AN ECONOMIC ANALYSES: BUSINESS CASE FOR SUSTAINABLE ENGAGEMENT INTO THE GAME MEAT EXPORT VALUE CHAIN (GIZ PROJECT NO. 83097888)

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ACRONYMS

CBC	Central Bureau of Statistics
CBD	Convention on Biological Diversity
CBNRM	Community-based Natural Resource Management
DRC	Democratic Republic of the Congo
DVS	Directorate of Veterinary Services
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organisation
FMD	Foot and mouth disease
GDP	Gross Domestic Product
GDP	Gross Domestic Product
GHG	Green House Gas
GIZ	Deutsche Gesellenschaft für Internationale Zusammenarbeit GmbH
GNI	Gross National Income
GNP	Gross National Product
Ha	Hectare
HACCP	Hazard Analysis and Critical Control Points
IEEA	Intelligent Energy Executive Agency
LSU	Livestock Unit
MAWF	Ministry of Agriculture, Water and Forestry
MET	Ministry of Environment and Tourism
MOHSS	Ministry of Health and Social Services
MTI	Ministry of Trade and Industry
NACSO	Namibian Association of CNRNM programs
NAPHA	Namibia Professional Hunters Association
NCA	Northern Communal Areas
NEF	Namibia Employers Federation
NICE	Namibia Institute for Culinary Education
NMA	Namibian Manufacturers Association
NTB	Namibia Tourism Board
OIE	Office International des Epizooties
PWC	Price Waterhouse Coopers
SAM	Social Matrix Model

SSU	Small Stock Unit
SVCF	South of the Veterinary Cordon Fence
SWOT	Strengths, Weaknesses, Opportunities and Threats
VCF	Veterinary Cordon Fence
WTTC	World Travel and Tourism Council

EXECUTIVE SUMMARY

The Namibian Government's Vision 2030 aims to ensure biodiversity conservation and the sustainable utilization of the country's wildlife for economic benefit. Approaches to wildlife conservation have changed considerably over recent years, where moving away from practising conservation towards wise and sustainable use of natural resources has had a major impact.

The wildlife industry in Namibia has shown tremendous growth over the past decades and is currently the only extensive animal production system that is expanding. Wildlife in Namibia is traditionally marketed as non-consumptive tourism, trophy hunting, live game sales and game meat. Although Namibia's freehold farmers have obtained ownership rights over land and livestock since the early 1900s, commercial rights over wildlife were only given to freehold farmers in 1967. Since 1975 the wildlife industry has been regulated by the Nature Conservation Ordinance No. 4 of 1975 as amended.

The Namibian tourism industry is the strongest driving force behind the growth of the wildlife industry and this sector is envisaged to grow by 6.9% per annum until 2017. Until recently live sales were a feasible option for managing wildlife populations, but auction prices are not always favourable. Trophy hunting contributes approximately 14% to the total tourism industry, but only removes about 1% of the wildlife population. Hunting tourism has long been an important part of the Namibian tourism and wildlife policies, but remains poorly explored in economic terms. A recent study found that only 16% of farmers interviewed, derived income from commercial harvesting, while 24% derived income from biltong hunts.

Currently approximately 2 million larger wild animals contribute to the physical wildlife asset base which is estimated to have a value of N$ 10.5 billion and a gross output of N$ 1.5 billion. The wildlife use sector today represents approximately 2.1% of GNP, compared with 4.6% for agriculture, 5% for fishing, 6.8% for mining and 3.4 % for tourism. Wildlife and tourism contributed N$ 1.4 billion to Namibia's Gross National Income in 2009, compared to N$ 1.97 billion of the livestock industry. It is anticipated that wildlife use values will triple its economic contribution in the next 30 years bringing it close to its spatial potential. The direst use values of Namibia's wildlife resources originate from diverse activities embracing several sectors of the economy and for every N$ 1.00 contributed to the Namibian Gross National Product through wildlife use, a further N$ 0.86 is contributed indirectly as a result.

Currently at least 41% of the country is under wildlife management. Approximately 15.3% of the area is under communal conservancy management, 16.5% managed by government as game parks and state protected areas, 6.1% comprise freehold areas and 2.1% protected land.

Game has a superior meat production potential compared to domestic livestock since most game species have higher carcass yields. Researchers found the dressing percentage of wild ungulates to be between 55 and 66% of live weight. Game meat can offer a healthy alternative to consumers. The fat content of game meat is less than 3% and significantly lower than that of livestock. Research on muscle tissue from wild animals indicated that the percentage of poly-unsaturated to saturated fatty acids is more important than the total fat content from a health point of view.

There is a clearly defined demand for meat from species such as springbok, gemsbok and kudu in some countries in Europe and niche markets are offering high prices. Environmental concerns resulted in consumers sharing more interest in free range and organic products. Research has, however, shown that consumers are poorly educated regarding the nutritional benefits and cooking methods of game meat and venison. Therefore the marketing of game meat on a larger and more organised scale could be beneficial and also increase profits to both game farmers and game meat processors.

