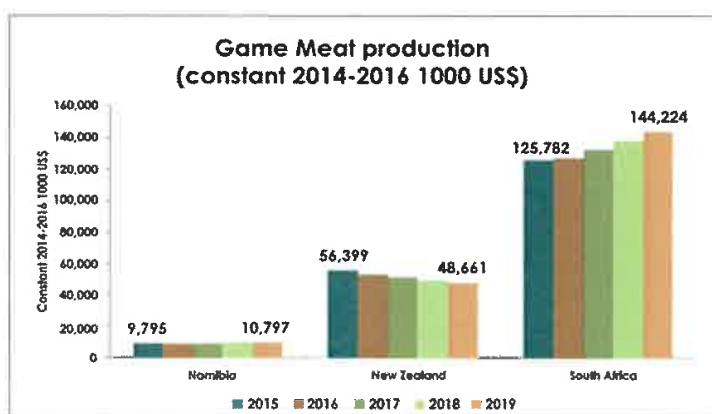


To supplement the analysis emanating from the StatsSA CCA, FAOStat (published in 2021) provide a time series for game meat production, in volume and value terms based on the HS6 code:

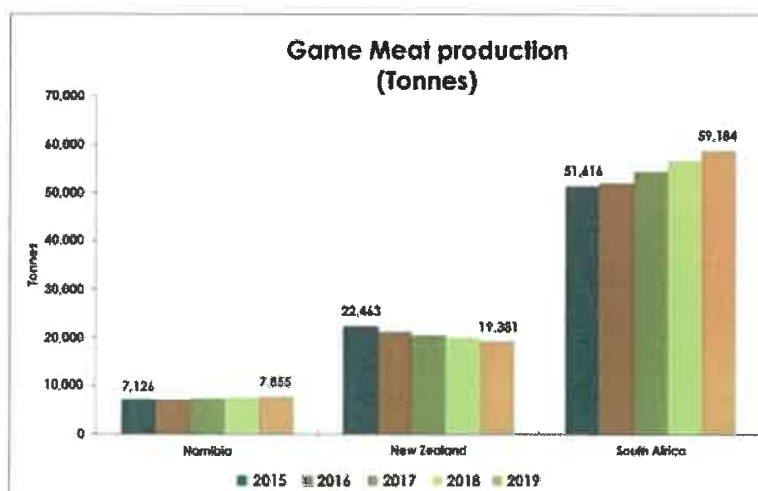
'020890 – "Meat and offal of game, whether fresh, chilled or frozen"

In addition to South Africa, FAOStat provided data for New Zealand (venison = deer meat) and Namibia's game meat production. This allowed for a preliminary comparison between the three countries, specifically at a production level (**Figure 10** and **Figure 11**). The full export profile will be detailed later in the report, with a focus on the HS codes as well as a value/volume comparison.

Figure 10: Game meat production for RSA, Namibia and NZ1000 US\$



Source: FAOStat , 2019

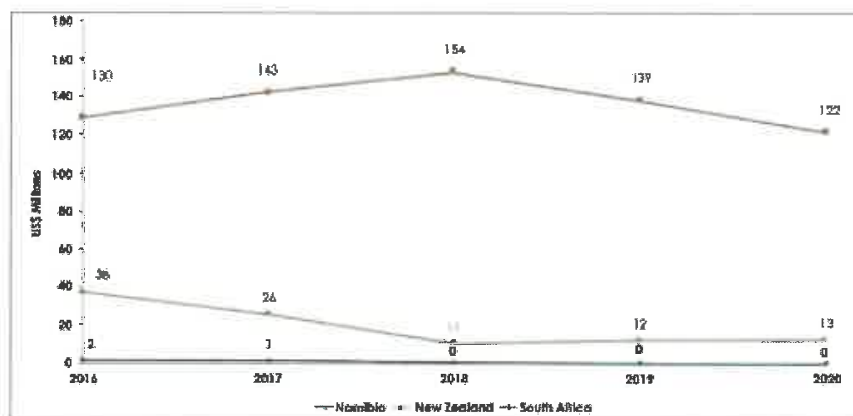
Figure 11: Game meat production for RSA, Namibia and NZ

Source: FAOStat, 2019

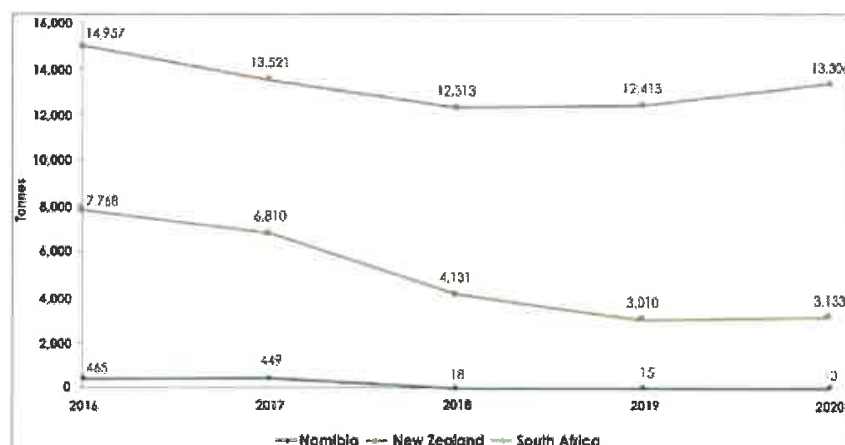
Considering these two graphs, both Namibia and South Africa are trending positive growth whilst New Zealand is trending negatively. Similar trends by country in terms of value and volume imply that relative prices (excluding inflationary pressures) are fairly consistent. While this does translate somewhat into the export profiles of the countries involved, there is a largedisparity between the production versus the export profiles.

1.3.3. Trade Statistics Comparisons

While the production profile from FAOStat published in 2021 indicates that South Africa is the largest of the three producer countries (**Figure 12**), New Zealand by far dominates the export market for venison, according to UN Comtrade data published in 2021.

Figure 12: Game meat export profile for RSA, Namibia and NZ (US\$ million, UN Comtrade)

Between 2016 and 2018 as per **Figure 12**, New Zealand grew its value of exports whilst South Africa lost over two-thirds of its export value, likely connected to the EU ban on South African meat due to FMD. However, from 2019 onwards, New Zealand's value of exports has been declining even while its tonnages increased (implying a lower US\$ per ton).

Figure 13: Game meat export profile for RSA, Namibia and NZ (Tons, UN Comtrade)

In contrast, South Africa's export value has increased over the same period with lower volume, implying an increase in value per ton. In between this, Namibia has been slowly losing export value and by 2020 has become almost completely absent from the world market in terms of its export profile.

When considering **Table 3**, it is important to note that the price profile shown is at current prices and includes in-country inflation. Thus, the US\$/ton price reflects changes both in the value and the volume of the exports for the period 2016 to 2020.

Table 3: Average export US\$/ton for RSA, Namibia and NZ from 2016 to 2020 (UN Comtrade)

Country	2016	2017	2018	2019	2020
South Africa	4 842	3 821	2 590	4 129	4 076
Namibia	3 913	3 104	5 948	7 203	3 903
New Zealand	8 662	10 582	12 502	11 182	9 204

Source: UN Comtrade statistics, retrieved: 20th March 2021 from: <https://comtrade.un.org/data/>

Despite the value and volume changes between 2016 and 2020, New Zealand remains the highest value per ton of game meat and increased its price from 2016 to 2020, although it has been on a downward trajectory from its peak in 2018. However, South Africa followed the exact opposite pattern to New Zealand and is currently trending upwards from a low in 2018.

Despite its small market share, Namibia, interestingly exhibited a sharp increase in its US\$/tons as South African prices declined in 2018 and 2019, potentially linked to the EU ban on SA exports. In 2020, however, Namibian game meat prices decreased to around its 2016 levels and remains at a level close to South Africa's 2020 prices.

When considering the export of game meat, it is worth taking cognisance of the type of meat being exported by each country per HS code. For simplicity, only the 2020 values and volumes are detailed in **Table 4**.

Table 4: Export profile for RSA, Namibia and NZ in 2020 by HS code (UN Comtrade)

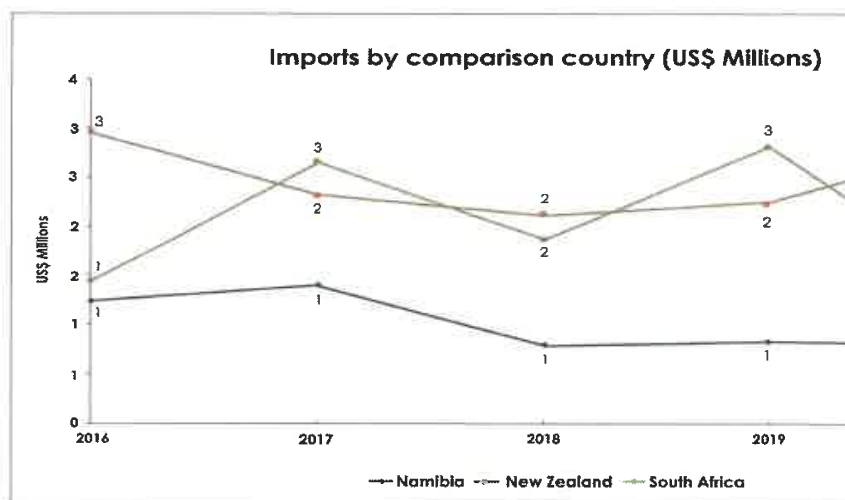
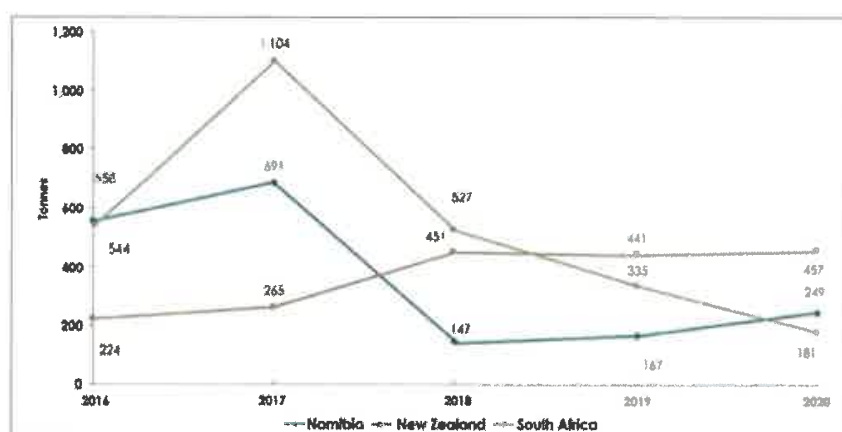
Country HS code	Value in 2020(US\$ thousand)	%	Volume in 2020 (Tons)	%
South Africa	12 769		3 133	
'020850	185	1.4%	33	1.0%
'020890	4 557	35.7%	392	12.5%
'021093				
'021099	106	0.8%	43	1.4%
'160290	7 921	62.0%	2 665	85.1%
Namibia	39		10	
'020890		7.0%		15.3%
'021099		2.0%	<1	0.9%
'160290	35	91.1%		83.8%
New Zealand	122 464		13 306	
'020890	109 146	89.1%	12 192	91.6%
'021099	8 409	6.9%	372	2.8%
'160290	4 909	4.0%	743	5.6%

While New Zealand has the largest export value due to its '020890 [Meat and offal of wild animals, whether fresh, chilled or frozen], South Africa has a market lead in '160290 [Prepared or preserved meat, offal or blood (excluding meat or offal of poultry, swine and bovine ...)]. New Zealand does, however, command higher US\$/ton in both of these commodities, which demonstrates a higher perceived value of New Zealand venison meat versus that on offer by SA.

The imports of game meat to SA, Namibia and New Zealand are largely unconnected to the profile of exports (**Figure 13**).

The following conclusions can be reached from the data analysed in tandem:

- Both New Zealand and South Africa's imports of game meat are negligible compared to their exports.
- South Africa's consumption of foreign game meat has dropped sharply after the peak in 2017, implying a larger emphasis on local supply for domestic consumption.
- New Zealand is importing more game meat, unlike South Africa and Namibia whose foreign consumption has dropped over the period.
- Namibia's imports fell after a spike in 2017 – most likely as a result of severe drought experienced and have been slowly recovering.

Figure 14: Game meat import profile for RSA, Namibia and NZ (US\$ million, UN Comtrade)**Figure 15: Game meat import profile for RSA, Namibia and NZ (Tons, UN Comtrade)**

As a point of comparison, **Table 5** details the import value per ton for South Africa, Namibia and New Zealand.

Table 5: Average import US\$/ton for RSA, Namibia and NZ from 2016 to 2020 (UN Comtrade)

Country	2016	2017	2018	2019	2020
South Africa	2 669	2 407	3 546	8 394	7 257
Namibia	2 231	2 034	5 478	4 992	3 234
New Zealand	13 191	8 723	4 718	5 103	6 293

Both South Africa and Namibia have been facing higher import prices for imported game meat, whilst New Zealand has seen a decreasing cost of importing foreign game meat, as detailed in **Table 6**.

Table 6: Import profile for RSA, Namibia and NZ in 2020 by HS code (UN Comtrade)

Country	Value in 2020 (US\$ thousand)	%	Volume in 2020 (Tons)	%
South Africa	1 311		181	
'020850				
'020890	54	4.1%	26	14.1%

'021099	1 149	87.7%	102	56.5%
'160290	107	8.2%	53	29.3%
Namibia	805		249	
'020890	50	6.2%	19	7.6%
'021093				
'021099	44	5.4%	27	11.0%
'160290	711	88.3%	203	81.4%
New Zealand	2 874		457	
'020850				
'020890	1 244	43.3%	75	16.4%
'021093				
'021099		0.0%	<1	0.0%
'160290	1 629	56.7%	382	83.6%

Note: Volumes less than 0.5 are represented by <1 due to rounding, whilst – denotes zero

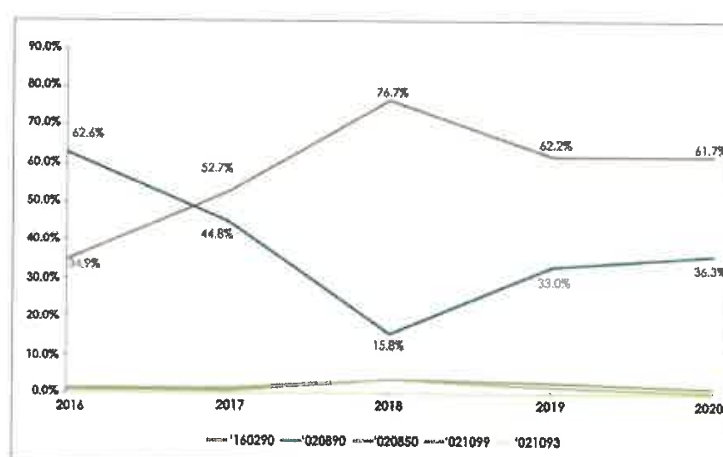
Whilst both New Zealand and Namibia's largest imports of game meat are '160290 [Prepared or preserved meat, offal or blood (excluding meat or offal of poultry, swine and bovine ...)], South Africa's primary import of game meat resorts under '021099 [Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of other animals].

1.3.4. Trade Statistics SA's Export Profile according to SARS

To gain a deeper understanding of the export profile of South Africa, the SARS data was analysed to identify foreign trade trends and patterns of game meat as detailed in **Figure 11**. The majority of export game meat trade is contained within:

- '020890: Prepared or preserved meat, offal or blood (excluding meat or offal of poultry, swine and bovine ...)
- '160290: Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of other animals.

Figure 16: Game meat export profile for RSA by HS6 code (% of total export value, SARS)



From 2017 to 2020, there has been a shift from exports of fresh meat to processed meat. While the major decline in 2017 and 2018, with the subsequent recovery in 2019, could be attributed to the EU ban on SA game meat as a result of FMD²³, the prominence of processed over fresh meat could also be indicative of a structural shift in the export of game meat. When considering the shift in exports, it is important to take cognisance of the

export price to determine if any material change has brought about the trends observed in the HS6 code graph.

Table 7: Average export R/ton for RSA by HS6 code from 2016 to 2020 (SARS)

HS6 Code	Rand per Ton				
	2016	2017	2018	2019	2020
'160290	39 544	40 779	29 365	46 280	48 877
'020890	128 549	85 886	78 866	117 827	189 878
'020850	77 193	94 619	71 546	181 454	91 740
'021099	49 117	11 075	76 020	80 738	81 623
'021093	541 000	106 365	–	–	8 156
Average	70 790	50 975	34 321	60 143	67 730

The marked drop and recovery of the Rand per ton in '020890 is consistent with the EU ban on game meat due to FMD (Makgopa, 2020). However, the recovery of the price did not translate to a switch back, which reinforces a more permanent structural change in exports from SA.

The export profile of game meat may also be described by the following internal classification: prepared meat; fresh, chilled or frozen meat; pastes; and biltong.

Applying this internal classification to the SARS data provides the following export profile for the year 2020 as depicted in **Figure 17**:

Figure 17: Game meat export profile for RSA by internal classification 2020 (R'000, SARS)

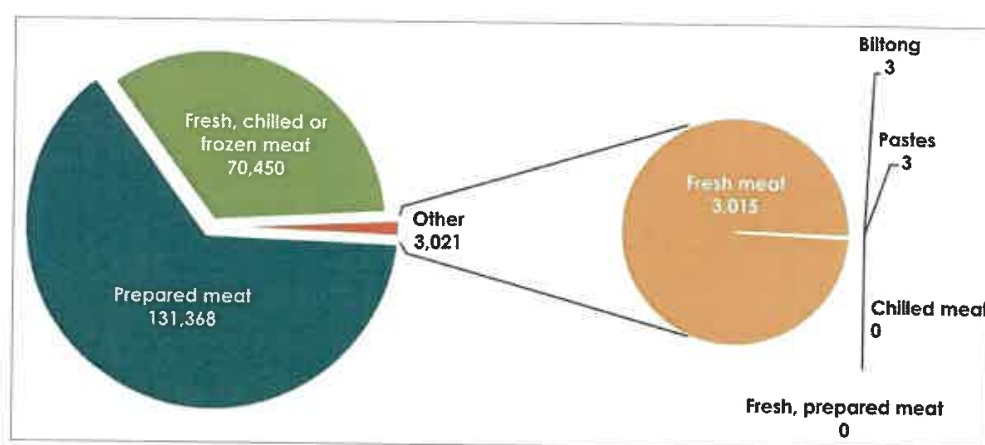
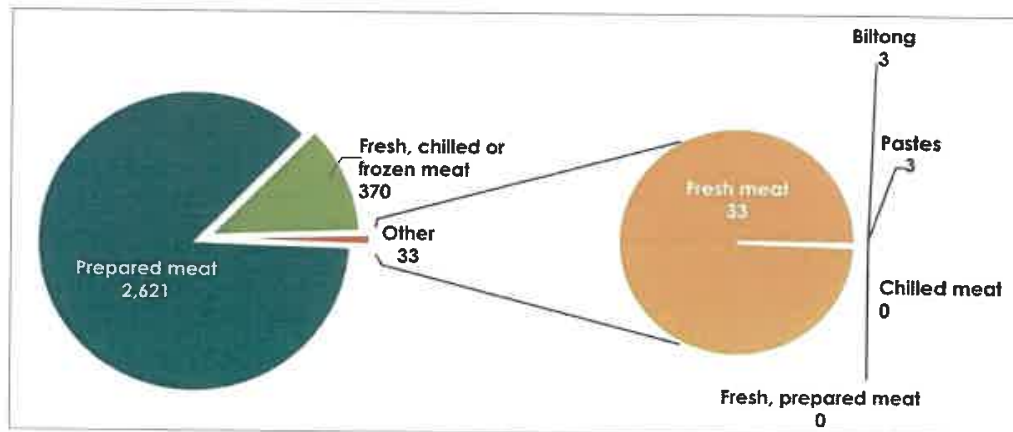


Figure 18: Game meat export profile for RSA by internal classification 2020 (Tons, SARS)

The internal classification aligns with the narrative emerging from the HS code, which shows that even though fresh meat fetches a higher price per ton from importing countries, there is a large portion of the game meat market that has switched to prepared game meat (**Figure 18**).