Game harvesting operations with the purpose of satisfying local and export demand for game meat is still in its infancy in Namibia as the formal game meat trade in Namibia is underdeveloped. The quantities of game meat produced in Namibia in informal and formal ways are estimated to vary between 3 400 and 18 000 tonnes annually. Game meat from commercial farms contributes mainly to food security in Namibia as an important source of rations for farm workers. They receive on average 3.8 kg of game meat a week, which is about 1.8 times more than the amount of meat received from domesticated animals. Game meat potentially benefits 33 000 people on farms when families are also taken into account. Game harvesting also has a positive impact on the environment, since it provides a tool to land owners and custodians of land to manage wildlife numbers for ecological carrying capacity.

Namibia has a number of regulations that apply to sustainable harvesting of game for commercial meat production. Countries importing game meat, such as South Africa and the European Union, also lay down specific rules and regulations whereby exporting countries

must abide. Game harvesting teams and processors should have a well-documented and implemented hygiene management system in place, before the meat will be allowed to be exported by the competent authority, the Directorate of Veterinary Services.

The economic contribution of game meat in Namibia is estimated between N$ 200 and N$ 500 million. A total of 95 and 28 tonnes of de-boned springbok meat were exported to both South Africa and the European Union, in 2010 and 2011, respectively. A total of approximately 637 tonnes of biltong were exported to South Africa in 2011. Producer prices appeared to have increased significantly in recent years, from an average of N$ 12.00/kg to N$ 18.00/kg in 2011.

The current practice in Namibia of declaring a harvesting season for only a few winter months does not enable the local game producers to ensure a constant supply of game throughout the year to slaughtering / processing facilities, resulting in these facilities being reluctant to commit processing capacity to game. With an open harvesting season, the game harvesting, processing and marketing industry will be in a position to conduct activities more efficiently.

Only night culling permits are allowed for the harvesting of game for meat exports. This ruling was introduced because of cooler night temperatures, fewer insects and that game animals do not run away that easily at night. However, it has been scientifically proven that the quality of game meat shot during the night does not differ significantly from the quality of game shot during the day. Quota setting is at times an impediment for commercial harvesting, as the inspections of game numbers are not executed as often as needed and the delay between inspections and the actual harvest often results in numbers being inaccurate.

Game harvesting in communal areas is in itself not an impediment as the supply exceeds the demand. The procedures for organising a harvest on communal land can however be simplified. Decisions to allow harvesting are vested in a committee and not an individual. The historical conditions which necessitated restrictive provisions as contained in the Nature Conservation Ordinance No. 4 of 1975 are still applicable and not yet amended to support the development of the game meat industry in communal areas. These include restrictions on the issuing of night culling permits for harvesting game for export purposes.

In this study game and livestock producers from commercial and communal farms were requested to complete a questionnaire specifically designed to obtain data for the financial modelling of the economic analyses of the game meat value chain. The model focussed on the financial feasibility of individual farming enterprises with mixed farming with species such as game, cattle, sheep and goat. Besides the calculation of the financial feasibility, the model also compared gross margins and labour productivity.

It was found that even though the game industry has shown tremendous growth over the past years, most of the commercial producers involved in livestock and game farming still have a huge percentage of their total income earned from livestock enterprises. Farming practices and management structures of communal areas and conservancies make it difficult to assess farming records to compare income generated from game and livestock enterprises. Game in communal conservancies is also not allocated to a specific producer, while livestock is owned and controlled by individual producers. Income from game in communal areas is primarily generated through trophy hunting and the selling of the meat to the local markets.

Producers benefit from including game as a farming enterprise, but need to increase the efficiency of game utilisation as game currently occupies 30% of the available farm area and only realises 20% of the total income. Pressure is still on livestock production earning 80% of the total income, while occupying 70% of the available farm area.

Farming practices in southern Namibia appeared to have the lowest direct allocated costs, as the dry and arid nature of the south results in low veterinary costs, as diseases and parasites are not so prevalent in the south. It was evident from the study that the game industry has the lowest production cost ratio with an average of only 8.6 %, compared to 34 % for cattle, 11 % for sheep and 10 % for goats.

One of the main objectives of the study was to evaluate the labour productivity and more specifically the percentage of total labour cost allocated to various enterprises. It was observed that neither the commercial producers, nor the communal producers had individual labourers allocated to a specific enterprise, but rather appointed a number of general farm workers suited for all tasks. The average labour expenses are similar for all areas in Namibia with an average value of 7% of total farming income.

The lack in uniformity in gross margin percentages found is an indication that there is no uniformity in the approach to farming practices across the country. An optimal gross margin percentage will have a large economy of scale to it, due to changes in expenses involved in farming practices as well as non-farming practices.

The financial results from 1) game farming only, 2) livestock farming only and 3) mixed farming were compared and it was evident that livestock farming is more profitable than game farming. It was also concluded that producers will be financially worse off with game farming only, than with the current mixed farming system. There was however a correlation between the percentage of income derived from game and the rangeland stocking rate of the farm. Farms deriving a larger percentage of their income from game usually also have more control.

Figures also suggested that should all game on a farm be replaced with livestock, producers will have a better gross margin. In practice this will however increase the rangeland stocking rate to ± 97%, which would be devastating to rangeland conditions and management practices. Results from the study clearly showed that producers do not include the rangeland stocking rate of game when calculating available grazing. The standard practice of livestock stocking rate in Namibia is currently ± 75%. The survey data revealed that farms in Namibia are overstocked which cannot be sustainable.