Table 8: Top 10 importers of game meat from RSA in 2020 (SARS)

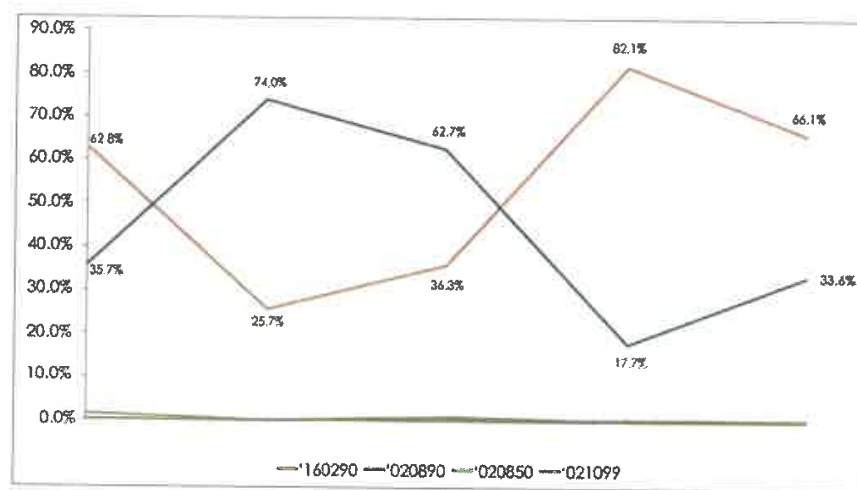
Importer	Value (R'000)	% of Total	Volume (Tons)	R/Ton
Netherlands	62 928	30.7%	280	224 694
Germany	37 494	18.3%	214	175 002
Belgium	25 385	12.4%	234	108 649
Lesotho	17 912	8.7%	696	25 741
Eswatini	13 903	6.8%	923	15 063
Namibia	11 220	5.5%	269	41 645
Botswana	5 405	2.6%	90	60 093
France	8 079	3.9%	48	166 964
United Kingdom	5 509	2.7%	28	198 584
Switzerland	4 369	2.1%	16	276 904
Top 10 Sub-Total	192 204	93.8%	2 798	68 692
Total Exports	204 839	100.0%	3 024	67 730

The top 10 importers constitute over 90% of the value of SA's exports. From the Top 10 importers, the following countries are member countries of the EU: Netherlands (1); Germany(2); Belgium (3); and France (8).

This means that SA is very dependent on its largest importers and the lack of diversification could be a risk – especially if further bans on SA game meat²⁵ are imposed.

To complement the export analysis, the imports of game meat into SA were analysed to see if any trends emerged from the SARS data. When analysing the HS codes that comprise import game meat, the same two HS codes as exports constitute the majority of import trade:

- '020890: Prepared or preserved meat, offal or blood (excluding meat or offal of poultry, swine and bovine ...)
- '160290: Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of other animals (**Figure 14**).

Figure 19: Game meat import profile for RSA by HS6 code (% of total import value, SARS)

Interestingly, prepared versus fresh game meat supplant each other as the majority of imports, with a changeover that occurred between 2016 and 2017 as well as between 2018 and 2019.

As consumer demand, coupled with local production capability determines import profiles, it is interesting that the demand for fresh game meat increased at a time when there should have been an abundance of such fresh meat in the market, which is exacerbated by the sharp decline in prepared game meat in 2019 (Makgopa, 2020). To supplement the analysis, **Table 9** details the price of imported game meat per HS6 code from 2016 to 2020.

Table 9: Average import R/ton for RSA by HS6 code from 2016 to 2020 (SARS)

HS6 Code	Rand Per Ton				
	2016	2017	2018	2019	2020
'160290	85 816	107 206	63 026	70 768	32 918
'020890	19 615	25 768	34 028	33 243	34 730
'021099	106 531	90 861	80 845	237 832	35 312
'020850	150 533	16 950	15 137		
Average	38 994	32 049	40 498	59 089	33 514

Note: For R/ton – denotes zero.

The price increase and subsequent decline in '160290 is consistent with the decline and recovery of the market share except for the year 2020, which should have seen a further increase in the market share but instead saw a noticeable decrease. The same logic does not hold true for '020890, which despite a price that trended upwards, has exhibited market share movements which appear to directly counteract '160290 – irrespective of the price.

The implication of this is that the import price does not dictate the demand for fresh game meat, but rather the demand (or lack thereof) for prepared game meat as the deciding factor. The import profile of game meat may also be described by the following classification, prepared internally:

- Prepared meat
- Fresh, chilled or frozen meat

- Pastes
- Biltong.

Applying this internal classification to the SARS data provides the following import profile for the year 2020 (*Figure 20* in value whilst *Figure 21* portrays the data in volume):

Figure 203: Game meat import profile for RSA by internal classification 2020 (R'000, SARS)

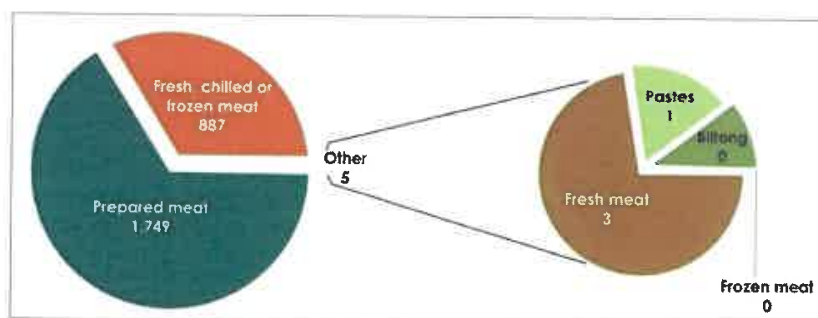
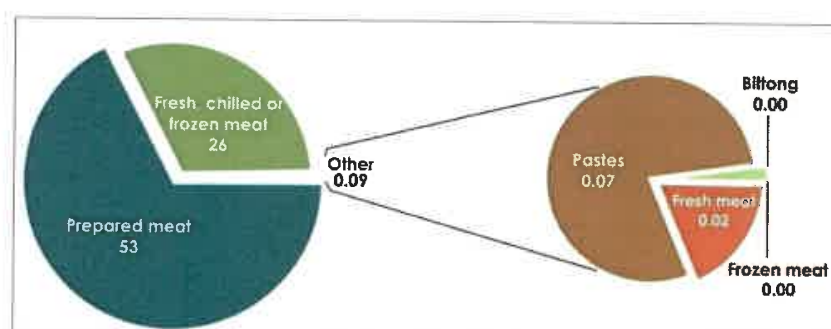


Figure 21 : Game meat import profile for RSA by internal classification 2020 (Tons, SARS)



The internal classification shows a tight correlation between the value and volume of the two major imports by internal classification. However, unlike the export profile, there is no further insight as to why the HS6 codes behave as they do.

The Top Five origin countries for South African imports of game meat are detailed in Table 10 and constitute 99.9% of South Africa's game meat imports.

Table 10: Top 5 exporters of game meat to RSA in 2020 (SARS)

Importer	Value (R'000)	% of total	Volume (Tons)	R/Ton
Namibia	1 581	59.9%	20	78 531
Australia	821	31.1%	23	35 644
Botswana	222	8.4%	35	6 302
South Korea	12	0.5%	<1	56 377
Lesotho		0.1%	<1	26 356
Top 5 Sub-Total	2 639	99.9%	79	33 538
Total Exports	2 641	100.0%	79	33 514

Note: Volumes less than 0.5 are represented by <1 due to rounding, whilst – denotes zero

In terms of exporters, the top five performers comprise almost 100% of the value of South Africa's imports. This denotes that SA is largely dependent on five countries for its game meat imports. Given the strong ties with neighbouring countries such as Namibia, Botswana and Lesotho, as well as the relative stability of Australia, there is not a great concern in future demand for game meat.

1.4. Global Perspective

The global market for game meat is dominated, both in terms of exports and imports, by a small number of major players. To determine the size and nature of the global game meat market, a high-level analysis of the global import and export markets for game meat was undertaken.

The data and statistics depicted in this section were sourced from UN Comtrade and served to determine where the largest import markets (potential opportunities) are as well as who are the largest export markets (potential threats).

The following HS codes (amalgamated) were considered the sum of the game meat market:

- '020850 – Fresh, chilled or frozen meat and edible offal of reptiles e.g. snakes, turtles, crocodiles.
- '020890 – Fresh, chilled or frozen meat and edible offal of pigeons, game, reindeer and other animals.
- '021093 – Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of reptiles.
- '021099 – Meat and edible offal, salted, in brine, dried or smoked, and edible flours and meals of meat ... of other animals.
- '160290 – Prepared or preserved meat, offal or blood excluding meat or offal of poultry, swine and bovine.

The year 2019 was used as reference, as a number of countries have not, at the time of publication of this report, finalised their data for 2020.

Figure 22 depicts the top 10 countries that imported game meat during 2019 from a value perspective (US Dollar denominated) whilst **Figure 23** informs of the import destinations from a volume (tonnage) perspective.

Figure 22: Top 10 import destinations for game meat in 2019 (US\$ import value, %, UN Comtrade)

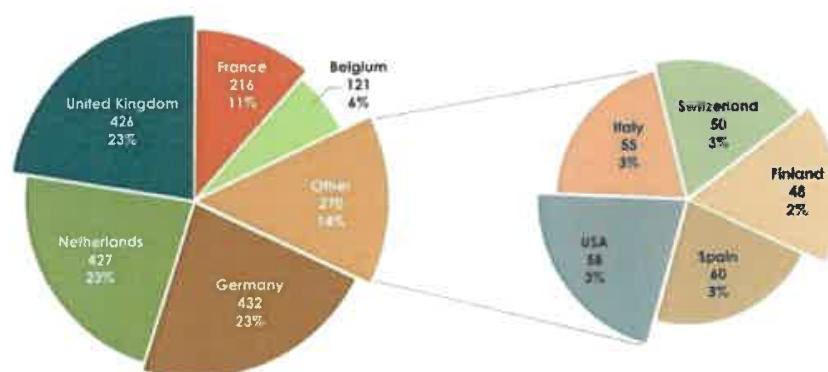
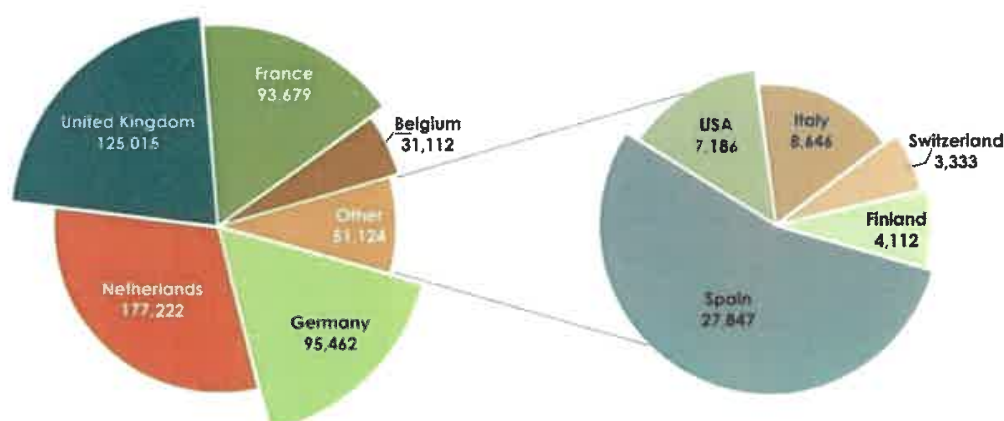
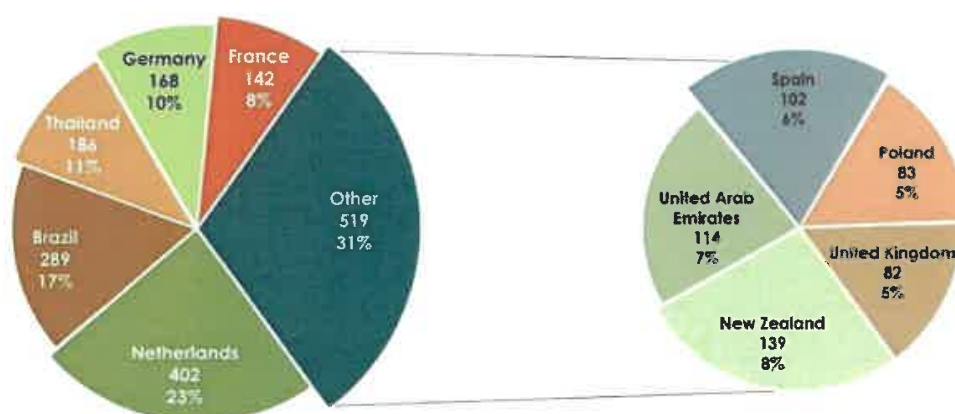


Figure 234: Top 10 import destinations for game meat in 2019 (Tons, UN Comtrade)

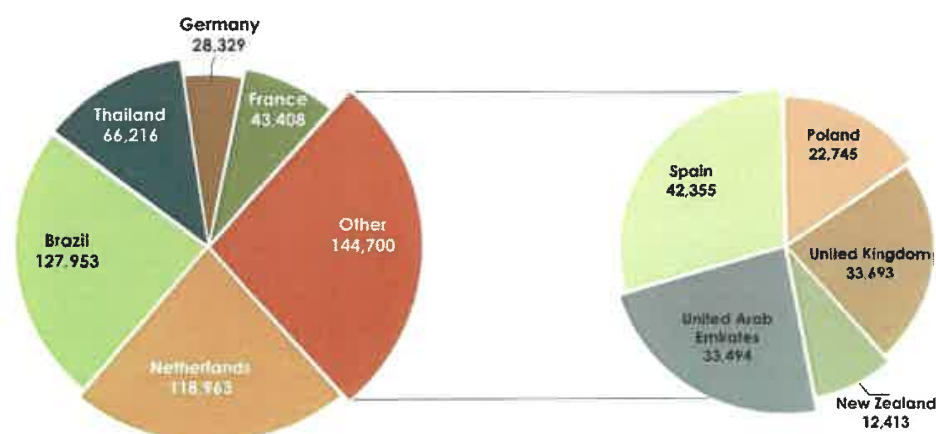
The analysis shows how valuable game meat is to the European market, with eight of the Top10 importing markets being located in Europe (six of which are in the EU-27). This is pertinent as the Top 10 importers make up over three-quarters of the world's total value of imports for the game meat market (approximately 78% in 2019).

Figure 24: Top 10 export origins for game meat in 2019 (US\$ export value, %, UN Comtrade)

The HS codes do not specify the game meat or the different species of game hunted and thus exported to the EU. Research by Pain, D. and Thomas, V (2020) asserts that the list of species harvested and processed could be a combination of the following species: Partridge, Pheasant, Hare, Deer including Roe Deer, Red Deer, Fallow Deer and European Elk, Wild Boar and Chamois.

According to Dennehy, J (2018) in the United Arab Emirates (UAE) there is also hunting activities associated with: Arabian Sand Gazelle, Arabian Oryx and Arabian Mountain Gazelle.

However, the game meat exported from the UAE tends to be more processed and prepared game meat, whilst the Netherlands is more focused on fresh game meat.

Figure 25: Top 10 export origins for game meat in 2019 (Tons, UN Comtrade)

Five of the Top 10 importing markets are also in the Top 10 exporting markets (as per **Figure 24** and **Figure 25**). However, all but Spain are net importers of game meat in value terms. The remaining five exporters, for example New Zealand, pose a much larger threat to smaller game meat producing countries, such as SA whom UN Comtrade lists at position 27th worldwide across the five HS codes (with a combined trade value of US\$12 million in 2019).

Overall, the Top 10 exporters make up over three-quarters of the world's total value of exports (approximately 76%), similar to the trend observed with the Top 10 importers (**Table 11**).

Table 11: RSA exports of game meat per HS code in 2019 (US\$ million, rank and Tons)

RSA Exports (2019)	Total	'020850	'020890	'021093	'021090	'160290
Value (US\$ million)	12	<1			<1	
Rank (Total)	27 (98)	4 (22)	23 (69)	- (13)	34 (70)	13 (84)
Volume (Tons)	3 010	29	499		60	2 422

Note: Values less than 0.5 are represented by <1 due to rounding, whilst – denotes zero

Positioning SA into the global perspective reveals how small a player SA is on a global scale. SA's game meat industry only constitutes 0.6% of the global export value of US\$2 243 million, and only 0.4% of total global tonnages (of 696 016 Tons). SA does, however, rank relatively high (13th globally) for processed game meat (HS '160290) and outperforms some of the major export players for this commodity such as New Zealand.

1.5. Regional Perspective

While South Africa is a relatively minor player from an international perspective in the game meat industry, it is by far the largest exporter from a regional perspective. **Table 12** depicts a regional analysis that covers the African continent for the year 2019. However, restricting the analysis to neighbouring countries does not change the outcome drastically:

Table 12: Regional view of game meat (US\$ million, regional rank, global rank, Tons)

Exports in 2019	Value(US\$ million)	Regional rank (Value/27)	Global rank (Value/98)	Volume(Tons)	US\$/Tons
South Africa	12.43	1 (27)	28 (98)	3 010	4 129
Zimbabwe	0.72	2 (27)	47 (98)	137	5 271
Ghana	0.43	3 (27)	53 (98)	47	9 265
Namibia	0.28	4 (27)	59 (98)	<1	3 271*
Egypt	0.18	5 (27)	61 (98)	114	1 548

Côte d'Ivoire	0.10	6 (27)	68 (98)	13	7 459
Zambia	0.09	7 (27)	70 (98)	27	3 249
Botswana	0.08	8 (27)	72 (98)	62	1 213
Benin	0.06	9 (27)	75 (98)	572	99
Mozambique	0.05	10 (27)	76 (98)		13 544
Morocco	0.01	11 (27)	83 (98)		2 920
Tunisia	<0.01	12 (27)	86 (98)		4 845
Kenya	<0.01	13 (27)	88 (98)	<1	5 867
Mauritius	<0.01	14 (27)	90 (98)	<1	9 588
Eswatini	<0.01	15 (27)	91 (98)	<1	50 040
DRC	<0.01	16 (27)	97 (98)	<1	3 000
Senegal	<0.01	17 (27)	98 (98)	<1	3 238
Total Regional	14.43			3 992	3 613

* While UN Comtrade has captured the Namibian value of exports in 2019, it has not fully captured the associated volumes. Therefore, the average price for all value transactions with a volume component were used to estimate the US\$/Tons. Note: Values less than 0.01 are represented by <0.01 due to rounding, whilst – denotes zero. Note: Volumes less than 1 are represented by <1 due to rounding, whilst – denotes zero.