From the value chain analyses it was evident that the gross margin calculated on production level was the highest for sheep (75%), followed by springbok (60%), large game (52%) and cattle (42%). Processing of game meat for the South African market revealed that the gross margin calculated for processing was the highest for cattle (31.64%), followed by sheep (26.6%), springbok (18.6%) and large game (16.2%).

Marketing and sales to the European Union revealed the highest gross margin calculation for the marketing of beef (36.2%), followed by lamb/mutton (31.5%), springbok meat (31.2%) and meat from large game (24.4%). When performance (gross margin calculations) of the Namibian springbok meat value chain was compared to the performance of the South African springbok meat value chain, it was evident that the South African value chain was more profitable in 2011.

A series of stakeholder meetings held in 2011 revealed the need for the game meat value chain in Namibia to be formalised in the same manner as the livestock value chains.

Several needs and constraints were identified during the discussions. Participants strongly felt that a common body should be established which could regularly disseminate topical information among the actors in the value chain. It was also proposed that some of the current regulations and processes pertaining to the quota system, the health and hygiene codes, consumer protection and others, be revised and simplified. This will, however, be a major exercise, which will require additional human resource capacity.

There is scope for meat from communal conservancies south of the veterinary cordon fence to be included in the existing rudimentary export value chain for game meat, provided that regulations are favourable towards exports and prescribed conditions are followed. The formal game meat value chain is profitable and by increasing economies of scale, rural populations can also benefit from these developments. Increasing wealth and business opportunities in Namibia are crucial preconditions for political stability and sustainable growth of industries.

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CHAPTER 1

INTRODUCTION

Namibia is well known for its richness in species, diversity of ecosystems, production systems (livestock and game) and sustainable natural resource utilization. People living in the remote areas of Namibia depend directly on biodiversity for their survival through farming, tourism, hunting, fishing, forestry, manufacturing, trade and education. Biodiversity includes all forms of life, from the smallest microbe, to the largest mammals, trees and other living organisms. It continuously changes so as to ensure that ecosystems stay in harmony. Species diversity in Namibia is clearly observed along the latitudinal rainfall gradient from the south west to north east of the country (IECN, 2006). Despite being the driest country in sub-Saharan Africa, the diversity of natural resources in Namibia has enabled many species to adapt to the harsh environment (Barnard, 2003). Namibia is one of the few arid countries with internationally recognized biodiversity clusters, which include areas that are extremely rich in species and endemism (IECN, 2006).

In Namibia, the preservation of biological diversity and its sustainable utilization are linked through the Namibian National Constitution Act No. 34 of 1998 Article 95, which requires the *"maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and utilization of living natural resources on a sustainable basis"* (Government of the Republic of Namibia, 1990). Namibia's National Biodiversity Program was established in September 1994 to support and stimulate national activities relating to natural resource conservation and sustainable use of biological resources (Barnard, 2003). As future developments are inevitable to ensure economic growth, the nature and quality of developments should take into account the value of biodiversity for the country and its inhabitants (IECN, 2006).

1. Non-agricultural resource-based production

Natural resource-based production systems in Namibia have overtaken agricultural production systems and exceed it by a factor of at least two (Brown, 2008). In 2005, the total gross annual output of Namibian livestock, as well as crops from the commercial and communal sectors, amounted to approximately N$ 1 878 million. The gross annual output of the non-agricultural natural resource-based sector in commercial areas (Table 1.1), such as

tourism, trophy hunting, wildlife products and indigenous plant products (commercial sector) amounted to approximately N$ 3 200 million.

Table 1.1 Natural resource-based production (N$) in Namibian commercial areas in 2005 (Brown, 2008)

Commodity	N$ million
Trophy hunting	316
Live game sales	14.3
Wildlife viewing	2 700
Wood fuel	63
Charcoal	75 – 100
Plant products	21.6
Total	3 600

In 2004 the total direct added value contribution of the wildlife-use sector (wildlife viewing, trophy hunting, live game and meat sales) represented approximately 2.1% of the Gross National Product (GDP), compared with 4.6% for agriculture, 5% for fishing, 6.8% for mining and 3.4% for the tourism industry (CBS, 2004). The broader impact of wildlife use on the economy is in fact greater than its direct contribution, when including the revenue earned from the game harvesting teams, game processing facilities, trade at game meat outlets and added value to the transport sector. The total value is estimated to be around N$ 1.3 billion when these indirect contributions are included using a multiplier effect of 1.86 (Barnes *et al.*, 2009).

In Namibia livestock farming is the most prevalent form of land use on freehold farms. This practice is different from parts of South Africa and Zimbabwe in areas of similar rainfall where wildlife based land use has largely replaced farming in some semi-arid areas. Notwithstanding this fact, wildlife- based land use is becoming increasingly popular in Namibia. Approximately 288 000 km^2 of freehold land is currently used for wildlife- based land use and 32 000 km^2 is used exclusively for game / wildlife production (Lindsey, 2011).

2. Wildlife utilization

The Namibian Government's Vision 2030 aims to ensure biodiversity conservation and the sustainable utilization of the country's wildlife for economic benefit (Government of Namibia, 2004). Approaches to wildlife conservation have changed considerably over recent years, where moving away from traditional conservation methods towards wise and sustainable use and community-based conservation of natural resources has had a major impact (Jones, 1994). Revenue obtained through biodiversity production is, however, often taken for granted. Therefore the concept of sustainable harvesting is essential in order to provide for future generations (IECN, 2006).

Namibia has an abundance of wildlife. There are in total at least two million head of different wildlife species (Table 2), a figure roughly similar to those for cattle, for sheep and for goats (Van Schalkwyk & Hoffman, 2010). Wildlife (defined here as all wild animals other than fish and forest dwelling invertebrates) is a complex resource, as it comprises all wild animal life, both vertebrates and invertebrates (Barnes *et al.*, 2009). In the previous two centuries wildlife numbers in southern Africa were reduced by outbreaks of diseases and over-exploitation by hunters (Bond *et al.*, 2004a).

Although Namibia's freehold farmers have obtained ownership rights over land and livestock since the early 1900s, commercial rights over wildlife were only given to freehold farmers in 1967 through the South West Africa Wildlife Ordinance (Barnett & Patterson, 2006). Since 1975 the wildlife industry has been regulated by the Nature Conservation Ordinance No. 4 of 1975, as amended (Laubscher *et al.*, 2007). However, minimal community based natural resource management was put into practice until the implementation of the policies of the Nature Conservation Amendment Act of 1996, resulting in wildlife being utilized and valued by the commercial sector. This contributed to the rapid growth of wildlife numbers in conservancies (Mendelsohn, 2006). Below are the figures for the 2004 game counts as depicted by Barnes *et al.* (2009) in their report (Table 1.2). Ostrich populations were since depleted and very few ostriches are left today.

Table 1.2 Wildlife numbers in Namibia in 2004 (Barnes *et al.*, 2009)

Species	Scientific name	Protected areas NVCF	Protected areas SVCF	Communal land NVCF	Communal land SVCF	Private land	Total
Springbok	*Antidorcas marsupialis*	33 811#	1 771	37 150	37 270	621 561	731 563
Kudu	*Tragelaphus strepsiceros*	2 063#	1 484	1 545	1 000	345 801	351 893
Gemsbok	*Oryx gazelle*	11 450#	3 115	18 670	5 084	350 092	388 411
Red hartebeest	*Alcelaphus buselaphus*	1 468#	115	700	0	122 805	125 088
Eland	*Tragelaphus oryx*	1 704#	524	245	0	34 743	37 216
Plains zebra	*Equus burchelli*	18 098#	0	20	0	7303	25421
Mountain zebra	*Equus zebra hartmannae*	8 564#	4 347	2 130	2 175	55 520	72 736
Ostrich	*Struthio camelus*	3 947#	530	2 840	2 020	36 336	45 673
Blue wildebeest	*Connochaetes taurinus*	4 975#	224	470	0	16 623	22 292
Black faced impala	*Aepyceros melampus petersi*	1 500#	0	0	0	1 870	3 370
Common impala	*Aepyceros melampus melampus*	77#	0	385	0	14 980	15 442
Roan	*Hippotragus equines*	440#	120	95	0	435	1 090
Sable	*Hippotragus niger*	256#	60	15	0	902	1 233
Lechwe	*Kobus lechwe*	0	0	250	0	284	534
Tsessebe	*Damaliscus lunatus*	0	15	0	0	162	177
Waterbuck	*Kobus ellipsiprymnus*	0	0	0	0	4 475	4 475
Buffalo	*Syncerus caffer*	1 025#	250	90	0	0	1 365
Giraffe	*Giraffa camelopardalis*	3 683#	229	666	68	5 769	10 415
Warthog	*Phacochoerus aethiopicus*	148#	61	40	0	173 866	174 115
Cheetah	*Acinonyx jubatus*	706#	149	405	270	2 970	4 500
Leopard	*Panthera pardus*	1 970#	430	960	640	4 000	8 000
Lion	*Panthera leo*	574#	23	109	22	0	728
Elephant	*Loxodonta Africana*	9 043#	24	735	155	0	9 957
Hippopotamus	*Hippopotamus amphibious*	1 262#	0	300	0	0	1 562
Black rhino	*Diceros bicornis*	816#	43	45	75	134	1 113
White rhino	*Ceratotherium simum*	54#	62	0	0	75	191
TOTAL		**107 634**	**13 576**	**67 865**	**48 779**	**1 800 706**	**2 038 560**

NVCF - North of the Veterinary Cordon Fence, SVCF - South of the Veterinary Cordon Fence

Game counts are not representative of the current numbers of wildlife in protected areas.

During 2011 a survey was conducted by Lindsey which indicated that wildlife populations (Table 1.3), as suggested by other authors also, appear to be increasing on freehold land in most areas (Erb, 2004;Gödde, 2008). Mammal biomass comprised by wild life increased from 8% in 1972, to 18% in 1992, to 29% currently (Barnes & De Jager, 1996; Saltz *et al.*, 2004). In the study farmers also revealed that the diversity of wild ungulates on freehold land has also increased during the last five years.

Lindsey (2011) found that wildlife biomass correlated positively with livestock biomass, meaning that land which is good for livestock, is also good for wildlife, but negatively correlated with income from livestock, indicating a degree of non-compatibility between livestock farming and wildlife based uses. Wildlife biomass is currently 58.4% lower than livestock biomass on private land.