Demonstrably, South Africa is the top game meat producer on the continent in both value (86%) and volume (75%) terms. While it does not fetch the highest prices on the global market, South Africa's game meat very clearly dominates the regional market.

Interestingly, the next largest exporter in 2019 was Zimbabwe. Though it only exported around 6% of South Africa's game meat in value terms (and 4% in volume terms), it commanded an almost 28% higher US\$/ton price. South Africa's next largest direct competitor, Namibia, was only around a third of Zimbabwe's export value and commanded a lower US\$/ton price for its game meat.

Joubert (2022) used data obtained from UN Comtrade to analyse regional trade of game meat in three African countries, this include SA, Zambia and Namibia. The results of the study are as follows:

- **020850 - Meat and edible meat offal; of reptiles (including snakes and turtles), fresh, chilled, or frozen**

Namibia did not report any shipments of goods covered by this HS code between 2017 and 2021. Zambia and South Africa, however, did. South Africa exported to Namibia, but Zambia solely exported to the DRC (Democratic Republic of Congo). There were other records for other nations, although the volumes were very little; fewer than 30 kilograms per nation were reported.

- **020890 - Meat and edible meat offal; n.e.c. in chapter 2 fresh, chilled, or frozen**

The majority of African nations received exports from South Africa between 2017 and 2021 that fall under the 020890 classification. Namibia, Lesotho, Somalia, Mozambique, and Eswatini were the principal export destinations during this time in terms of volume. South Africa was by far the main country of destination for Namibia's exports, which were too fewer nations. During this time, South Africa received fewer quantities of Zambian exports than the DRC did.

- **021099 - Meat and edible meat offal; salted, in brine, dried or smoked, and edible flours and meals of meat or meat offal, other than of primates, whales, dolphins, porpoises, manatees, dugongs, seals, sea lions, walruses, reptiles (including snakes and turtles)**

Under this HS code, South Africa reported shipments to the most nations. Volumes to Namibia and the DRC were particularly noteworthy. Namibia reported small-scale shipments to South Africa in addition to its main destination of Zambia. According to the data that is available, Angola is Zambia's main market.

- **021093 - Meat and edible meat offal; salted, in brine, dried or smoked, and edible flours and meals of meat or meat offal, of reptiles (including snakes and turtles)**

Only 32kg of merchandise were exported by South Africa to Zimbabwe between 2017 and 2021 using this tariff code. Both Namibia and Zambia denied exporting any goods to Africa using this HS code.

- **160290 - Meat preparations; of meat, meat offal or the blood of any animal, n.e.c. in heading no. 1602**

Lesotho, Eswatini, and Namibia were the main destinations for South Africa's exports of this goods, with smaller quantities going to Botswana and Namibia. South Africa was Namibia's primary export market, with very little also going to Zambia, Angola, and Botswana. Zambia only acknowledged shipping 50 kilograms in total to the DRC during this time.

- **020810 - Meat and edible meat offal; of rabbits or hares, fresh, chilled, or frozen**

During that time, only South Africa reported shipping goods with this HS code. These applied to Mozambique, Botswana, and Angola to a lesser extent. Neither Zambia nor Namibia reported any exports.

- **020840 - Meat and edible meat offal; of whales, dolphins, and porpoises (mammals of the order Cetacea); of manatees and dugongs (mammals of the order Sirenia); of seals, sea lions and walruses (mammals of the suborder Pinnipedia), fresh, chilled, or frozen**

Between 2017 and 2021, only one of the three nations—South Africa—reported exports of this product to Africa primarily to Eswatini and Lesotho.

1.6. Barriers to entry

The purpose of detailing Barriers to Entry for the game meat industry is to protect market share and the industry's ability to generate revenue, and ultimately positive financial performance. Based on direct stakeholder engagement and related research, the barriers to entry into this market segment is, holistically speaking, relatively high as portrayed in **Figure 26**.

Figure 26: Barriers to entry

Barrier to Entry	Why is it a Barrier?
1 Access to Land 	Access to adequate land for use of game ranching is costly. The availability of land for game ranching for PDI's and other new entrants are a cause of concern
2 Capital Intensive 	Cost of capex to start farm, fencing, breeding, production, and construction of abattoirs are high
3 Legislative Framework 	Bureaucratic processes to obtain permitting requirements of firearms and harvesting is costly, time consuming and not integrated nor governed effectively
4 Lack of Economies of Scale 	Lack of consistent supply throughout the year to serve the needs of the local market as well as the differentiated needs of the export market
5 Lack of Accurate Information related to Market Size (Supply and Demand) 	Lack of accurate industry related data and statistics to make informed decisions. There is not one single depository of industry related data to understand supply or demand (market size) of the SA Game Meat Industry

Barrier to Entry		Why is it a Barrier?
6 Skills and Know-How		Wildlife related skills and know-how for new entrants in the industry is limited which ranges from breeding, raising, harvesting, meat safety, conservation to eco-tourism
7 Creating a Brand and Markets		Access to local and international distribution channels and to develop an export market is costly and takes time. High costs in spending on advertising, marketing, research and development
8 Network Effect / Competition with other Red Meat Producers		Due to strong network of livestock meat consumers, game meat consumers fail to gain sufficient numbers versus the consumption of other red meat and sometimes on offer at exploitative prices. Furthermore, the nature of game ranching results in higher cost to harvest than meat production processes from domesticated livestock, yet the price of the final products are compared (as equal) upon purchase
9 Disease Outbreaks		Resulting in interrupted / inconsistent export supply opportunities and therefore interrupted periods of marketing as a brand in export markets. Specific examples include FMD and AI
10 Consumer Confidence in Product		Overcoming the reputation of 'poor' quality game meat that entered the market in the past, as well as regaining consumer trust after meat adulterity scandals
11 Product Differentiation		Loyal consumers resist to change from other red meat products to game meat due to misconceptions about game meat, preparation and availability

Source: stakeholder consultation, 2021

1.7. Business Environment (STEEP Analysis)

The business environment is best described as the sum of all external and internal factors that influences an industry. In this section, an analysis was embarked on to understand how environmental influences work together and/or how it may affect the game meat industry.

1.7.1. Social Factors

Factors like cultures, attitudes, religion, values, and lifestyles influence what, how, where, and when people purchase products. They are difficult to predict, define and measure as it is very subjective. Consumers are increasingly becoming concerned about healthy and safe products and the demand for these products is escalating.

According to González *et al* (2020) there is an urgent need to change the dietary habits of most people, at least in developed western countries, and especially, to reduce meat consumption. More consumers focus on less red meat intake but healthier meat. Game meat that is brought to the market has shown its high nutritional value, that it is wholesome, fresh and lean. However, due to misconceptions, game meat is still negatively perceived which leaves room for improvement to amend perceptions amongst non-consumers of game meat products. Benefits from growth within the wildlife sector stretches beyond the economic scope as the sector also contributes towards conservation and the management of biodiversity.

1.7.2. Demographic

In order to help the game meat industry to determine and understand market preferences and requirements for game meat products, it is important to determine the size and composition of meat consumers. Wassenaar (2016) stated that the game ranching industry relies on a variety of income opportunities to be successful economically. Game ranchers have four possible markets for their animals namely game meat exports, the sale of live animals, trophy hunting and the local game meat market.

When food (particularly meat) consumption is explored, it is important to account for the different population

groups as each group has their own customs and traditions. In addition, factors such as religion, age and income also play a role in consumer (buying) behaviour.

The current population of SA for 2021 is 59 847 352³⁸ which portrays a 1.24% increase from 2020. As the population will continue to increase it also becomes more diverse. It is important to take note of the unique shopping preferences of the different generations, which each require differentiated marketing approaches and goods targeted to specific needs.

The millennial generation, born between 1981 and 1997, are technologically advanced and prosperous young people, who disburse to enjoy a convenient lifestyle of which a classical example is ready-made cooked meals. Younger consumers are also increasingly averse to food produced using growth hormones, the blanket use of antibiotics, inhumane and unethical practices, and other matters of concern. They often state a willingness to pay a premium for such products or brands.

Generation X is people born between 1965 and 1980 and they have their own spending patterns. Baby boomers were born between 1946 and 1964 and as they are in or near retirement age, they are willing to spend more on their health by means of consuming healthier products. With regards to the game meat industry there is limited to no data available to depict consumer behaviour for game meat produce. To ensure effective and targeted marketing strategies in relation to meat products, more research is needed to understand the preferences related to gender, age, race, ethnicity and cultural practices.

A recent report on the food consumption changes in South Africa highlights the fact that meat consumption has increased, particularly that of poultry and pork which retails at roughly 60% and 30% lower than that of beef and lamb/mutton. The trend is that consumers will purchase meat that is more cost-effective.

More game meat information and knowledge should be shared with the public in general. As there is a definite market for game meat production to be exploited, it is of utmost importance that the right marketing strategy be developed and deployed.

1.7.3. Technology

The overall ability to maintain and build wealth depends in large on the speed and effectiveness with which technology is used. To stay abreast of the required standards, the game meat industry must invent and adapt more efficient ways and equipment to improve the production and the handling of the meat when harvested. Requirements to grow the export market of game meat also see the application of technology to become more prominent.

The use of technology to create change, improve efficiency and streamline operations in the game meat industry is no exception. Developments related to improved hunting equipment over the years are already observable. Practices on game ranches, like wildlife production systems, hunting and harvesting methods as well as meat handling and cold storage facilities improved as the game meat industry expanded.

The latest development in technology includes the use of mobile or rural throughput approved abattoir concepts and software products that increase meat safety, quality and traceability. Mobile technology is widely used on game ranches to communicate with all the stakeholders ranging from employees, consumers as well as suppliers and is therefore seen as critical to the industry's success.

1.7.4. Economic

When economic activity is strong, unemployment rates are low, and income levels rise. Game ranching contributes significantly to the South African economy. It was noted by the DFFE that the wildlife economy created over 100,000 jobs and it has the potential to create even more direct and indirect jobs. The majority of the wildlife economy is still untransformed, and it is envisaged that transformation should be supported through Public Private Partnership (PPP) Co-operatives, land reform programmes, sponsorship and training of Previously Disadvantaged Individuals and communities to own and manage wildlife rangelands, abattoirs, meat processing facilities and be involved in the marketing and sales of game meat products.

1.7.5. Environmental

Wildlife/game ranching is considered to be an environmentally friendly agricultural practice due to sustainable land management practices and the conservation of biodiversity. Game ranching can have a positive environmental impact in an area by conserving the habitat while also increasing the amount of wildlife. Climate change as well as the pressure on water availability limits agricultural production in SA. However, game is better adapted to the marginal conditions, and is not as likely to suffer from the effects of global climate change as severely as domesticated livestock. It is well-known that climate change could have an effect on meat quality and also on meat safety. Potential effects of climate change could result in higher mortality during transport or higher contamination of carcasses with *Escherichia Coli* or *Salmonella*, which means an overall reduction in the quality of meat.

Almost 80% of South African agricultural land is considered marginal agricultural land, fit only for animal production (Wassenaar, 2016). Studies have shown that wildlife adapted better to dry environments than cattle, since they make use of both browsing and grazing material. Therefore, game ranching can be extended which could lead to growth in game meat production. Furthermore, game ranching could have a positive environmental impact on an area by conserving the habitat while also increasing the number of game. By conserving the habitat of the utilised species, the habitat of other non-utilised species can also be protected. Because owners of game ranches obtain an income from the animals, they use sustainable land management practices to contribute to natural habitat and vegetation conservation.

1.7.6. Political and Legal

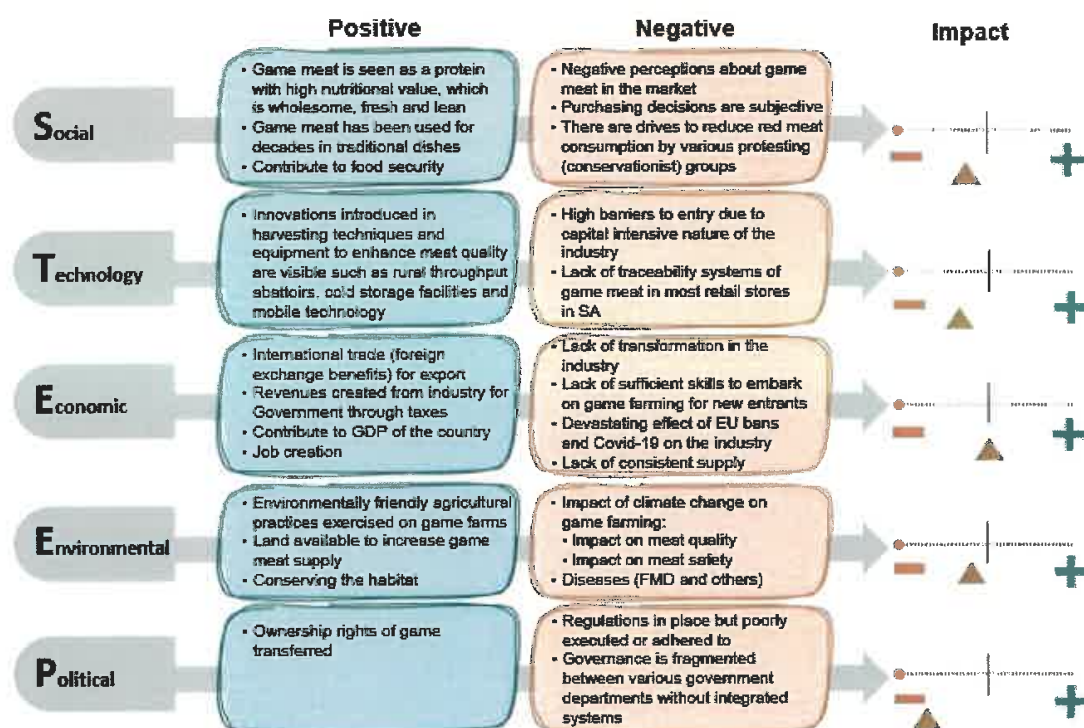
The South African context of meat is deeply rooted in the heritage of our people. The demand is greatly influenced by its availability, price and traditional (cultural) usage as well as the consumer's associations and perceptions. Domestic animals and game are main meat sources, where the meat as well as the offal are utilised and incorporated into traditional dishes. The informal game meat market provides meat to a large portion of the population yet, it is poorly regulated. On the other hand, the formal market is strictly regulated to ensure that safety and quality of the meat are maintained.

Ownership rights of wild animals provided a positive change in South Africa's legislation through the Game Theft Act 105 of 1991. This legislation provides greater incentives for game ranching and grant landholders the right to use wildlife commercially and to gain an economic advantage from wildlife on their ranches.

The regulatory bodies responsible for food legislation in South Africa include the DoH, the DFFE, the DALRRD, and the DTIC. Related to meat, these national departments regulate the harvesting of animals as well as the safety, quality, sale and labelling of fresh and processed meat products.

Game meat exported from SA should comply with the South African Policy for the Export of Game Meat, which is based on the European Economic Community Council directives as a guideline. This ensures that there is traceability of the meat back to the ranch of origin and detailed information available about the health status of the animals. The ostrich meat exporters have been applying these regulations for years with great success. From a summative perspective, the STEEP factors are depicted in **Figure 27**.

Figure 27: STEEP Factors of the SA Game Meat Industry



Source: Stakeholder consultation, 2021

1.8. The Game Meat Industry and Food Security

The right to have access to sufficient food is embedded in Section 26 and 27 of the South African Constitutional Law of 1996. The Bill of Rights enshrined in the Constitution states that "every citizen has a right to have access to sufficient food, water and social security" and that "the State must take reasonable legislative and other measures, within its available resources, to achieve the realisation of this right".

A widely accepted definition of Food Security is provided by FAO as being "access by all people, at all times, to the food required for a healthy life". In an expanded form, the World Bank defines food security as "the physical, social and economic access to sufficient, safe and nutritious food by all, at all times, to meet their dietary and food preferences".

In SA's National Development Plan (NDP), it is explicitly stated that food insecurity is both a cause and a consequence of poverty. Statistics SA (2014) stated that SA experienced an increase in the proportion of people living below the food poverty line. Albeit significant efforts that have been embarked on by the State to promote food security, 25.5% of our citizens are living below the poverty line, of which most struggle to feed themselves.

The SA government has developed The National Policy on Food and Nutrition Security for the Republic of South Africa. In the policy it is stated that SA still faces serious food security challenges, which can be summarised as follows:

- There are inadequate safety nets and food emergency management systems to provide for all those who are unable to meet their immediate food needs or to mitigate the impact of natural and non-natural disasters on food security;

- Citizens have inadequate access to knowledge and resources to make optimal choices for nutritious and safe diets;
- In cases where productive land is available, it is not always optimally utilised for food production, often for lack of inputs (including finance, equipment and water), or skills; at the same time, there is a need to ensure that overproduction does not drive down prices to the point that farming becomes unprofitable.
- There is limited access to processing facilities or markets for small-scale primary producers, including farmers, fishermen and foresters;
- Climate change and altered patterns of land use pose a threat to domestic production; and
- There is not adequate, timely and relevant information on food security.

The Policy provides a broad framework for the fulfilment of this Constitutional imperative, and serves as a guide to national, provincial and local government in pursuit of food and nutrition security at every level. The policy also serves as a key pillar in delivering the objectives of the NDP.

Game meat is a significant source of protein for South Africans. As SA is an importer of protein, thus not meeting own national protein demand, increase the availability of another healthy protein source in the market could contribute positively to food security. Considering the challenging circumstances of how to 'feed the nation', the game meat industry could invariably play a major role in improved food security. Based on the lack of data and statistics about the flow of game meat into the market, it is difficult to state how much game meat are consumed by impoverished families.

1.9. SWOT Analysis

A SWOT analysis was undertaken to identify the strengths, weaknesses, opportunities and threats of:

- Primary Production;
- Processing of Meat (which caters for harvesting to processing in an abattoir); and
- Catering for the Market or alternatively referred to as Commercialisation.

The findings are depicted overleaf.

1.9.1. Primary Production

The SWOT analysis detailing primary production follows in **Figure 28**.

Figure 28: SWOT Primary Production



1.9.2. Processing of Meat

The SWOT analysis related to harvesting and processing of meat is depicted in **Figure 29**.

Figure 29: SWOT Harvesting and Processing of Meat



1.9.3. Commercialisation

The SWOT analysis for commercialisation of game meat products follow in **Figure 30**.