3. Economic contribution of wildlife and tourism

The economic contribution of wildlife and tourism is rapidly approaching that of livestock, despite policies favouring livestock production and the slow development of wildlife-based land uses. The livestock industry in Namibia on freehold land contributed N$ 1.97 billion (US$ 233 million) to the Gross National Income (GNI) in 2009, while wildlife and tourism contributed N$ 1.4 billion (US$ 166 million) to the GNI in Namibia in 2009.

If all natural resources are taken into account, the figure was NS 1.8 billion (US$ 213 million (2008)). The figure is considered to be conservative as the economic contribution of game meat was estimated at between N$ 200 million (US$ 23.7 million) (Barnes *et al.*, in prep.) and N$ 500 million (Van Schalkwyk and Hoffman, 2010) and not included in the figures. Taking into account the continued growth of hunters and tourists in Namibia, the economic contribution of game / wildlife will probably increase further in years to come (Lindsey, 2011).

Table 1.3 Wildlife population estimates for freehold land (Lindsey, 2011), based on mean densities for each species derived from farmers' estimates of population sizes, relative to those of Barnes *et al*. (2009)

	Erongo	Hardap	Karas	Khomas	Kunene	Omaheke	Otjozondjupa	Oshikoto /Oshana/ Omusati	Total	Barnes	Ratio
Springbok	38234	332946	239470	71491	14409	25683	35769	4623	762635	621561	1.23
Gemsbok	66057	111764	32970	83460	36155	41093	119230	11599	502328	350092	1.43
Kudu	52150	60962	29500	52082	54756	41093	141089	17567	449199	345801	1.3
Warthog	52585	37515	2603	78931	30129	72279	139765	9666	423472	174115	2.43
Red Hartebeest	8474	35170	3471	54023	5764	39258	38419	1849	186428	122805	1.52
Eland	4129	2345	781	7117	8646	7705	56303	2774	89798	37216	2.41
Hartmann Zebra	11299	22665	868	17468	9956	1834	13910	3194	81195	55520	1.46
Blue Wildebeest	1304	17976	1041	11646	5764	6971	29145	1849	75696	16623	4.55
Ostrich	1521	15631	11366	8087	4391	7705	19209	1409	69320	36336	1.91
Common impala	3107	7034	0	8411	2358	6971	33120	756	61757	15442	4
Black Wildebeest	1956	6253	781	10675	1834	8439	15434	588	45959	?	
Waterbuck	43	1563	347	4205	1310	8806	12254	420	28949	4475	6.47
Plains Zebra	435	3908	0	4432	576	2201	7949	185	19686	25421	0.77
Black faced impala	326	1563	434	0	2201	972	7286	706	13488	3370	4
Sable antelope	0	0	0	0	157	73	1987	50	2268	1233	1.84
Lechwe	0	0	0	0	79	0	795	25	899	1188	0.76
Tsessebe	0	0	0	0	629	0	66	202	897	162	5.54
Roan antelope	0	0	0	0	0	0	331	0	331	1090	0.3
Total	241628	657295	323631	412027	179112	271083	672063	577464	2814303	1812450	2.47

4. Wildlife distribution

As depicted in Table 2, approximately 90% of the numbers of wildlife are located outside formally proclaimed conservation areas (Krugmann, 2001), while more than 80% of the numbers of the larger wildlife species are found on privately owned farms, which comprise about 44% of the total land area of the country (Bojo, 1996; Brown, 2009). This reflects the fact that property rights for use and management of wildlife were given to private landowners in 1967 (Barnes *et al.*, 2009) and to communal areas in 1996 (Mendelsohn, 2006) under the legislation for community-based natural resources management programmes.

A veterinary cordon fence (VCF) in northern Namibia (Figure 1.1) separates areas free of foot and mouth disease from areas where outbreaks of this illness may occur from time to time. No hunting of game for commercial use is allowed in the areas north of the veterinary cordon fence (Kamwi & Magwedere, 2007). Also the black rhino (*Diceros bicornis*) is a species that is regarded by the IUCN (*International Union for Conservation of Nature)* as being critically endangered, not only in Namibia, but also in South Africa, Botswana and Zimbabwe. The mountain zebra (*Equus zebra*) is also an endangered species in Angola, Namibia and South Africa (Anonymous, 2010a). It is worth noting the numbers of these endangered species under private land ownership (Table 1.2) and it is a clear indication of the value placed by landowners on these species for consumptive and non-consumptive use.

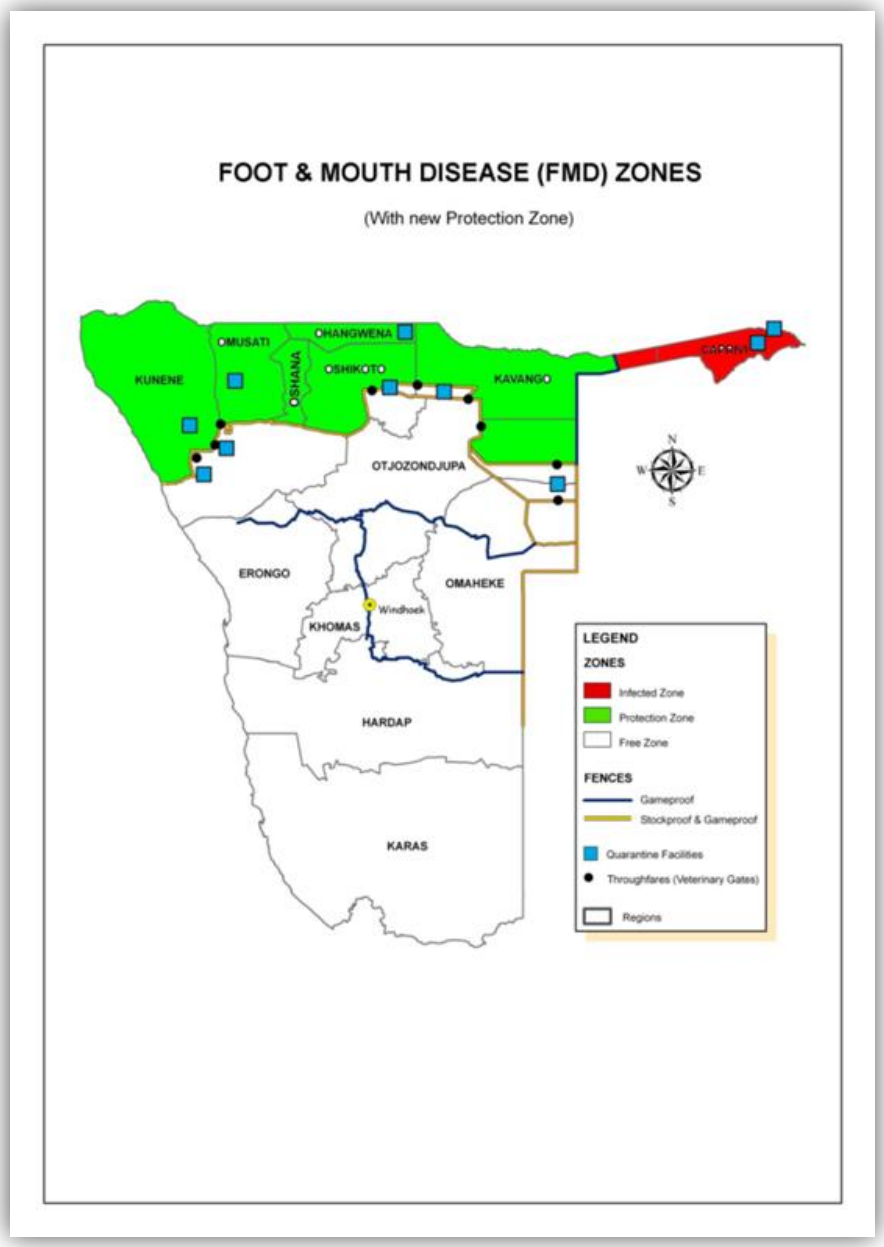

Figure 1.1 Foot and mouth disease free zones in Namibia (DVS, 2010)

Currently at least 41% of the land is under wildlife management as depicted in Figure 1.2. Approximately 60 communal conservancies were registered by 2010, representing 15.3% of the area under wildlife management; 16.5% is managed by the government as game parks and

state protected areas, 6.1% comprise freehold conservancies, 2.1% private protected land and 1.3% community forests and concessions (Brown, 2009).