Figure 30: SWOT Commercialisation



1.10. Business Models Deployed in the Game Meat Industry

1.10.1. Business models analysed and potential new business models

During the situational analysis phase of the Game Meat Strategy developmental process, various business models were analysed – specifically related to wildlife rangelands, how mixed farming systems work, how communal areas operate and generate revenue (inclusive of Communal Property Associations) as well as how protected areas (inclusive of national, provincial and private nature reserves) contribute to either one of the following:

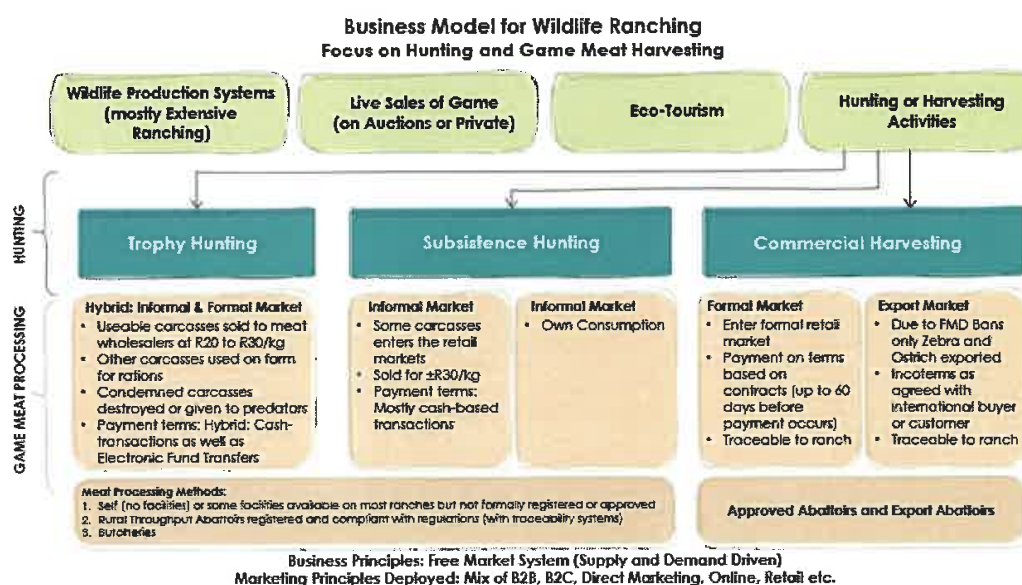
- The game meat industry and its associated revenue streams (inclusive of value addition);
- Job creation;
- Food security; and
- Transformation of the industry.

Transformation today revolves around the need to generate new value, inclusive participation, unlock new opportunities, to drive new growth and to deliver new efficiencies which will require change throughout the value chain. To this effect, a high-level outline of these varying types of business models follows:

1.10.1.1. Natural Wildlife Production Business Model

As a result of stakeholder engagement, various business models are deployed within the Wildlife sector. The focus of the model depicted in **Figure 31** is only on hunting or harvesting of game meat, its meat processing methods, pricing related trends as well as payment terms and conditions.

Figure 31: Business Model: Natural Wildlife Production



Source: Stakeholder consultation, 2021

It is noteworthy to mention that ranchers deploy a hybrid of ranching business models. Having said this, it implicates that business models will vary based on the unique species on the ranch, the facilities that are available on the ranch, conservation targets as well as ranch owner needs and wants.

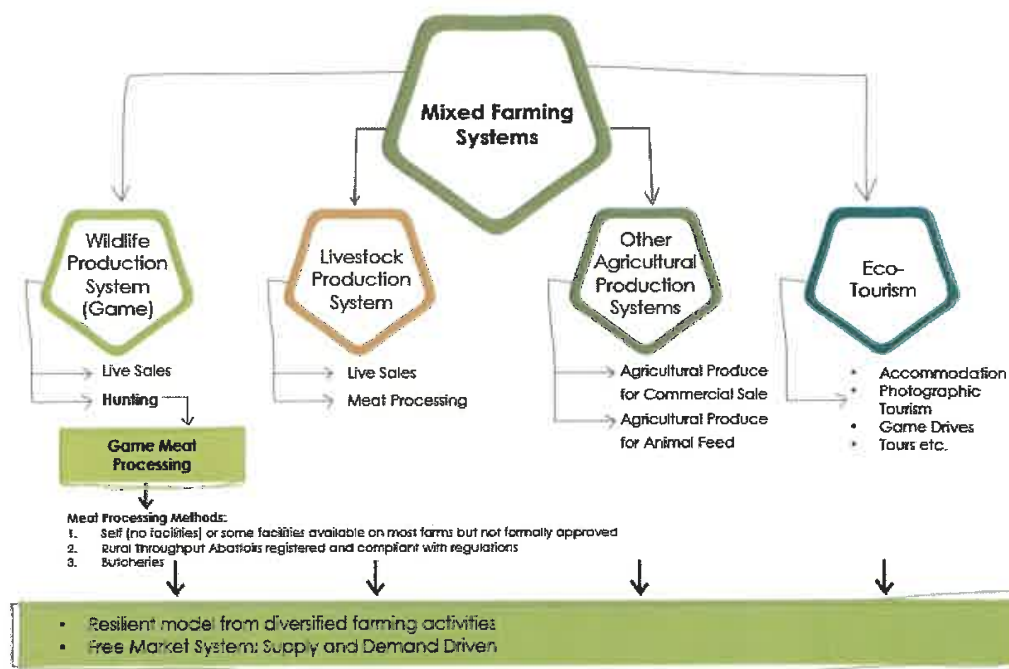
For instance, some ranchers could focus only on breeding, others only on Eco-Tourism whilst most ranchers or outfitters that offer trophy hunting, does offer facilities related to accommodation (thus bed nights) to complement the hunting experience. This is also applicable to the subsistence hunter that does not own a ranch but that hunts game meat for own consumption.

1.10.1.2. Mixed Farming Business Model

In order to penetrate the game meat industry, and in an aid to curb the high barriers of entry, it is possible to enter the industry by deploying mixed farming systems. This business model makes provision for various farming options, as portrayed in **Figure 32**.

As per this business model it entails that a farmer has land and that he/she embarks on livestock production. However, they also plant, for instance mealies, to be self-sufficient in relation to animal feed. Apart from the aforementioned, the farmer developed a number of chalets on the farm which could be used for eco-tourism purposes. Based on this model, the farmer could add game onto the farm whereby they either focus on eco-tourism with no hunting activities, bar for live animal sales, or they offer hunting as an additional source of revenue. This business model then follows the Wildlife Ranching Model, however, revenue streams will emanate from the four divisions (or a combination of the four).

Figure 32 : Mixed Farming Business Model



Source: Stakeholder consultation, 2021

1.10.1.3. Large Scale Game Production and Harvesting Commercial Focus Business Model

Current business models mainly focus on production of game for live sales and hunting. Game meat is produced as a by-product of hunting, rather than a focus in itself. Operations tend to be small, often individual farm based. Such an approach cannot achieve economies of scale, or consistent supply, and there are also increased risks to food safety. Such models also have large barriers to entry, as indicated above.

An alternative approach is to follow a Biodiversity Economy Node (BEN) approach to achieve economies of scale. A BEN is a geographic platform that provides networks to enable market access, skills transfer and

creating supply chain linkages for local SMMEs. Applying such a model to game meat production would require larger, consolidated areas, which can carry large numbers of game that can be harvested throughout the year. In such ventures, ecotourism, live sales, trophy hunting, and local hunting would be secondary, but not incompatible activities, and would increase the viability and resilience of ventures.

Land and game acquisition would be major barriers to entry, but commercial ventures of this scale should be able to raise capital investment through a range of options. This would be an ideal model to facilitate quick entry for PDIs into commercially viable ventures. Opportunities therefore exist in communal buffer zones or areas surrounding or bordering protected areas, including communal areas far away from protected areas where such ventures can be explored. This model would also be appropriate for community public-private partnerships linked into community owned enterprises. Mechanisms would need to be created to link small operators into these ventures, possibly through associations or partnerships, as they may otherwise be outcompeted and struggle to survive. This may lead to takeovers of small operators, reducing the number of game farmers, as was observed with small commercial livestock farmers.

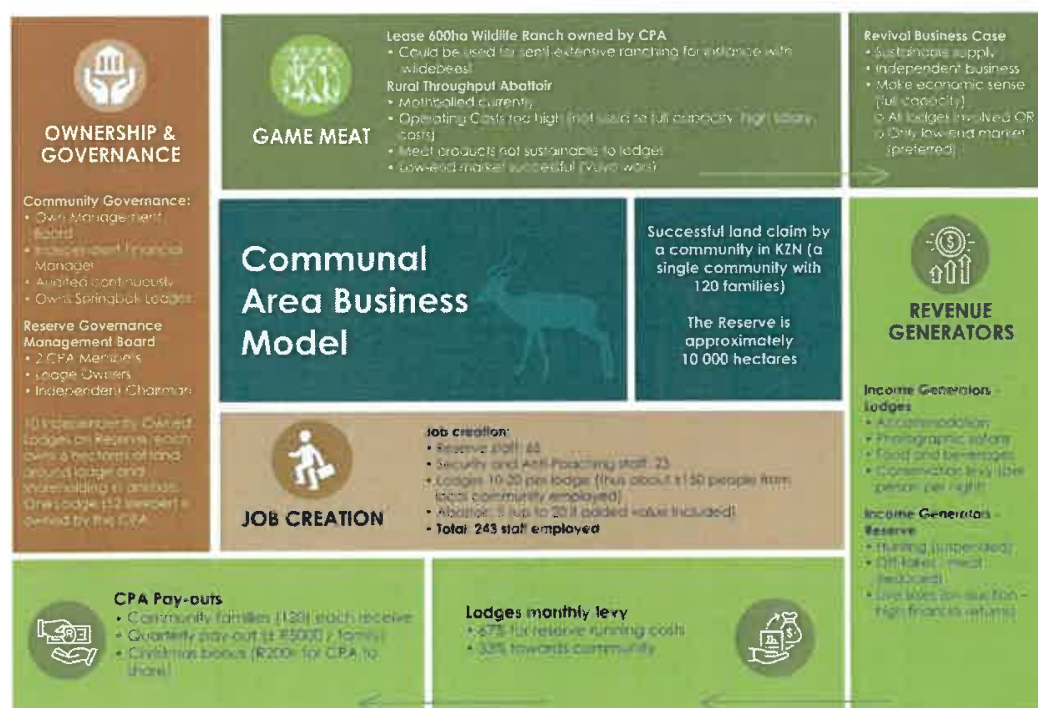
1.10.1.4. Communal Areas and CPA Business Models

Various private- and other nature reserves are owned by communities as a result of successful land claims. Although various CPA's have been engaged with, not many proved to be successful and sustainable. However, one prime example of a successful CPA model could be found close to Ladysmith in KwaZulu Natal.

The Game Reserve hosts an abundance of wildlife and vast opportunities to get sight of the Big 5. Furthermore, it provides for a truly authentic African feel whereby the Reserve reflects the serenity of its surrounds with neutral colours representing life, renewal, nature and energy.

Some key lessons learned is that the reserve is owned by one community with 120 families which all benefits from the operations of the Reserve, apart from the fact that the CPA owns one of the ten lodges. Their business model follows in **Figure 33**.

Figure 335: Communal Area Business Model



Source: Stakeholder consultation, 2021

Benchmarked information obtained from Namibia, where a conservancy model is utilised albeit over much larger land areas, similar attributes to what is evident at this CPA surfaced. This includes governance structures such as the institutional framework, for instance, the Board of both the community and independent entities, independent financial management functions to curb prospective maladministration, meat supply to communities and job creation at various levels in the conservancy. The only difference in this model is that most income is generated utilising the trophy hunting model and not eco-tourism as is the case of most Communal Area Business Models deployed.

1.10.1.5. Game Meat Production on Extensive Communal Land

There are large areas of communal land that are natural, and used for subsistence livestock farming and mostly degraded, marginal lands. This is in addition to the communally owned reserves mentioned above. There is potential for these areas to convert to game production for meat, adopting the large business enterprise approach as outlined above. It may be possible to manage such areas as extensive wildlife areas free roaming game. This would require dealing with complicated governance issues in establishing the approach and business model.

Investment would be necessary to build the herds of game necessary to sustain commercial harvesting, and these areas should be targeted as recipients of game donations to build these herds. Ventures based on this model would be formal commercial ventures, which can attract both government and private sector investment. Game can co-exist with livestock, however the risk of disease transmission will have to be stringently managed as game and livestock share some diseases.

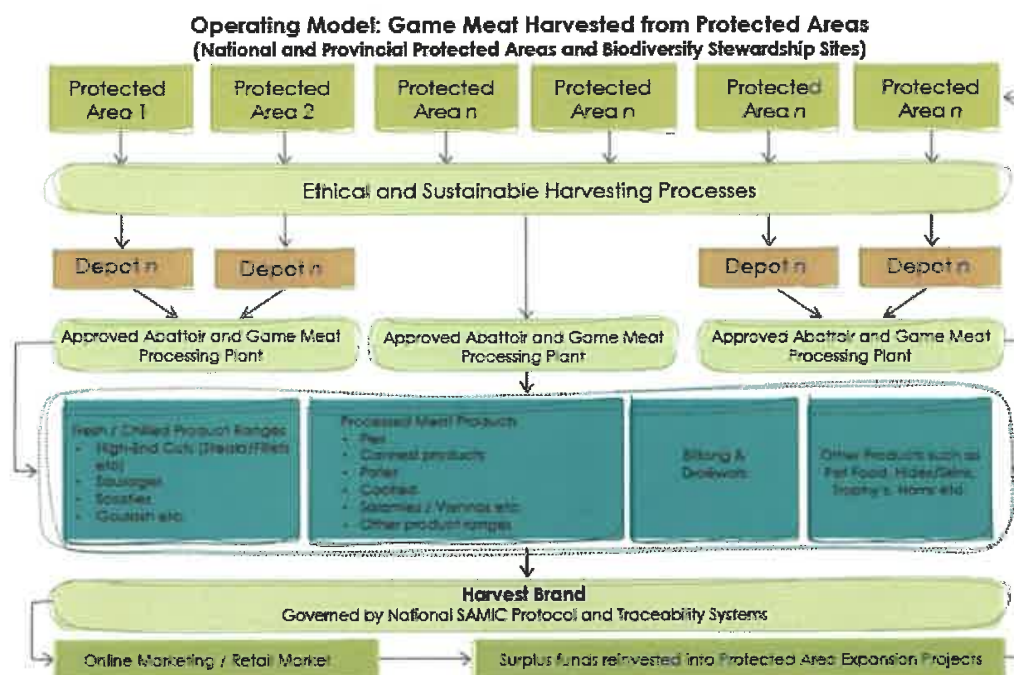
This will provide opportunities for mixed farming system models which can also promote commercialisation of communal livestock production. Harvesting would be through large harvests, which reduces input costs such as inspection and abattoirs. In such ventures, ecotourism, livesales, trophy hunting, and domestic hunting would be secondary, but not incompatible activities, and would increase the viability and resilience of ventures. A by-product of this model is that it could lead to a large increase in the conservation area of South Africa, to improvement of conservation and ecosystem services.

1.10.1.6. National Parks and Protected Areas

Vast research has been undertaken by Conservation Outcomes in relation to national and provincial protected areas, specifically Biodiversity Stewardship Sites. An operational model is depicted that details the flow of game meat within protected areas to the market as is evident in **Figure 34**.

The model represents the operational ecosystem proposed for the harvesting of game meat, specifically where overpopulation adversely impacts the ecological environment. Throughout South Africa, various protected areas present an opportunity for effective game population management and the opportunity to economically benefit from off-takes. However, caution should be taken to ensure scientific methods are used to determine off-take quantities.

Harvesting game needs to be done in a sustainable manner. To define sustainability in this context, considerations are given to the effect of the harvesting process on social and economic levels, as well as the impact of biodiversity. The game population selected for harvesting is based on proportional ecological parameters.

Figure 34: Operational Model Protected Areas

Source: Stakeholder consultation, 2021

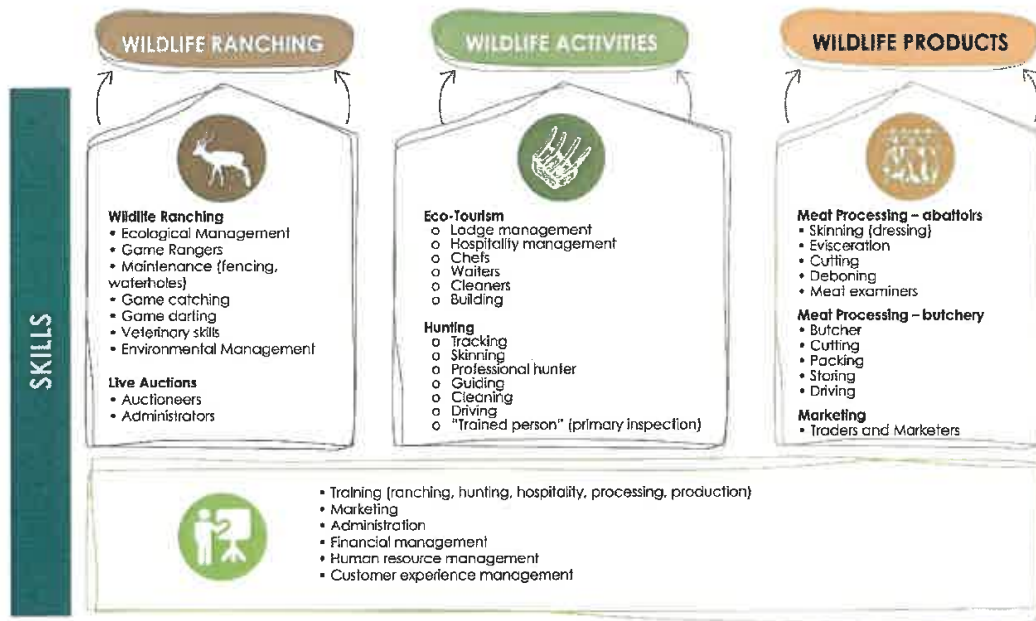
Once game meat is harvested in protected area(s), the carcasses will be transferred to depots (or refrigerated vehicles) and thereafter to approved abattoirs. The processing plants will serve as manufacturers of game meat processing and associated value addition to produce various game meat products to avail to the local market.

A brand, **Harvest** ignited and various steps of brand building is currently in process of implementation. It will be required that the brand have sound governance frameworks (as per SAMIC Protocol) and to ensure traceability systems are effectively implemented.

A typical retail business model that caters for perishable produce will offer an opportunity to efficiently market various game meat products, complemented by online marketing platforms that will be deployed.

1.11. The need for Capacity Building throughout the Value Chain

In order to grow the game meat market, capacity building will be prudent to sectoral growth. Skills are graphically depicted in **Figure 35** below.