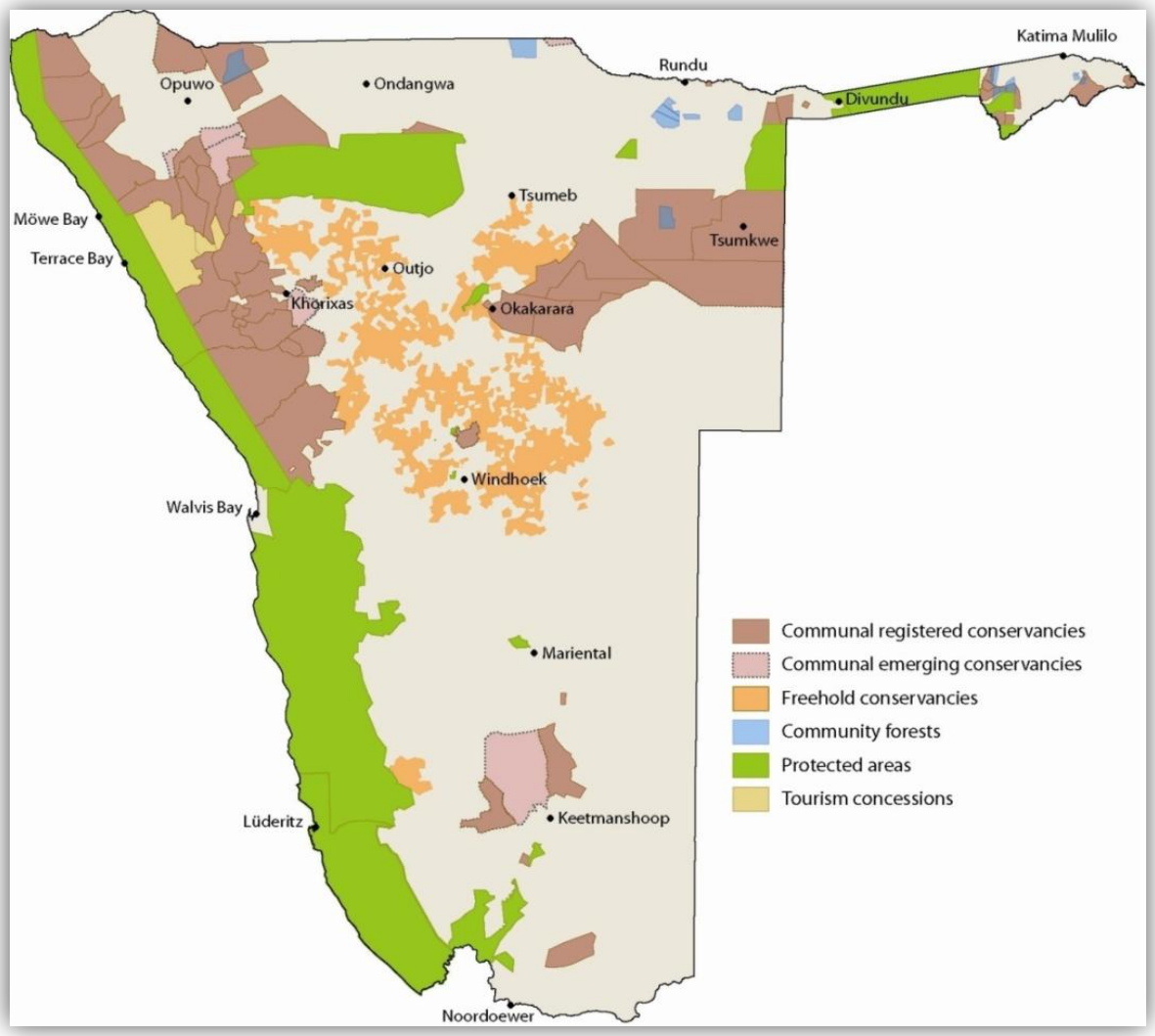

Figure1.2 Areas in Namibia under wildlife management in 2009 (adapted from Brown, 2009)

5. Conclusion

Natural resource-based production systems overtook agricultural production systems and exceeded it by a factor of at least two. The shift from practicing conservation to sustainable utilization of natural resources contributed to the rapid growth of wildlife utilization. The wildlife

industry in Namibia is currently the only animal production system that is expanding with in total at least two million head of different wildlife species.

Tourism, live sales and trophy hunting, cannot sustain further growth. Wildlife farming could offer better opportunities for ensuring long-term sustainability. As the game meat trade in Namibia is not formalized, harvesting wildlife to satisfy the demand for game meat in export markets is still in its infancy. This leaves opportunities to commercial and communal to enable them to successfully engage in formal game meat value chains.

CHAPTER 2

GAME / WILDLIFE PRODUCTION

The wildlife industry in Namibia has shown tremendous growth over the past decades and it is currently the only extensive animal production system that is expanding (Van Schalkwyk & Hoffman, 2010). A recent survey concluded that this phenomenon can be attributed to increased rainfall in some areas, good farming practices, sustainable harvesting and the creation of additional water sources (Lindsey, 2011). Barnes *et al.* (2009) indicated that, as a result of sustainable wildlife utilization, good wildlife practices and community-base natural resource management programmes, the number of the main wildlife species doubled while livestock numbers decreased by 45% primarily due to severe bush encroachment (Joubert, 2006), during the period 1970 to 2000.

1. Game / wildlife farming

As acknowledged, tourism, live sales and trophy hunting alone cannot sustain further growth. Trophy hunting only removes approximately 1% of the national wildlife herd (Van Schalkwyk & Hoffman, 2010). Predator populations that remove the excess of animals are continuously suppressed, mainly because of livestock farming (Erb, 2004). Game ranchers also import exotic wildlife species at a high cost, such as blesbok, black wildebeest etc., for tourist viewing. They often refer to the need to control the number of large carnivores by killing them off, else run the risk of having expensive imported game species preyed upon. This behaviour of game ranchers is not likely to change as long as wildlife viewing and wildlife utilization have commercial value (Schumann, 2006). Perceived losses of livestock also influences the removal of these predators (Marker *et al*., 2003a; Montag, 2003), although game ranchers have more problems with predators than livestock farmers (Marker *et al*., 2003b). Possible explanations for this phenomenon could be that game farmers have improved accounting for their wild animals than many livestock farmers and most predators prefer to prey on wild game species than domestic livestock species. It could also be that livestock farmers are much more rigorous in killing all predators while game farmers often entertain tourists by viewing predators and therefore accept the need for a balanced ecosystem.

The Namibian freehold farmers are reluctant to venture into solely wildlife land uses. These fears are probably based on the belief that a dual system comprising livestock and wildlife farming is more profitable and less risky (Lindsey, 2010). The relatively high investment costs for wildlife stocking and enclosure (Barnes & De Jager, 1996), as well as the variability of rainfall, are limiting factors (Saltz *et al*., 2004). Rain usually falls during summer (October – April) and ranges from 10 mm/year in desert areas in the west, to 600 mm/year in the subtropical savannah areas in the north (IECN, 2006). The dry climate in Namibia results in little of the land being converted to arable agriculture and natural vegetation is rather used for extensive grazing by livestock and wildlife (Barnes & Jones, 2009). Mixed farming with wildlife could offer better options for long-term farming systems (Saltz *et al*., 2004).