Figure 7: Capacity Building throughout the Value Chain

1.12. Risks related to the Game Meat Industry in SA

Whilst game meat production and sale presents many economic opportunities for the country and wildlife managers, there are risks associated with the industry. The risks identified relate to the following: lead contamination, climate change, risk from intensively bred wildlife, market risk, zoonotic disease, habitat degradation, animal welfare and over-exploitation. The section below gives a detailed review of each risk and possible mitigation measures:

1.12.1. Lead contamination

Lead (Pb) is a neurotoxic heavy metal and Endocrine Disrupting Chemical with severe health impacts on living organisms. The toxic effects of acute lead poisoning in humans have been documented for centuries and include dysfunction of the peripheral and central nervous, renal, and circulatory systems (Needleman 2004). Researchers have only recently begun to elucidate the chronic effects of cumulative low dose exposure, such as that obtained from long term multiple ingestion of small quantities of lead (Kosnett 2009). In adults, these effects include increased risk of hypertension (Nawrot et al. 2002), nephrotoxicity (Ekong et al. 2006), and premature cognitive decline (Shih et al. 2006). Increased risk of cardiovascular and cancer mortality occurs at blood lead levels previously considered safe (Lustberg & Silbergeld 2002, Menke et al. 2006). Children are more susceptible to environmental lead exposure with demonstrated negative effects on cognitive function (Gomaa et al. 2002, Canfield et al. 2003) and behavioural regulation (Needleman et al. 1996, Mendelsohn et al. 1998, Dietrich et al. 2001), resulting in costs to the economy. Because no lower threshold has been established for these effects, there is no blood lead level considered safe for children (Betts 2012). The effects of cumulative low dose exposure are of concern to individuals who consume game harvested with lead bullets. Lead fragments, often too small to notice and remove prior to ingestion, are commonly detected in radiographed packets of big game meat and are bioavailable upon consumption (Hunt et al. 2009, Fachehoun et al. 2015). Additionally, if game meat is cooked with lead fragments still embedded, even if large fragments are removed prior to eating, detectable levels of lead can be left in the meat (Pain et al. 2010). Game consumption has been linked to higher blood lead levels in several

populations (Iqbal et al. 2009, Bjerme et al. 2013, Meltzer et al. 2013) and individuals (Johansen et al. 2006, Buenz and Parry 2018) over time.

1.12.1.1 Lead and Meat safety

Lead (Pb) bullets fragment and lead particles can travel a significant distance from the point of impact or wound channel (Hunt et al. 2006, 2009; Grund et al. 2010; Stewart & Ververka 2011; Broadway et al. 2020; NATShoot & CHASA 2020). A single bullet can fragment into many thousands of fragments, 99% of which may be $<140\text{ }\mu\text{m}$ (nanoparticles) and would likely not be resolvable using common medical X-ray imaging instruments and certainly not by a meat inspector (Leontowich, Panahifar & Ostrowski 2022). The only way of removing these lead nanoparticles is through discarding a significant proportion of the meat. All (100%) meat samples from game animals (impala) harvested in South Africa using lead-containing shotgun and rifle ammunition had lead levels exceeding the EU products' limits, leading to the recommendation to use lead-free ammunition for harvesting (Nkosi, Bekker & Hoffmann 2022).

The lead levels in that study were also above the legal upper limits for lead in domestic animal meat in South Africa (DoH 2018). In addition to the lead toxicity, bullet fragments represent a physical hazard to game meat consumers. Nkosi et al. (2022) found that for helicopter shot animals, most of the carcasses had bullet particles displaced between 30 and 225 mm from the point of impact/entry on the carcass, whilst 17% of carcasses had bullet particles 226–337 mm from the point of entry; the majority of the dispersion in rifle thoracic shot carcasses was between 30 mm and 332 mm from the point of entry. The results of this study confirm that, in the case of a thoracic killing shot, a radius of up to 340 mm from the wound channel should be examined and trimmed to remove any bullet particles. Removal of all lead would be difficult if not impossible to achieve with the current and proposed meat inspection protocols in South Africa, especially at game animal slaughter facilities, where the focus is on disease detection through visual inspection. Trimming will not only lead to a loss of money due to the significant volume of meat that will be removed from each carcass suspected of being contaminated, but it will also reduce the general appearance and value of the carcasses (Nkosi et al., 2022).

While visible affected areas could be removed during dressing and inspection, extensive traces of Pb could be picked up from areas that were generally not affected by bullets thus posing a risk to consumers (Nkosi, Bekker & Hoffmann 2022). This problem is not unique to South Africa (Pain et al., 2019; Pain et al., 2022), with recent calls for setting maximum lead limits for game meat in Europe (Thomas et al. 2022). A simple solution to the lead contamination issue is to transition to only shooting with lead-free (or so-called non-toxic) ammunition. The same lead-free ammunition will produce significantly fewer metal fragments (CHASA and Natshoot 2020), thereby reducing physical hazards in the meat. The adoption of maximum lead concentrations for game meat and offal in South Africa could be achieved by specifying the maximum levels of lead permissible in Annexure A of the Regulations Relating to Maximum Levels of Metals in Foodstuffs promulgated under the Foodstuff, Cosmetics and Disinfectants Act, Act 54 of 1972. It is recommended that the following standard for game sold through commercial channels, would protect consumers: (a) Meat and fat (excluding offal) of bovine animals, sheep, pigs, poultry and game animals (0.10 mg/kg); and (b) Offal of bovine animals, sheep, pigs, poultry and game animals (0.50 mg/kg). This would bring the regulation of lead concentrations in game meat into line with regulations that already apply to meat from domesticated animals.

Perhaps more of a risk, although not formally studied in an African context yet, is exposure of skippers, guides and farm workers. These staff are routinely given the heads, innards and/or other offal as part of the custom of sharing of parts of the quarry with various people associated with hunting. These are the parts of the carcass most likely to contain lead. This represents a form of occupational exposure that, given what we know about the presence of lead in meat and offal, would likely be in contravention of, and represent widespread non-compliance with, the Lead Regulations, 2001, promulgated in terms of the Occupational Health and Safety Act (No.85 of 1993). Studies elsewhere have demonstrated that staff, hunters and their families and pets are more exposed to lead than the general population (e.g. Couture et al. 2012, Danieli et al. 2012, Ahmadi et al. 2018, Juric et al. 2018, Tammone et al. 2021). Likewise, families of staff and neighbouring communities to protected areas and game

farms are often donated or sold meat as part of the social programs, without being aware that meat shot with lead-based bullets may contain lead. This may result in lead exposure and may have implications in terms of compliance with the Lead Regulations, 2001. Such sales or donations would likely frequently exceed the safety requirements for domestic animal meat, and, at a minimum, could be considered unethical.

1.12.1.2. Lead poisoning of wildlife

Wildlife can be exposed to lead shot and bullet fragments and suffer or die from acute or chronic lead toxicosis (reviewed by Pain, Mateo & Green 2019). The means of exposure for wildlife related to game management/harvesting include (1) feeding on unrecovered carcasses, (2) feeding on gut piles of thoracic shot and field gutted animals, (3) feeding on waste meat removed from around the bullet wound, (4) feeding on heads removed and discarded from head-shot animals, and (5) preying on other wounded animals containing embedded lead shot or bullets. Scavengers, particularly obligate scavengers such as vultures, are particularly susceptible. In southern Africa, lead exposure and toxicity relating to lead shot or bullet fragments has been recorded or suspected in four species of vulture (van den Heever et al. 2019, 2022; Garbett et al. 2018; Krüger & Amar 2018; Naidoo et al. 2012; Naidoo, Walter & Botha 2017), Southern Ground Hornbill (Koeppel & Kemp 2015), cranes (Rushworth, *pers. comm.*), and cheetah (North et al. 2015). Lead from bullets is likely to affect Spotted and Brown Hyaena, and possibly other opportunistic scavengers like lion and leopard. In the case of vultures, it has been demonstrated that the lead is transferred from adults to eggs or through the food from adults to chicks, with various detrimental effects (Naidoo et al. 2012; van den Heever et al. 2022).

In addition to increased mortality and reduced productivity of wildlife, another area of cost not generally considered is that of increased risk of collision of large birds with power line infrastructure which has been found to be related to elevated blood lead level (Kelly & Kelly 2005; Ecke et al. 2017) - probably related to the disorientation and physical impediment created by sublethal lead levels - with associated economic impacts resulting from interruptions of power and damage to power lines (Pain et al. 2019).

It should be noted that wildlife may be exposed to lead through other processes and mechanisms, including thorough the transfer of lead through the food chain from contaminated soil or through the ingestion of metallic lead. The other mechanisms have not yet been recorded for the game species that the strategy seeks to utilise (or in farmed crocodile meat, but extremely high levels of lead have been recorded in wild crocodiles relating to the ingestion of lead fishing tackle, with implications for the use of meat from hunted wild crocodiles). Research on lead exposure of wildlife in Africa, while extending back 50 years, is in its relative infancy and despite recent progress much remains to be discovered; however, it is clear that the more we look the greater the number of species and the more significant the impacts observed.

1.12.1.3. Mitigation of Risk

Table 13: Risks of lead contamination and the associated mitigation measures

Risk	Mitigation
(i) Lead (Pb) contamination of game carcasses and gut piles from the use of lead-containing shot and bullets, leading to lead poisoning of scavengers, especially vultures, Southern Ground Hornbill, hyaenas and jackal, and other mammalian and avian scavengers and predators. Chronic lead exposure can lead to sub-lethal impacts on behaviour, immunity, and general health, leading to suffering and indirect mortality, and resulting at higher doses in direct	(i) Rapid transition to use of lead-free ammunition for harvesting of game; (ii) Adopt maximum lead concentrations for game meat and offal by specifying the maximum levels of lead in game in the Regulations to the Foodstuff, Cosmetics and Disinfectants Act, Act 54 of 1972, with maximum levels specified as (a) Meat and fat (excluding offal) of bovine animals, sheep, pigs, poultry and game animals (0.10 mg/kg); and (b) Offal of bovine animals, sheep, pigs, poultry and game animals (0.50 mg/kg); (iii) Revision of draft Game Meat Regulations under the Meat Safety Act, 2000, to include requirement for inspectors to

mortality; acute toxicity can lead to suffering and direct mortality. (ii) Lead in game meat and products increases human health risk and damages the reputation and brand of game meat as a healthy alternative.	inspect and remove all physical hazards within at least a 340 mm radius around the wound channel and excise and condemn this meat and the offal of any animals shot with bullets containing lead; heads and upper neck to be condemned for animals killed with head shot using lead-containing bullets. All condemned meat must be disposed of according to appropriate protocols and must not be made available to scavengers; (iv) Improved product labelling to give consumers assurance that game meat does not contain elevated lead levels; in the absence of complete traceability or a complete transition to lead-free ammunition, consideration should be given to using existing product labelling regulations to ensure that all game meat products have the following statement on the label: "This product may contain lead (Pb)"; (v) Adoption of interim culling and carcass management SoP to reduce lead availability to game animals.
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1.12.2. Climate Change and Mitigation of Risk

Climate change is defined as a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed largely to the increased levels of atmospheric carbon dioxide produced by the use of fossil fuels. IPCC (2019) defines climate change as a phenomena experienced through global warming. Besides incrementally increasing global temperatures, climate change is witnessed through other ecological changes, such as large-scale shifts in weather patterns, including longer periods of drought or increased tropical storms and cyclones. Dunne et al (2020) further identified increased desertification, land degradation and wild fire potential as phenomena experienced through global warming.

When considering the impact of climate change on the game meat sector, there are three points to consider:

- The impact on game habitats, especially considering ownership through fencing (Blackmore, 2020)
- Transportation of meat, including higher mortality rates and increased chances of viral infections (González et al., 2020)
- The impact of game versus other animals and their contributions to climate change (Six et al., 2017)

Ownership of game animals is dependent on the enclosed environment being suitable to raising and maintaining those animals. According to Makelane (2020) the risk posed by climate change is the possible degradation of the enclosed areas, including less grazing area and greater possibility of wild fires, compounded by a historic scarcity of water in SA. There is also a risk of the loss of ownership if game animals escapes the enclosure due to the impact of climate change.

When analysing the impact of climate change on animals, such as game, it is important to note that the domesticated animals or livestock also have an impact on climate change. This is because climate change is caused in part by increased CO₂ emissions, which animal husbandry has been linked to, specifically the need to feed animals (Makelane, 2020). Below are some of the common risks associated with climate change on biodiversity as well as their mitigation measures:

(I) Common risks of climate change on biodiversity and ecosystems:

- In South Africa, almost 30% of the endemic terrestrial species may be facing an increasing danger of extinction by the middle of this century if climate change is not reduced.

- The distribution of the South African terrestrial biomes may change as a result of changes in temperature, rainfall patterns, and atmospheric carbon dioxide concentrations. This could have significant effects on species diversity, ecosystem processes like wild fires, and essential ecosystem services like water yield and grazing biomass.
- The immediate impacts of rising atmospheric carbon dioxide on ecosystems are poorly understood. With conflicting impacts on biodiversity and potential advantages for carbon sequestration, it may be increasing the amount of shrubs and trees in the Grassland and Savannah Biomes.
- Wild fire frequency and the abundance of invasive alien species are two additional climate change-related stressors on biodiversity. The vulnerability of biodiversity to climate change will be further exacerbated by these pressures together with diminished and fragmented habitats.

(II) Common mitigation measures for climate change on biodiversity and ecosystems

- To better monitor, evaluate, and respond to current human stresses as well as the extra demands that climate change provides, strengthen organisations that manage biodiversity and that conduct research.
- Preserve, rehabilitate, and recover affected natural systems that increase resistance to or mitigate the effects of climate change.
- Set a high priority on impact analyses and adaptation planning that considers the whole spectrum of potential climatic outcomes as well as realistic scenarios of other pressures.
- Enhance current efforts to stop the spread of invasive and alien species, especially when they exacerbate the effects of climate change.
- In areas where it increases climate change resilience, the protected area network should be expanded. Threatened biomes, ecosystems, and species should also be managed to reduce the likelihood of extinction.
- Extend existing gene banks in the medium term to protect severely endangered species that exhibit rising vulnerabilities to trends in climate change.
- Encourage farmers to utilise and manage water in a more sustainable manner. This will entail promoting and supporting water-saving technologies.
- Provide education on the importance of ecosystem services and the advantages of restoring them to both the public and private sectors. This would entail educating the public and private sectors on the importance of ecosystem services and the financial gains associated with their restoration.

1.12.3. Risk from intensively bred wildlife (biodiversity, habitat degradation and health risks)

The South African wildlife sector has been substantially supportive of biodiversity conservation over the past few decades and as a result has significantly contributed to its protection. However, within the larger private wildlife business, a new and expanding sector has evolved in recent years: selective breeding and the intense management of game (Cloete et al, 2015). The long-term and possible effects of the practice on other wildlife sector sub-sectors, the nation's biodiversity, and the biodiversity economy have all been cited as causes for concern. Intensive breeding of highly valuable rare species and active selection for uncommon and unique features are key components of this industry (Scientific Authority Report, 2018). With 45% of game ranchers engaging in this technique, which by 2015 was projected to have occupied 6% (1 000 000 hectares) of the wildlife estate, what was once a small niche sector has become widespread. A large portion of this is occurring in regions where significant game ranching was formerly prosperous. In terms of ecological or evolutionary timescales, the extensive breeding of game is a relatively new phenomenon. As a result, many of the consequences might not have materialized, been quantified, or even be quantifiable. In order to assess the risks, it is necessary to anticipate repercussions based on a deeper understanding of biology and ecology and/or extrapolate lessons from other species or habitats, rather than just reporting current case studies (Scientific Authority Report 2018). Table 15 below details both the risks and mitigations associated with the intensive breeding of game:

Table 14 : Biodiversity and environment risks and mitigation measures

Type of the Risk		Description(summary of what risk entails) concerns	Mitigation measures
Issue	Impact		
Intentional breeding for selected traits	1.1 Expression of deleterious attributes that may lead to physical, behavioural and lethal outcomes	Breeding practices, such as inbreeding, line breeding and artificial selection for specific phenotypic traits, which increases the physical expression of rare alleles, and may lead to conditions that could compromise the wellbeing of the individual animal. Where deleterious co-segregating traits are linked to selected genes, i.e. colour genes or horn length, and are non-lethal, they can be transmitted to other individuals within the deleterious traits which could lead to lower reproductive potential, as well as an altered ability to adapt to the environmental.	○ Maintain proper stud books with detailed records of the pedigrees of each individual selectively bred. Breeding with close relatives (e.g. between first order relatives) should be discouraged. ○ Keeping of accurate pedigree information and records of the movement of animals should be mandatory. ○ Exchanging breeding animals, which are not related, between different breeders to prevent inbreeding. ○ Development of scientifically-based best practice guidelines for the breeding of game species based on conservation breeding principles. ○ Openly reporting any incidences of deleterious effects. ○ Support of current research efforts and commissioning of research into under-investigated aspects such as the genetic basis for colour transmission in African game species. ○ The expression of undesirable traits and its impact upon wild populations need to be quantified

1.2 Loss of genetic and allelic diversity resulting in decreased fitness and reduced adaptive potential.	Removal of the process of natural selection, including mate selection and selection by differential mortality will reduce the evolutionary potential of populations to adapt to environmental change, especially in light of environmental and climate change. Using a small subset of the available gene pool (number of founders) and deliberate inbreeding thereafter can result in the fixation of certain genetic traits. Deleterious mutations will tend to accumulate, because selection is less effective in small populations and likely to be less effective in captive populations protected from natural selection pressures.	○ Maintain proper study books with detailed records of the pedigrees of each individual selectively bred. Keep records of translocations. ○ Development of scientifically based best practice guidelines for the breeding of game species based on conservation breeding principles.
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1.3 The mixing of genes from naturally separated gene pools leading to the breakdown of natural evolutionary processes and/or possibly leading to outbreeding depression.	Animals that may be less adaptable to the current environment due to the loss or gain of genetic traits. Hybrid subpopulations may have a greater probability of extinction as they may be less adaptable to their current environment. Hybrid subpopulations may have negative	○ No properties should be permitted to keep species that are likely to hybridize together in the same area. ○ Keeping wild and intensively bred animals separate including by prohibiting intentional release into the wild (i.e. outside of intensive breeding facilities) for hunting etc. ○ Requirement to distinguish between intensively bred and wild in marketing/hunting etc. This should include the establishment of a stud book and micro chipping register. ○ Guidelines for the management of hybrids of rare and threatened species.
1.4 Physiological stress as a result of poorly adapted animals to their current environment.	Movement of animals to habitats outside their natural environmental, tolerance may lead to physiological stress and lower performance. When	○ Research on the effect of coat colour selection on level of predation, territoriality and dominance and mate selection is required to fully understand the impact of coat colour selection on an animal's adaptability to its environment. ○ Physiological stress and behavioural differences between the novel phenotypes and wild types should be investigated in a wide variety of landscapes and across different species.

	1.5 Domestication of wild species resulting in a loss of their natural ability to adapt to wild conditions.	Process of domestication that in the short term leads to the habituation of animals to humans, but in the long term leads to the selection for more timid animals that adapt better to a captive environment and might be less adaptable to wild conditions. Erosion of the social structure and behaviour of intensively-bred animals over time resulting in a loss of their natural ability to adapt to wild conditions i.e. predator naivety. Resource selection and the inability to adapt to changing environmental conditions i.e. droughts.	- o Keeping wild and domesticated/intensively bred animals separate including by prohibiting intentional release into the wild (i.e. outside of intensive breeding facilities) for hunting etc. - o Requirement to distinguish between domesticated and wild in marketing/hunting etc. This should include the establishment of a stud book and micro chipping register. - o Conscious prevention of domestication through regulation of breeding practices or adoption of best practice following conservation breeding guidelines - o Development of a clear policy framework with respect to domestication of wild species
Impacts on wild populations through unsustainable movement of animals from the wild into captivity, introduction and genetic introgression of genetically altered animals into the wild	2.1 The natural genetic composition, evolutionary trajectory and adaptive potential of wild populations is compromised as a result of deliberate or accidental introductions of captive populations/animals which have undergone.	It is expected that intensively-bred specimens will differ from wild populations as a result of different selection pressures (see Chapter 4). Animals that escape from these intensive breeding facilities could have direct and indirect negative impacts on wild populations. It is further expected that these farmed specimens will have severely reduced life-time fitness compared to wild counterparts with intermediate hybrid fitness. This change in the genetic composition may result in populations that are unable to adapt to environmental changes and consequently face an increased extinction risk.	A detailed research programme should be initiated to understand the relationship between individuals bred under controlled environments and their wild counterparts. To ensure that no unknown impacts occur in the interim, all captive-breeding facilities should be required to maintain a comprehensive breeding register and stock record system. Any releases and/ or fatalities should be accounted for and monitored through the legislative channels and the following should be implemented through a standard permitting control across all provinces: - o All captive-bred animals should be clearly marked with an approved marking system that is durable and weather resistant. - o Captive-bred animals should not be allowed to be released into the wild without permission and under authority of a permit. - o Wild specimens of rare or endangered species may not be introduced into a captive facility/breeding operation unless the facility forms part of an approved conservation breeding programme or is a registered commercial exhibition facility. - o Prior to the establishment of any breeding facility or the holding of animals that exhibit any colour variation, a review

			of all game species present on the neighbouring properties must be undertaken. ○ Animals with colour variations or originating from captive facilities must be made known at the time of application.
	2.23 The removal of wild specimens of naturally rare species or species with currently small population sizes, in South Africa or other African countries can lead to population declines resulting in a lower overall conservation status and a higher extinction risk for these species.	A number of high value game species are being captured from the wild and brought into intensive breeding facilities. For species with small population sizes in the wild or rare species, the continuous sourcing or "leakage" from wild populations will reduce wild population sizes and can increase extinction risk of the species. For species that are not very successful breeders in intensive facilities, new wild-caught individuals have to be regularly brought into intensive breeding facilities. This has a negative impact on the free-roaming or wild populations.	○ Limit/restrict the sourcing of wild animals for commercial intensive breeding facilities, especially for rare and threatened species. ○ Introduction of wild specimens of threatened species into captivity should only be undertaken as part of a conservation breeding programme with a re-introduction plan in line with IUCN guidelines. ○ Invest in research and development of better breeding practices to improve breeding success of species considered difficult to breed under captive conditions, such that there will be less reliance on constant sourcing of wild animals for breeding operations. ○ Implement active in situ conservation programmes to ensure survival of wild populations of the species that are targeted for intensive and selective breeding. ○ Provide incentives to private game farmers to form conservancies or own larger properties where wild and free roaming populations of game can be re-established and maintained. ○ Undertake research on the viability of re-introduction of intensively bred animals into extensive systems. ○ Rating of production systems and labelling systems implementation, so that consumers can distinguish whether products are from a controlled or wild environment.

. Significant increases in the extent of impermeable fences with associated with negative biodiversity impacts	3.1 Fragmentation of the landscape through impermeable fencing which restricts movement of free-ranging populations.	Intensification of impermeable fences fragments the landscape and has a range of negative ecological impacts. Impermeable predator proof fences for high value game species reduce the habitat available for free-ranging populations of threatened species such as Wild dog (<i>Lycaon pictus</i>), Cheetah and Pangolin (<i>Smutsia temminckii</i>). Impermeable fences are often electrified and designed in a way that leads to the unintentional mortality of non-target species.	○ Apply a land-use planning process to restrict or limit intensive breeding in camp systems in sensitive and threatened ecosystems (Critical Biodiversity Areas). ○ The implementation of a conservation spatial planning approach that will, for example, identify corridors for movement of free-ranging species. ○ Reduce fencing to the minimum by promoting large extensive areas, e.g. through tax and other financial incentives for landowners that opt not to sub-divide into small camps. ○ Allowing for a portion of the property to remain extensive and ensuring that external fencing is permeable. ○ Re-design intensive breeding facility fences to be more permeable for non-target species. ○ National Norms and Standards for fencing for different land-uses, focussing on maximum specifications instead of minimum specifications.
	3.2 High concentrations of animals in small areas with impermeable fences for intensive breeding purposes result in habitat degradation within such areas.	Unusually high densities of animals in small breeding camps may cause overstocking resulting in overgrazing and increased trampling effects, leading to habitat degradation and loss of plant species diversity. Overgrazing and trampling in small camps may result in erosion and loss of soil. Severe grazing patterns may result in an increase of undesirable woody species and some poisonous plant species. Transformation of natural veld to planted pastures with a homogenised structure and composition. Excessive or complete removal of certain vegetation strata such as the woody component from intensive breeding camps. Land intensification practices negatively affect ecosystem functioning and services.	○ Game farmers must manage densities of game in camps to a level that is ecologically sustainable. A set of best practice norms and standards should be developed to guide stocking rates of camps. ○ Apply land-use planning process to restrict or limit intensive breeding in camp systems in sensitive and threatened ecosystems (Critical Biodiversity Areas). ○ Limit the proportion of a property that can be used (fenced) for intensive breeding. ○ Leave natural vegetation in place (herbaceous and woody). ○ Design camps to include transformed areas with low biodiversity to minimise impact. ○ Design game breeding camps to be as large as possible. ○ Avoid where possible mono-specific stocking of animals.

The intensification of management practices and subsequent control of species that are likely to impact negatively on the commercial objective of breeding programmes.	4.1 The killing of predators and other conflict species may result in a reduction in population numbers or elimination from certain areas with limited opportunity for recolonization, which in turn may lead to a change in the conservation status of the species and thereby furthering the extinction risk of these species.	Predators are not the only species deemed to increase human-wildlife conflict within the game ranching sector. Species that may be the cause of increased management interventions and potentially lower profit margins may also be targeted through systematic control and removal. Declining apex predator populations limit sustainable utilisation opportunities and thereby reduce the incentives for landowners to conserve such predators. Removal of top-order predators from systems can have effects at an ecosystem level, cause trophic cascades and meso-carnivore release. This in turn can cause increased human-carnivore conflict and increased losses, in particular to sheep and goat farmers, which are more vulnerable to meso-carnivore pressure.	○ A concerted effort is required by conservation agencies to highlight the plight of predators and the importance of their existence within the landscape. ○ Landowners should be made aware of the possible options to prevent losses: fertility control, appropriate fencing, and habitat modification (although this may be controversial and impact on other elements of biodiversity conservation), use of repellents, guard dogs, and aversion conditioning. These options depend on the species being targeted and should be managed accordingly within the broader landscape. ○ The perception that predators present a direct impact upon the economic viability of game farming enterprises, despite Thorn et al. (2013) concluding that losses as a result of predation are limited, would suggest that any facility/property undertaking intensive or selective breeding should ideally be located outside areas in which large apex predators occur. The placement of such facilities should be planned accordingly prior to authorisation. ○ A holistic approach to land-use management is required to address predator conflict and management and may be best managed through an approved management plan for the property, wherein such management plans are viewed across the entire landscape and not just per cadastral property. ○ Enforcement of the illegal persecution of predators needs to be improved but requires the cooperation of both conservation agencies and private landowners. Private landowners are to be encouraged to report illegal activities, while conservation agencies are to ensure that such activities are investigated thoroughly.
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4.2 The disruption of social structures of species targeted for removal may exacerbate the conflict potential, as a result of the constant removals of individuals as well as within the receiving environments. This in turn could lead to a decline in the survival rate of the affected population. Constant removals of dispersers may further lead to a loss or disruption of dispersal opportunities, thereby increasing the local extinction risk. Relocations may increase conflict and reduce reproductive performance and increase mortalities.	The survival of removed problem predators may be low in the receiving environment and may result in increased intraspecific competition as well as increased losses in the receiving environment with the decreasing availability of safe areas for relocations. The constant removal of individual predators from a particular area may result in the disruption of a species social behaviour over a broader area. The continued translocation of problem animals, either predator or other species impacting upon an intensive breeding operation, may disrupt the ecological processes within the receiving environment. Existing populations within the receiving environment may be forced to utilise more resources defending a particular territory than it would have prior to such introductions. This increased resource demand may impact upon breeding success.	○ It is suggested to undertake research into the impact of predator removal and subsequent mesopredator release within the wildlife ranching landscape. ○ This is concurrent to an intensive landowner awareness campaign to highlight the impact of predator removal and mesopredator management. ○ Further investigation is required into current methods to manage small predators within the game farming landscape. Currently, initiatives are being implemented to deploy guard dogs within the agricultural landscape to assist in lowering stock losses. The viability of such, and other possible non-lethal control methods, in the game stock industry must be assessed. ○ The translocation of any animal should only be undertaken with the necessary permits and to dedicated release sites. Such sites should be pre-approved for relocation to limit any disruptions to natural processes. ○ It is suggested that each provincial agency maintains a database of suitable release areas. ○ Considering the need to understand the effect of predator removal within the wildlife ranching landscape, it is recommended that the criteria required to validate an area as a suitable release site be compiled and distributed to all provincial conservation agencies.
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1.12.4. Livestock and zoonotic disease transmission

A zoonotic disease is a disease or an infection that can spread spontaneously from vertebrate animals to humans or from humans to vertebrate animals. Wildlife animals, like domestic animals, are not immune to diseases. Such diseases include malignant catarrhal fever (MCF), also known as bovine malignant catarrh or snotsiekte, Foot and Mouth disease (FMD), rabies, SARS-CoV-2, etc. For example, wildebeest is a reservoir of a virus that causes MCF and is transmissible to other animals such as kudu, wild sheep, cattle, etc. Domestic animals can also infect wild animals with Foot and Mouth Disease (Hunt and Billups, 1979).

FMD is a severe, incredibly contagious illness that not only affects livestock but also wild animals. Of the three FMD serotypes indigenous to South African Territories (SAT), SAT-2 is most frequently linked to outbreaks of the illness in livestock in Southern Africa. SA is an endemic zone for FMD and lost its FMD-free status due to the permanent FMD infection of African buffalo within the Kruger National Park. Despite the vaccination of cloven-hoofed animals in the Buffer Zone, outbreaks do occur due to risk infected animals (DAFF, 2020) as well as trade of meat from infected animals (USDA Foreign Agricultural Service, 2020)

A number of plains game animals are cloven-hoofed, which means that any FMD that gets into those populations can spread quickly. According to DAFF (2014), some examples of game susceptible to FMD are: African Buffalo (permanently infected in the KNP), Giraffe and Impala, Kudu and other plains game. Despite attempts by government to contain the spread within the FMD-controlled area, and provide vaccines to animals within the Buffer Zone, FMD does occasionally escape into wider game population. This is problematic due to the free movement of game, especially if there is no game-proof fence to enclose and isolate infected animals.

The EU, the largest game import market, bans game meat originating from SA if the OIE does not declare the game meat origin FMD-free. Despite the potential to sell to the local market, gross profit is lower than exporting the same meat (Uys, 2015). While trade agreements with countries combined with processing of the game meat to remove FMD (which does not always guarantee exports) do exist and provide an export channel for some game meat, the average price per ton of processed game meat is much lower than fresh game meat. Despite the VPN containment strategies, FMD continues to escape the controlled area and infect animals within the Buffer Zone and occasionally outside the Zone.

If SA can contain the spread of FMD, it will allow game ranchers to supply the export market again under FMD-free status. While this means that, in the short- to medium-term, exports to the regional market and the large import markets in EU, it also allows farmers to begin export expansions into potential new markets in Asia, such as Vietnam

Table 15: Types of livestock and zoonotic diseases associated with wildlife and their mitigation measures

Type of disease	Description (Summary of what risk entails)	Mitigation measures
1. Food and Mouth Disease (FMD)	The FMD outbreaks can lead to the ban of exports of beef and other types of meat from South Africa to other key regional and global markets. In addition, the ban can also lead to the subsequent halt in the movement of animals domestically and have a devastating effect to the livestock industry locally. The economic aspect of the industry will be heavily affected.	Enhanced biosecurity precautions include the following: i. Always use clean personal protective equipment (PPE) when dealing with livestock; disinfect and replace PPE and other equipment promptly after handling animals; and ii. After contact with livestock, boots must be cleaned with a disinfectant. Avoid visiting farms that are contaminated, and never transfer trucks or equipment across farms. iii. Keep wild animals, stray pets, and cattle from other farms from coming into touch. iv. All animal waste must be properly disposed of, and barns and storage areas must be kept clean and sanitary at all times. v. Limit tourists' access to farms and forbid them from coming into contact with the animals. Before accessing or leaving the property, guests should clean their vehicles and themselves. vii. Deliveries must be left at the farm's entrance, and a record of delivery vehicles is required. Movement control (forbidden movement of all cloven-hoofed animals, products, and genetic material into, within, through, and out of the Disease Management Area, unless allowed after strict risk-mitigation measures by the State Veterinary Services who will issue a permit for such movement) can have extremely detrimental effects on the livestock industry, with repercussions for downstream industries. Early notification to the OIE is crucial because delayed notification could prevent the country from reestablishing its zonal freedom from FMD and returning to regular economic operations. Most farmers find it difficult to resume "regular" economic operations because doing so requires the implementation of more expensive biosecurity measures, which might cause aversion or stakeholder fatigue. Continued FMD surveillance. Due to failures in surveillance, FMD spreads to a broader geographic area (since it is airborne) before it is discovered and control measures are put in place. In order to render the virus inactive and stop FMD from spreading through these products, animal products like milk, meat, hides, and pig swill must be treated.

		Examples of such treatments include heating meat and pig swill, ultra-high temperature pasteurization of milk, deboning meat, maturing/pH reduction of meat, salting hides, skins, and live embryos, and scouring and carbonation of wool. The vaccination of cattle in the areas affected by the outbreak and the adjacent areas has helped to stop the disease's spread. However, insufficient vaccine stockpiles and other logistical and technological shortcomings within the State Veterinary Services may cause immunization to be postponed. Multiple stakeholder groups, including those most directly impacted by national and international decisions on control strategies, such as animal transporters, farm workers, farmers, veterinary and para-veterinary staff, and livestock auctioneers, must participate in and cooperate with continuous active disease surveillance and reporting in order to successfully control FMD. Prior to implementing risk mitigation techniques, it is essential to execute an education push to raise stakeholder knowledge and buy-in and improve disease surveillance.
2. Malignant Catarrhal Fever (MCF) or Snotsiekte	The Snotsiekte outbreak can have a devastating effect in the wildlife industry and these may halt the exportation of wild meat, both regionally and internationally.	Same as above

Furthermore, Sanitary and Phytosanitary (SPS) measures are put in place if there are concerns around the application of food safety, animal and plant health regulations (World Trade Organization, 1998). However, SPS measures are not designed to be a barrier to trade or tool of protectionism and exist solely for concerns related to food safety.

In 2010 DALRRD published a guideline for when SPS measures could be considered, noting that a Technical Barrier to Trade is not considered an equivalent to SPS as per Table 17 below:

Table 16: What are SPS measures used to protect and what do they protect from

SPS measures protect	From
Human life	Risks from toxins, contaminants, food additives, or disease-causing organisms in food and beverages
	Diseases carried by <u>animals</u> , <u>plants</u> or <u>products thereof</u>
Animal life, including <u>fish</u> and <u>fauna</u>	Risks from toxins, contaminants, food additives, or disease-causing organisms in feedstuffs
	The entry, establishment or spread of pests, diseases, disease-carrying or disease-causing organisms
Plant life, including forests and wild flora	The entry, establishment or spread of pests, diseases, disease-carrying or diseases-causing organisms
<u>Territory of a country</u>	Damage from entry, establishment or spread of <u>pests</u> (including <u>weeds</u>)

Following containment strategies for disease outbreaks are the safest way to mitigate the risks of SPS measures. For example, the DALRRD has a comprehensive set of strategies within two Veterinary Procedural Notices for containing FMD:

- Veterinary Procedural Notice for Foot and Mouth Disease Control in South Africa, 2014
- Veterinary Procedural Notice for Buffalo Disease Risk Management in South Africa, 2017.

Additionally, isolation of game that is earmarked for export would reduce the risk of disease outbreaks and thus SPS measures in response to disease outbreaks. It is also possible to mitigate the risk around proving disease containment by allowing foreign observers, such as the EU FVO mission, access to the country to expedite the process of removing SPS restrictive measures. Otherwise, it is difficult to mitigate the risk of SPS measures as they are put in place themselves to mitigate risk from viral outbreaks that could potentially harm human and animal life.

1.12.5. Reputational Risks related to the Game Meat Industry

Reputational risk is the combination of threats to and consequences of public perceptions on businesses or industries⁴², such as the game meat industry (Table 18). Threats could include negative media coverage or disinvestment campaigns, whilst consequences tend to be more financially damaging, such as lost sales due to perceptions around the game meat industry.

Table 17: Reputational risks related to the Game Meat Industry

Element	Threat	Consequence
Conservation	Inadequate communication on conservation efforts to the public	Less funds available leading to reduced conservation efforts and consequently negative environmental impacts
Animal well-being	Perceived impacts on protected vulnerable species, or inadequate care of current species	Disinvestment from the sector due to negative public perceptions
Duty of Care	Lack of measures to prevent harm from occurring to biodiversity with the environment and ecosystems that they are part of,	Closure of potential markets, compromises certification schemes, reduced sales, reduced access to capital, negative consequences for other elements of the biodiversity sector.
Ethics	Negative media coverage of the sector and/or other associated activities as a result of perceived unethical harvesting methods	Loss of sales and potential disinvestment from the sector

A major reputational risk to game meat is inadequate information and communication related to operations. For example, as to how game meat contributes to sustainable harvesting or conservation. More effective communication, education and awareness of the facts around the game meat industry are required.

APPENDIX B: LEGISLATIVE FRAMEWORK

The legal framework highlights key legislations governing the game meat industry in South Africa. The list below is NOT comprehensive and does not include all the conservation, food safety and quality Acts. It should be noted that food safety and quality legislation in South Africa are mainly the responsibility of the DALRRD, DOH and DTIC.

LEGISLATIVE PRESCRIPT	PURPOSE OF THE ACTS	REGULATOR ON LEGISLATIVE
National Environmental Management Act 107 of 1998	- to provide for co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by organs of state; and - to provide for matters connected therewith.	DFFE
National Environmental Management: Biodiversity Act 10 of 2004	- to provide for the management and conservation of South Africa's biodiversity within the framework of the National Environmental Management Act, 1998; - the protection of species and ecosystems that warrant national protection; - the sustainable use of indigenous biological resources; the fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources; - the establishment and functions of a South African National Biodiversity Institute; and - for matters connected therewith.	DFFE
National Environmental Management: Protected Areas Act 57 of 2003	- to provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes; - for the establishment of a national register of all national, provincial and local protected areas; - for the management of those areas in accordance with national norms and standards; - for intergovernmental co-operation and public consultation in matters concerning protected areas; and - for matters in connection therewith	DFFE
Firearms Control Act 60 of 1998	- General provisions regarding application for competency certificate, further competency certificate, licence, permit, temporary authorisation, duplicate and renewal; To establish a comprehensive and an effective system of firearms control; and - to provide for matters connected therewith.	SAPS
Game Theft Act 105 of 1999	- to regulate the ownership of game in certain instances; - to combat the theft and wrongful and unlawful hunting, catching and taking into possession of game; and - to provide for matters connected therewith.	SAPS
The Marketing of Agriculture Production Act 47 of 1996	- to authorise the establishment and enforcement of regulatory measures to intervene in the marketing of agricultural products, including the introduction of levies on agricultural products; - to establish a National Agricultural Marketing Council; and - to provide for matters connected therewith.	NAMC
Fertilizers, Farm Agriculture Remedies and Stock Remedies Act of 1947	- to provide for the registration of fertilizers, farm feeds, sterilizing plants and certain remedies; - to regulate the importation and sale of fertilizers, farm feeds, seeds and certain remedies; and - to provide for matters incidental thereto	DALRRD

LEGISLATIVE PRESCRIPT	PURPOSE OF THE ACTS	REGULATOR ON LEGISLATIVE
Meat Safety Act 40 of 2000	- to provide 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.	DALRRD
Draft Game Meat Regulations (2016)	Intends to exempt game animals from a portion of the provisions of section 11(1)(i) of the Meat Safety Act, 2000 (Act No. 40 of 2000) in terms of section 11(3)(e) of the Meat Safety Act, 2000 (Act No. 40 of 2000),	DALRRD
Food Stuff; Cosmetics and Disinfectant Act 54 of 1972	- to control the sale, manufacture and importation of foodstuffs, cosmetics and disinfectants; and - to provide for incidental matters	DOH
International Health Regulations Act 25 of 1974	To apply the International Health Regulations, adopted by the World Health Assembly, in the Republic, and. to provide for incidental matters	WHO
SABS: South Africa National Standards for Processed Meat (SANS:885:2011)	South African standard was approved by National Committee SABS TC 1027, Canned and processed meat products, in accordance with procedures of the SABS Standards Division, in compliance with annex 3 of the WTO/TBT agreement. This document was published in September 2011.	National Committee SABS TC 1027
Hygiene Management Programme	To Provides objective guidance and instruction so that both the employer and workers understand the health risks in the workplace, what controls are in place and how the controls work.	DOH
Hygiene Assessment System	assessment of the hygiene status of the abattoir by means of the Hygiene Assessment System (HAS) by Veterinary Public Health (VPH) officers; (2) provision of results to the provincial executive officer for verification as frequently as he or she may require; (3) a documented management system; traceability; (4) a tested product recall procedure; (5) schematic plan of the abattoir; documentation of flow diagrams of the slaughter process; (6) risk assessment of abattoir processes to identify potential hazards; (7) prevention of identified hazards and sampling programmes for laboratory analyses; (8)	DOH
Agriculture Product Standard Act 119 of 1990	- to provide for control over the sale and export of certain agricultural products and other related products; and - for matters connected therewith.	DALRRD
Consumer Protection Act 68 of 2008	- to promote a fair, accessible and sustainable marketplace for consumer products and services and for that purpose to establish national norms and standards relating to consumer protection, - to provide for improved standards of consumer information, - to prohibit certain unfair marketing and business practices, - to promote responsible consumer behaviour,	DTIC

LEGISLATIVE PRESCRIPT	PURPOSE OF THE ACTS	REGULATOR ON LEGISLATIVE
	- to promote a consistent legislative and enforcement framework relating to consumer transactions and agreements, - to establish the National Consumer Commission, - to repeal - sections 2 to 13 and sections 16 to 17 of the Merchandise Marks Act, 1941 (Act No. 17 of 1941), - the Business Names Act, 1960 (Act No. 27 of 1960), - the Price Control Act, 1964 (Act No. 25 of 1964), - the Sales and Service Matters Act, 1964 (Act No. 25 of 1964), - the Trade Practices Act, 1976 (Act No. 76 of 1976), - the Consumer Affairs (Unfair Business Practices) Act, 1988 (Act No. 71 of 1988), and - to make consequential amendments to various other Acts; and - to provide for related incidental matters.	
National Regulator for Compulsory Specifications Act 6 of 2008	- to provide for the establishment of the National Regulator for Compulsory Specifications of South Africa; - to provide for the appointment of the Board of the National Regulator; - to provide for the administration and maintenance of compulsory specifications in the interests of public safety and health or for environmental protection; and - to provide for matters connected therewith.	NRCS
Hygiene Regulator for Food Premises and Transport of Food (r962)	Regulation on Governing General Hygiene Requirements for Food Premises, the Transport of Food and Related Matters has now been gazetted	DOH
International Trade Administrations Act 71 of 2002	- to establish the International Trade Administration Commission; - to provide for the functions of the Commission and for the regulation of its procedures; - to provide for the implementation of certain aspects of the Southern African Customs Union (SACU) Agreement in the Republic; - to provide, within the framework of the SACU Agreement, for continued control of import and export of goods and amendment of customs duties; and - to provide for matters connected therewith.	SACU
Customs and Excise Act 91 of 1964	- to provide for the levying of customs and excise duties, the prohibition and control of the importation or manufacture of certain goods and - for matters incidental thereto	NERSA
Legal Metrology Act 62 of 1988 Relevant SANS and Codes of practices as	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.	NRCS

LEGISLATIVE PRESCRIPT	PURPOSE OF THE ACTS	REGULATOR ON LEGISLATIVE
per the SABS		
Accreditation for conformity Assessment, calibration and good laboratory practice Act 19 of 2006	To provide for an internationally recognised and effective accreditation and monitoring system for the Republic by establishing SANAS as a juristic person; to recognise SANAS as the only accreditation body in the Republic for the accreditation of conformity assessment and calibration and monitoring of good laboratory practice; and to provide for matters connected therewith.	DTI
Climate Change: Paris protocol	Aims to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.	UNFCCC
Legal Metrology Act 9 of 2014	The Legal Metrology Act 9 of 2014 aims: 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.	DTI
Conservation of Agricultural Resources Act of 1983	To provide for control over the utilization of the natural agricultural resources of the Republic in order to promote the conservation of the soil, the water sources and the vegetation and the combating of weeds and invader plants; and for matters connected therewith.	DALRRD
Animals Protection Act 71 of 1962	to consolidate and amend the laws relating to the prevention of cruelty to animals.	DALRRD
Animal Health Act 7 of 2002	- to provide for measures to promote animal health and to control animal diseases; - to assign executive authority with regard to certain provisions of this Act to provinces; - to regulate the importation and exportation of animals and things; - to establish animal health schemes; and - to provide for matters connected therewith.	DALRRD
Veterinary and Para-Veterinary Professions Act 19 of 1982	- for the establishment, powers and functions of the South African Veterinary Council; - for the registration of persons practising veterinary professions and para-veterinary professions; - for control over the practising of veterinary professions and para-veterinary professions; and - for matters connected therewith.	DALRRD
All Nature Conservation Provincial Ordinances and Regulation	The Constitution of the Republic of South Africa, 1996, establishes three spheres of government: National, Provincial and Local. Within this arrangement, national parks, national botanical gardens, water, forests and fisheries are deemed national competencies, while nature conservation and environment management are concurrent national and provincial competencies. The Constitution sets up a system of cooperative governance in these and other spheres to facilitate cooperative implementation. These include, but are not limited to: The Natal Nature Conservation Ordinance No.15 of 1974	Conservation Management Authorities

LEGISLATIVE PRESCRIPT	PURPOSE OF THE ACTS	REGULATOR ON LEGISLATIVE
	• The Limpopo Environmental Management Act, 2003 (Act No 7 of 2003) • The Mpumalanga Nature Conservation Act, 1998 (Act No. 10 of 1998). • The Ciskei Nature Conservation Act, 1987 (Act No. 10 of 1987). • The Transkei Decree No. 9 of 1992 • The Nature Conservation Ordinance, Ordinance 19 of 1974 • Nature Conservation Ordinance 8 of 1969 • North West Biodiversity Management Act No. 4 of 2016	
Convention on Biological Diversity	South Africa and the majority of African countries are party to the Convention on Biological Diversity. This convention has three core principles: • the conservation of biological diversity; • the sustainable use of biological resources; and • fair and equitable sharing of benefits arising from the use of genetic resources.	3 Spheres of government
Convention on International Trade in Endangered Species of Wild Fauna and Flora	CITES an international cooperation conservation and trade treaty which regulates and safeguards species from over-exploitation to threaten their survival and further contribute to the current extinction crisis, was developed and ratified by a number of states.	DFFE and Conservation Management Authorities

References

- ABSA Group Economic Research (2003). Game Ranch Profitability in Southern Africa. South Africa: The SA Financial Sector Forum
- Anderson et al, 2019. The Nature of Risk. Available from <https://www.worldwildlife.org/>.
- Blackmore, A., 2020. Climate change and the ownership of game: A concern for fenced wildlife areas. *Koedoe*, 62(1), 1-5. Available from <https://dx.doi.org/10.4102/koedoe.v62i1.1594>
- Blood Lions, 2015. Bred for the Bullet. Available from: <https://bloodlions.org/>
- Born Free. The truth about canned hunting: what is it and how is it regulated? Available from: <https://www.discoverwildlife.com/animal-facts/mammals/the-truth-about-canned-hunting-what-is-it-and-how-is-it-regulated>
- Boatemaa S., Barney M., Drimiea S., Harper J., Korstend L., Pereira L. (2019) Awakening from the listeriosis crisis: Food safety challenges, practices and governance in the food retail sector in South Africa. *Food Control*
- Brackowski, A., 2020. Covid-19, Africa's conservation and trophy hunting dilemma. Available from <https://theconversation.com/covid-19-africas-conservation-and-trophy-hunting-dilemma-140029>
- Cloete P.C., van der Merwe P and Saayman M. (2015). Game Ranch Profitability in South Africa. 2nd ed. South Africa: ABSA
- Crown, Barbara, 2016. 63rd General Assembly of The CIC Affirms "Hunting Is Conservation". Available from: <http://www.africanindaba.com/2016/06/63rd-general-assembly-of-the-cic-affirms-hunting-is-conservation-june-2016-volume-14-3/>
- DAFF, 2019. A Profile of the South African Ostrich Market Value Chain 2019. Available from: <https://www.dalrrd.gov.za/daaDev/sideMenu/Marketing/Annual%20Publications/Ostrich%20Market%20Value%20Chain%20Profile%202019.pdf>
- DEFF, 2018. Biodiversity Colloquium; with Minister. Available from: <https://pmg.org.za/committee-meeting/25856>
- DEFF: Draft Concept Note for Development and Implementation of a voluntary, market-based Wildlife Economy Certification Scheme. 30 November 2020
- Department of Agriculture, 2010. Game Industry Market Value Chain Profile 2009-2010. Available from: <https://www.nda.agric.za/docs/AMCP/GameMVCP2009-2010.pdf>
- Department of Agriculture, Forestry and Fisheries, 2017. Veterinary Procedural Notice for Buffalo Disease Risk Management in South Africa
- Department of Agriculture, Forestry and Fisheries, 2010. Animal health sanitary and phytosanitary regulations
- Department of Agriculture, Forestry and Fisheries, 2014. Veterinary procedural notice for foot and mouth disease control in South Africa
- Department of Agriculture, Forestry and Fisheries, 2017. Veterinary Procedural Notice for Buffalo Disease Risk Management in

South Africa

Department of Agriculture, Forestry and Fisheries, 2017. SPS Newsletter Issue 1: March 2017

Department of Agriculture, Forestry and Fisheries, 2018. SPS Newsletter Issue 1: February 2018

Department of Forestry, Fisheries and the Environment .2020. The high-level panel of experts for the review of policies, legislation and practices on matters of elephant, lion, leopard and rhinoceros management, breeding, hunting, trade and handling

Department of Forestry, Fisheries and the Environment .2023. White Paper on the Conservation and Sustainable Use of South Africa's Biodiversity as approved by Cabinet

Department of Forestry, Fisheries and the Environment .2014. National Biodiversity Economy Strategy

Department of Forestry, Fisheries and the Environment 2016. Operation Phakisa-Wildlife Economy Delivery Lab

De Villiers, C. (2018). Game meat market outlook. Consumption Tourism

Drew, K. 2008. Deer and deer farming – Venison production', Te Ara – the Encyclopedia of New Zealand.
<http://www.TeAra.govt.nz/en/deer-and-deer-farming/page-7>. Accessed 18 <ay 2021).

Dugmore, Heather, 2019. Growth of South African game meat. Available from:
<https://www.nedbank.co.za/content/nedbank/desktop/gt/en/news/nedbankstories/affinity-projects/2019/growth-of-south-african-game-meat.html>

Dunne, D. et al., 2020. Media reaction: Australia's bushfires and climate change. Available from
<https://www.carbonbrief.org/media-reaction-australias-bushfires-and-climate-change>

Erasmus, S.W. and Hoffman, L.C. (2017). What is meat in South Africa? Stellenbosch University.

FAOStat, 2021. Production Data Domain: Livestock Primary. Available from:<http://www.fao.org/faostat/en/#data/QL>

González, N. Marquès, M., Nadal, M. and Domingo, J.L. (2020). Meat consumption: Which are the current global risks? A review of recent (2010–2020) evidence. Journal – Food Research International 137

Dennehy, JK., 2018. The UAE's only wild hunting resort says visitor numbers are growing. Available from
<https://www.thenationalnews.com/uae/the-uae-s-only-wild-hunting-resort-says-visitor-numbers-are-growing-1.724113>

Hoffman, L.C. and Wiklund, E. (2006). Game and venison – meat for the modern consumer. MeatScience, vol. 74, pp. 204-206

<https://conservationaction.co.za/resources/reports/an-assessment-of-the-potential-risks-of-the-practice-of-intensive-and-selective-breeding-of-game-to-biodiversity-and-the-biodiversity-economy-in-south-africa/>

<https://dailyfriend.co.za/2021/05/05/barbara-creecy-railroaded-by-animal-rights-extremists/>

Humane Society of the United States, 2010. Greenhouse Gas Emissions from Animal Agriculture

IPCC, 2019. Climate Change and Land

Janovsky, E., 2015. Wildlife industry expected to continue to grow. Available from:<https://redmeatsa.co.za/wp-content/uploads/2015/07/Game-Outlook.pdf>

Jones, M. (2017). Profiling of traditional South African biltong in terms of processing, physicochemical properties and microbial stability during storage. Unpublished thesis for PhD (Food science). Stellenbosch University

Kitshoff-Botha, A, 2019. Game farmers need to adapt to meet political and economic changes in South Africa. Available from:
<https://www.wrsa.co.za/game-farmers-need-to-adapt-to-meet-political-and-economic-changes-in-south-africa/>

Kalandarishvili, A. (2019). The ethics of game meat. [Online]. Available: <https://hams.online/en-US/blog/the-ethics-of-game-meat> [24 March 2021]

- Magwedere, K. et al, 2015. Challenges of Sanitary Compliance Related to Trade in Products of Animal Origin in Southern Africa
- Makelane, H., 2020. South Africa approaching physical water scarcity by 2025. Available from: <https://www.esi-africa.com/event-news/south-africa-approaching-physical-water-scarcity-by-2025/>
- Marx Companies. 2021. A quick primer on venison. Accessed on 17 May 2021 at: <https://www.newzealmeats.com/venison-info.html>
- Meat in Focus. 2018. Article released by the Meat Industry Association, Meat & Wool New Zealand and the Deer Industry New Zealand
- Meat in Focus. 2018. A closer look at a key New Zealand industry. Article released by the Meat Industry Association
- Ministry of Industrialisation, Trade and SME Development (MITSMED). (2016). "Development of a Sector Growth Strategy for the Namibian Agro-Processing Industry: Game Meat – In-depth Value Chain Analysis and Strategy". Published by Optimal Agricultural Business Systems (OABS). Namibia
- Ministry for Primary Industries. 2020. Animal Products (Export Requirements for Game Estate Products) Notice 2013. Ministry for Primary Industries. 2013
- Mokhema, T., 2015. SA seeks to sell game, beef to EU. Available from <https://www.news24.com/fin24/Economy/South-Africa/SA-seeks-to-sell-antelope-meat-beef-to-EU-20150113>
- Mostert, A.C. (2006). Meat quality of kudu (*tragelaphus strepsiceros*) and impala (*aepyceros melampus*). Unpublished thesis for MSc Agric (Animal Science). University of Stellenbosch
- Government of South Africa. National Development Plan 2030 (NDP 2030)
- Nel, E.J., 2018. Potential Risks and Collateral Damage that the Shooting of Intensively and Selectively Bred Game, Including Captive-Bred Lions, May Have on the Contribution by the Hunting Sector to the Biodiversity Economy. SAHGCA report
- Government of South Africa. 2016. Operation Phakisa — Wildlife Economy Delivery Lab
- Pain, D. and Thomas, V., 2020. Setting maximum levels for lead in game meat in EC regulations: An adjunct to replacement of lead ammunition. *Ambio* volume 49, pp. 2026–2037
- Rogers, Katie, 2015. American Hunter Killed Cecil, Beloved Lion Who Was Lured Out of His Sanctuary. Available from: <https://www.nytimes.com/2015/07/29/world/africa/american-hunter-is-accused-of-killing-cecil-a-beloved-lion-in-zimbabwe.html>
- Saayman, M. et al, 2018. The economic impact of trophy hunting in the south African wildlife industry. Journal homepage: <http://www.elsevier.com/locate/gecco>
- SANBI. 2021. Sustainable Wildlife Economics Project Presentation April 2021
- Schönfeldt, H.C. (1993). Nutritional content of venison. Symposium: Venison Industry – Research requirements and possibilities. Pretoria, South Africa
- Shairp, R. et al, 2016. Understanding Urban Demand for Wild Meat in Vietnam: Implications for Conservation Actions
- StatsSA, 2020. Census of commercial agriculture, 2017: Financial and production statistics. Available from: http://www.statssa.gov.za/?page_id=1854&PPN=Report-11-02-01
- StatsSA a., 2021. GDP: Quantifying SA's economic performance in 2020. Available at: <http://www.statssa.gov.za/?p=14074>
- StatsSA b., 2021. P0441 - Gross Domestic Product (GDP), 4th Quarter 2020. Available at: http://www.statssa.gov.za/?page_id=1854&PPN=P0441
- Statistics SA. 2019. Towards Measuring the Extent of Food Security in South Africa. An Examination of Hunger and Food Inadequacy. ISBN 978-0-621-47243-1
- Six, L., et al., 2017. Using the product environmental footprint for supply chain management: lessons learned from a case study on pork. *Int J Life Cycle Assess* 22, 1354–1372
- Taylor A, Lindsey P and Davies-Mostert H. (2016). An assessment of the economic, social and conservation value of the wildlife ranching industry and its potential to support the green economy in South Africa. Department: Environmental Affairs RSA
- UN Comtrade, 2021. United Nations Statistics Division – UN Comtrade Database. Available from:

- <https://comtrade.un.org/data/>
- USDA Foreign Agricultural Service, 2020. South Africa Unable to Stifle Latest Outbreak of Footand Mouth Disease
- Uys, G., 2015. Game exports after FMD. Available from <https://www.farmersweekly.co.za/agri-business/agribusinesses/game-exports-after-fmd/>
- Van der Merwe, P. & Saayman, M. (2005). Analysis of biltong hunting game species in SouthAfrica
- Van der Merwe, M., Hoffman, L.C, Jooste, P.J. and Calitz, F.J. (2014). The Hygienic Practices Involved in Three Game Meat Production Systems in South Africa Based on Environmental and other Independent Variables. Journal of Veterinary Science & Technology
- Wassenaar, A (2016). Exploring South African consumers' attitudes toward game meat. Dissertation for Master of Consumer Science. University of South Africa
- World Organisation for Animal Health. (FMD). Available from <https://www.oie.int/en/animal-health-in-the-world/animal-diseases/Foot-and-mouth-disease>
- Business insider. Undated. <https://www.businessinsider.co.za/typical-south-african-plates-are-starch-and-meat-heavy-everywhere-and-for-everyone>
- World Trade Organization, 1998. Understanding the WTO Agreement on Sanitary and Phytosanitary Measures
- Ahmadi, S., Maman, S., Zoumenou, R., Massougboji, A., Cot, M., Glorennec, P., & Bodeau-Livinec, F. 2018. Hunting, Sale, and Consumption of Bushmeat Killed by Lead-Based Ammunition in Benin. International Journal of Environmental Research and Public Health **15**(6):1140.
- Bartoň, L., Bureš, D., Kotrba, R. and Sales, J., 2014. Comparison of meat quality between eland (*Taurotragus oryx*) and cattle (*Bos taurus*) raised under similar conditions. *Meat Science*, **96**(1), pp.346-352.
- Betts, K.S. 2012. CDC updates guidelines for children's lead exposure. *Environmental Health Perspectives* **120**:a268.
- Bjermo, H., Sand, S., Nälsén, C., Lundh, T., Barbieri, H.E., Pearson, M., Lindroos, A.K., Jönsson, B.A.G., Barregård, L., & Darnerud, P.O. 2013. Lead, mercury, and cadmium in blood and their relation to diet among Swedish adults. *Food and Chemical Toxicology* **57**:161–169.
- Broadway, M.S., McCallen, E.B., Caudell, J., & Stewart, C.M. 2020. Ammunition type and shot placement determine lead fragmentation in deer. *J. Wildl. Manag.* **84**: 1406–1414.
- Buenz, E.J., & Parry, G.J. 2018. Chronic lead intoxication from eating wild-harvested game. *American Journal of Medicine* **131**:e181–e184.
- Canfield, R.L., Henderson, C.R., Cory-Slechta, D.A., Cox, C., Jusko, T.A., & Lanphear, B.P. 2003. Intellectual impairment in children with blood lead concentrations below 10 µg per deciliter. *New England Journal of Medicine* **348**:1517–1526.
- Cloete, P.C., Van der Merwe, P. and Saayman, M., 2015. *Game ranch profitability in South Africa* (pp. 50-87). Cape Town: ABSA.
- Coad, L., Fa, J.E., Abernethy, K., Van Vliet, N., Santamaria, C., Wilkie, D., El Bizri, H.R., Ingram, D.J., Cawthorn, D.M. and Nasi, R., 2018. *Towards a sustainable, participatory and inclusive wild meat sector* (p. 181). Montreal, Canada.
- Cooper, R.G., 1999. Ostrich meat, an important product of the ostrich industry: a southern African perspective. *World's Poultry Science Journal*, **55**(4), pp.389-402.
- Couture, A., Levesque, B., Dewailly, É., Muckle, G., Déry, S., & Proulx, J.-F. 2012. Lead exposure in Nunavik: From research to action. *International Journal of Circumpolar Health* **71**:18591.
- Crawford, M.A., Gale, M.M., Woodford, M.H. and Casped, N.M., 1970. Comparative studies on fatty acid composition of wild and domestic meats. *International Journal of Biochemistry*, **1**(3), pp.295-305.
- Danieli, P.P., Serrani, F., Primi, R., Ponzetta, M.P., Ronchi, B., & Amici, A. 2012. Cadmium, lead, and chromium in large game: a local-scale exposure assessment for hunters consuming meat and liver of wild boar. *Archives of Environmental Contamination and Toxicology* **63**:612-627.
- Department of Agriculture, Environment and Rural Affairs (DAERA), 2023. Biosecurity. Available online: <https://www.daera-ni.gov.uk/articles/biosecurity>. Date: 11/01/2023.
- Dietrich, K.N., Douglas, R.M., Succop, P.A., Berger, O.G., & Bornschein, R.L. 2001. Early exposure to lead and juvenile delinquency. *Neurotoxicology and Teratology* **23**:511–518.
- Department of Health. 2018. Regulations relating to maximum levels of metals in foodstuffs. Notice 588, Government Gazette No. 41704,
- Department of Health. 2020. South African National Lead Exposure Prevention Strategy. Department of Health, Pretoria, 57 pp.
- Ecke, F., Singh, N.J., Arnemo, J.M., Bignert, A., Helander, B., Berglund, Å.M.M., Borg, H., Bröjer, C., et al. 2017. Sub-lethal lead exposure alters movement behavior in free-ranging golden eagles. *Environmental Science and Technology* **51**:5729–5736.
- Ekong, E.B., Jaar, B.G., & Weaver, V.M. 2006. Lead-related nephrotoxicity: a review of the epidemiologic evidence. *Kidney*

- International **70**:2074–2084.
- Fachehoun, R.C., Lévesque, B., Dumas, P., St-Louis, A., Dubé, M., & Ayotte, P. 2015. Lead exposure through consumption of big game meat in Quebec, Canada: risk assessment and perception. *Food Additives & Contaminants: Part A* **32**:1501–1511.
- FAO Agricultural and Development Economics Division: Accessed online at <http://www.fao.org/es/esa/> EC-FAO Food Security Programme: <http://www.foodsecinfoaction.org/> date:11/12/2022.
- FAO., 2018. Sustainable food systems Concept and framework. Food and Agriculture Organisation of the United Nations.CA2079EN/1/10.18.
- Garbett, R., Maude, G., Hancock, P., Kenny, D., Reading, R., & Amar, A. 2018. Association between hunting and elevated blood lead levels in the critically endangered African white-backed vulture *Gyps africanus*. *Science of the Total Environment* **630**:1654–1665.
- Gibson, M., 2012. Food security—a commentary: what is it and why is it so complicated?. *Foods*, 1(1), pp.18-27.
- Global Strategic Framework for Food Security and Nutrition. First Version. Available online: <http://www.fao.org/docrep/meeting/026/ME498E.pdf> (accessed on 13 November 2022). GSFFNFV
- Gomaa, A., Hu, H., Bellinger, D., Schwartz, J., Tsaih, S.W., Gonzalez-Cossio, T., Schnaas, L., Peterson, K., Aro, A., & Hernandez-Avila, M. 2002. Maternal bone lead as an independent risk factor for fetal neurotoxicity: a prospective study. *Pediatrics* **110**:110–118.
- Green, R.E., Pain, D.J., & Krone, O. 2022. The impact of lead poisoning from ammunition sources on raptor populations in Europe. *Science of the Total Environment* **823**:154017.
- Grund, M.D., Cornicelli, L., Carlson, L.T., & Butler, E.A. 2010. Bullet fragmentation and lead deposition in white-tailed deer and domestic sheep. *Human-Wildlife Interactions* **4**:257–265.
- Henn, A., 2020. *Meat quality characteristics of the plains zebra (Equus quagga)* (Doctoral dissertation, Stellenbosch: Stellenbosch University).
- Hoffman, L.C., Geldenhuys, G. and Cawthorn, D.M., 2016. Proximate and fatty acid composition of zebra (*Equus quagga burchellii*) muscle and subcutaneous fat. *Journal of the Science of Food and Agriculture*, 96(11), pp.3922-3927.
- Huber, N., Andraud, M., Sassu, E.L., Prigge, C., Zoche-Golob, V., Käsbohrer, A., d'Angelantonio, D., Viltrop, A., Żmudzki, J., Jones, H. and Smith, R.P., 2022. What is a biosecurity measure? A definition proposal for animal production and linked processing operations. *One Health*, p.100433.
- Hunt, R.D. and Billups, L.H., 1979. Wildebeest-associated malignant catarrhal fever in Africa: a neoplastic disease of cattle caused by an oncogenic herpesvirus?. *Comparative immunology, microbiology and infectious diseases*, 2(2-3), pp.275-283.
- Hunt, W.G., Burnham, W., Parish, C.N., Burnham, K.K., Mutch, B., & Oaks, J.L. 2006. Bullet fragments in deer remains: implications for lead exposure in avian scavengers. *Wildlife Society Bulletin* **34**:167–170.
- Hunt, W.G., Watson, R.T., Oaks, J.L., Parish, C.N., Burnham, K.K., Tucker, R.L., Belthoff, J.R., & Hart, G. 2009. Lead bullet fragments in venison from rifle-killed deer: potential for human dietary exposure. *PLoS One* **4**(4):e5330.
- Iqbal, S., Blumenthal, W., Kennedy, C., Yip, F.Y., Pickard, D., Flanders, W.D., Loring, K., Kruger, K., Caldwell, K.L., & Brown, M.J. 2009. Hunting with lead: association between blood lead levels and wild game consumption. *Environmental Research* **109**(8):952–959.
- Johansen, P., Pedersen, H.S., Asmund, G., & Riget, F. 2006. Lead shot from hunting as a source of lead in human blood. *Environmental Pollution* **142**:93–97.
- Juric, A.K., Batal, M., David, W., Sharp, D., Schwartz, H., Ing, A., ... & Chan, L. 2018. Risk assessment of dietary lead exposure among First Nations people living on-reserve in Ontario, Canada using a total diet study and a probabilistic approach. *Journal of Hazardous Materials* **344**:55-63.
- Kelly, A., & Kelly, S. 2005. Are mute swans with elevated blood lead levels more likely to collide with overhead power lines? *Waterbirds* **28**: 331–334.
- Koeppel, K.N., & Kemp, L.V. 2015. Lead toxicosis in a southern ground hornbill *Bucorvus leadbeateri* in South Africa. *Journal of Avian Medicine and Surgery* **29**(4):340-344.
- Kosnett, M.J. 2009. Health effects of low dose lead exposure in adults and children, and preventable risk posed by the consumption of game meat harvested with lead ammunition. Pages 24–33 in: Watson, R.T., Fuller, M., Pokras, M & Hunt, W.G., editors. Ingestion of lead from spent ammunition: implications for wildlife and humans. The Peregrine Fund, Boise, Idaho, USA.
- Kroucamp, M., 2004. *Meat quality characteristics of the springbok (Antidorcas marsupialis)* (Doctoral dissertation).
- Krüger, S.C., & Amar, A. 2018. Lead exposure in the critically endangered bearded vulture (*Gypaetus barbatus*) population in southern Africa. *Journal of Raptor Research* **52**(4):491-499.

- Leontowich, A.F., Panahifar, A., & Ostrowski, R. 2022. Fragmentation of hunting bullets observed with synchrotron radiation: Lighting up the source of a lesser-known lead exposure pathway. *Plos one* **17**(8):e0271987.
- Lustberg, M., & Silbergeld, E. 2002. Blood lead levels and mortality. *Archives of Internal Medicine* **162**:2443–2449.
- Meltzer, H.M., Dahl, H., Brantsæter, A.L., Birgisdottir, B.E., Knutsen, H.K., Bernhoft, A., Oftedal, B., Lande, U.S., Alexander, J. & Haugen, M. 2013. Consumption of lead-shot cervid meat and blood lead concentrations in a group of adult Norwegians. *Environmental Research* **127**:29–39.
- Mendelsohn, A.L., Dreyer, B.P., Fierman, A.H., Rosen, C.M., Legano, L.A., Kruger, H.A., Lim, S.W., & Courtlandt, C.D. 1998. Low-level lead exposure and behavior in early childhood. *Pediatrics* **101**(3):e10–e10.
- Menke, A., Muntner, P., Batuman, V., Silbergeld, E.K., & Guallar, E. 2006. Blood lead below 0.48 µmol/L (10 µg/dL) and mortality among US adults. *Circulation* **114**:1388–1394.
- Naidoo, V., Wolter, K., & Botha, C.J. 2017. Lead ingestion as a potential contributing factor to the decline in vulture populations in southern Africa. *Environmental research* **152**:150–156.
- Naidoo, V., Wolter, K., Espie, I., & Kotze, A. 2012. Lead toxicity: consequences and interventions in an intensively managed (*Gyps coprotheres*) vulture colony. *Journal of Zoo and Wildlife Medicine* **43**(3):573–578.
- NATSHOOT & CHASA. 2020. Preventing unintended secondary lead poisoning of the South African vulture. Unpublished NATSHOOT and CHASA Conservation Project report.
- Nawrot, T.S., Thijs, L., Den Hond, E.M., Roels, H.A., & Staessen, J.A. 2002. An epidemiological re-appraisal of the association between blood pressure and blood lead: a meta-analysis. *Journal of Human Hypertension* **16**:123–131.
- Needham, T., Musa, A.S., Kotrba, R., Ceacero, F., Hoffman, L.C., Lebedová, N. and Bureš, D., 2022. Carcass and Offal Yields of Farmed Common Eland (*Taurotragus oryx*) Males, as Affected by Age and Immunocastration. *Animals*, **12**(21), p.2893.
- Needleman, H. 2004. Lead poisoning. *Annual Review of Medicine* **55**:209–222.
- Niewiadomska, K., Kosicka-Gębska, M., Gębski, J., Gutkowska, K., Jeżewska-Zychowicz, M. and Sulek, M., 2020. Game meat consumption—Conscious choice or just a game?. *Foods*, **9**(10), p.1357.
- Nkosi, D.V., Bekker, J.L., & Hoffman, L.C. 2021. Toxic metals in wild ungulates and domestic meat animals slaughtered for food purposes: A systemic review. *Foods* **10**(11):2853.
- Nkosi, D.V., Bekker, J.L., & Hoffman, L.C. 2022. Toxic metals in meat contributed by helicopter and rifle thoracic killing of game meat animals. *Applied Sciences* **12**(16):8095.
- Nkosi, D.V., Bekker, J.L., Gower, L.A., Van der Watt, M., & Hoffman, L.C. 2022. Physical hazards in *Aepyceros melampus* carcasses killed for meat purposes by aerial and thoracic shots. *Applied Sciences* **12**(14): 6861.
- North, M.A., Lane, E.P., Marnewick, K., Caldwell, P., Carlisle, G., & Hoffman, L.C. 2015. Suspected lead poisoning in two captive cheetahs (*Acinonyx jubatus jubatus*) in South Africa, in 2008 and 2013: Case report. *Journal of the South African Veterinary Association* **86**(1):1–5.
- Pain, D.J., Cromie, R.L., Newth, J., Brown, M.J., Crutcher, E., Hardman, P., Hurst, L., Mateo, R., Meharg, A.A., & Moran, A.C. 2010. Potential hazard to human health from exposure to fragments of lead bullets and shot in the tissues of game animals. *PLoS One* **5**(4):e10315.
- Pain, D.J., Dickie, I., Green, R.E., Kanstrup, N., & Cromie, R. 2019. Wildlife, human and environmental costs of using lead ammunition: An economic review and analysis. *Ambio* **48**:969–988.
- Pain, D.J., Green, R.E., Taggart, M.A., & Kanstrup, N. 2022. How contaminated with ammunition-derived lead is meat from European small game animals? Assessing and reducing risks to human health. *Ambio* **51**(8):1772–1785.
- Pain, D.J., Mateo, R., & Green, R.E. 2019. Effects of lead from ammunition on birds and other wildlife: A review and update. *Ambio* **48**(9):935–953.
- Poławska, E., Marchewka, J., Cooper, R., Sartowska, K., Pomianowski, J., Jozwik, A., Strzałkowska, N. and Horbanczuk, J., 2011. The ostrich meat—an updated review. *Animal Science Papers and Reports*, **29**(2), pp.89–97.
- Republic of South Africa, 2011. National Climate Change Response Policy White Paper.
- Republic of South Africa, 2019. National Climate Change Adaptation Strategy.
- Rushworth, I. *Pers. comm.* Lead toxicosis of Grey Crowned Crane and Blue Crane in KwaZulu-Natal, 2022, Pietermaritzburg
- Shih, R.A., Hu, H., Weisskopf, M.G., & Schwartz, B.S. 2006. Cumulative lead dose and cognitive function in adults: a review of studies that measured both blood lead and bone lead. *Environmental Health Perspectives* **115**:483–492.
- Singh, A., Naidoo, S. and Le Roux, A., 2021. SAGE Advisory on the outbreak of foot-and-mouth disease in KwaZulu-Natal in June–July 2021: mitigating a potential emergency SAGE Sub-committee on Foot and Mouth Disease Authors—Munyaradzi C. Marufu, Musafiri Karama, Marizvikuru Mwale-Manjoro, Cletos Mapiye, Jerome.
- Stewart, C.M., and Ververka, N.B. 2011. The extent of lead fragmentation observed in deer culled by sharpshooting. *Journal*

- of Wildlife Management **75**:1462–1466.
- Swan, J.E., Esguerra, C.M. and Farouk, M.M., 1998. Some physical, chemical and sensory properties of chevon products from three New Zealand goat breeds. *Small Ruminant Research*, **28**(3), pp.273-280.
- Tammone, A., Caselli, A.E., Condorí, W.E., Fernandez, V., Estein, S.M., Vanstreels, R.E.T., ... & Uhart, M.M. 2021. Lead exposure in consumers of culled invasive alien mammals in El Palmar National Park, Argentina. *Environmental Science and Pollution Research* **28**:42432-42443.
- Thomas, V.G., Pain, D.J., Kanstrup, N., & Green, R.E. 2020. Setting maximum levels for lead in game meat in EC regulations: An adjunct to replacement of lead ammunition. *Ambio* **49**:2026-2037.
- Van den Heever, L., Elburg, M.A., Iaccheri, L., Naidoo, V., Ueckermann, H., Bybee, G., ... & McKechnie, A.E. 2022. Identifying the origin of lead poisoning in white-backed vulture (*Gyps africanus*) chicks at an important South African breeding colony: a stable lead isotope approach. *Environmental Science and Pollution Research*, 1-11.
- Van den Heever, L., Smit-Robinson, H., Naidoo, V., & McKechnie, A.E. 2019. Blood and bone lead levels in South Africa's Gyps vultures: Risk to nest-bound chicks and comparison with other avian taxa. *Science of the Total Environment* **669**:471-480.
- Van Heerden, A.M., 2018. *Profiling the meat quality of blue wildebeest (Connochaetes taurinus)* (Doctoral dissertation, Stellenbosch University)