Namibia's pastures experience severe bush encroachment and it is estimated that Namibian livestock farmers lose approximately N$ 700 million in meat production annually due to this problem (Joubert, 2006). The present cattle numbers in commercial farming areas represents only 36% of the figures for 1959 (Meat Board of Namibia, 2006). Fortunately, domestic livestock and most wildlife species do not compete for the same fodder (Du Toit, 1990; Saltz *et al*., 2004). Hopcraft (2002) found that the productivity from wildlife within their ecosystem equalled or exceeded that of cattle farming in terms of meat production. Wildlife shows extreme physiological adaptation to the environment (Hopcraft & Arman, 1971), maintains high standing crop and carrying capacities and has better resistance to poisonous plants (Dasmann, 1964) and diseases than livestock (Dasmann, 1964; Berry, 1986). These animals also roam large areas without losing weight and have less need for water than cattle (Dasmann, 1964).

The costs of raising wildlife were found to be lower than costs encountered with livestock farming as some management expenses associated with domestic animals such as dipping, inoculation and herding, are not required for wildlife (Skinner *et al*., 1986). This phenomenon was also observed in a study undertaken by the World Bank, which indicated that wildlife utilization can offer better returns than commercial or communal livestock farming (Bojo, 1996).

Wildlife populations naturally increase in numbers, typically at a rate of 15 - 35% per year (Van Schalkwyk & Hoffman, 2010). Some authors suggest that the abundance of wildlife on freehold land is higher for species such as gemsbok, kudu, hartebeest, impala and eland (Erb, 2007;

Barnes *et al.*, 2009; Lindsey, 2010). If uncontrolled, particularly on fenced land, wildlife numbers can rapidly exceed the carrying capacity of the land and result in rangeland degradation (Davies, 1994). Several factors, such as declining income from livestock production, limited farming subsidies and an increase in hunting and ecotourism resulted in some Namibian farmers practicing or considering game ranching as an alternative or additional farming system to cattle ranching (Saltz *et al.*, 2004). The shift from traditional livestock farming to more natural resource-based wildlife farming is likely to increase with climate change, as well as with the political uncertainty concerning land ownership resulting from new land reform policies promulgated after Namibia's independence in 1990 (Van der Merwe *et al.*, 2004).

Some experts believe that game ranching for eco-tourism and live sales might reach saturation point, thereby forcing a change in the focus to growing markets for game meat and meat products (Hoffman, 2000a, 2000b; Hoffman *et al.*, 2005; Higginbottom & King, 2006; Du Toit, 2007). A study carried out by Berry (1986) concluded that when different forms of wildlife utilization, namely trophy hunting, non-trophy recreational hunting, live animal sales and game meat production were evaluated, trophy hunting gave the highest net return, followed by live game sales. However, when an index based on harvesting percentages was developed, the net values of the weighted calculations showed that game meat production was the most profitable followed by live game sales, non-trophy recreational hunting and trophy hunting. The harvesting percentages used were derived from actual harvesting figures and field operations and considered to be the exploitable surplus. The index value calculated from the harvesting percentages was then multiplied by the net value resulting in the weighted value. Although these findings cannot be generalized, it was observed that a broader based wildlife utilization strategy offered a better return.

2. Meat production from game / wildlife

Game harvesting operations with the purpose of satisfying local and export demand for game meat is still in its infancy in Namibia (Van Schalkwyk & Hoffman, 2010) as the formal game meat trade in Namibia is underdeveloped. This sector has however, significant potential for growth. Game harvesting also has a positive impact on the environment, since it provides a tool to landowners and custodians of land to manage wildlife numbers for ecological carrying capacity. This management approach can prevent environmental damage (Conroy, 2002) in a

rapidly changing climatic area.

The potential of meat production from various wildlife species has long been recognized (Ledger *et al*., 1967; Skinner, 1984). The major wildlife species in Namibia under consideration for commercial game meat export are springbok (*Antidorcas marsupialis – Zimmerman, 1780*), gemsbok (*Oryx gazella – Linnaeus, 1785*), kudu (*Tragelaphus strepsiceros – Pallas, 1766)*, mountain zebra (*Equus zebra hartmannae – Linnaeus, 1758)* and red hartebeest (*Alcelaphus buselaphus caama – Pallas, 1766)*. The suitability of these species for commercial meat production is not only based on their population numbers (Table 6), but also on other factors such as their reproductive performance, the fact that they occur in large herds in easily accessible regions, their suitability for commercial harvesting and proximity to processing facilities.

In Namibia, officials from the Ministry of Environment and Tourism determine the number of wildlife animals that may be hunted on private ranches on the basis of a single visit, where the size of the range, the vegetation type and density, as well as an estimate of wildlife numbers, are considered (Saltz *et al*., 2004). These numbers are then used to determine an off-take quota for live game sales, personal use or commercial harvesting. Long term studies of wildlife population dynamics and aerial surveys will produce more reliable results, but these approaches are both expensive and time consuming (Caughley & Sinclair, 1994).

Wildlife may not be harvested from areas subject to official prohibition of harvesting. The reasons for prohibition may be related to conservation, animal health and to animal or plant chemical control (Anonymous, 1993a). Game meat for export may only be harvested in the OIE (Office International des Epizooties) recognized foot and mouth disease free zone without vaccination. The Nature Conservation Ordinance No. 4 of 1975 (Anonymous, 1975) and its associated regulations regulate the registration of hunting farms, the harvesting of game animals and the registration of game harvesting teams (Namakhela & Müseler, 2007). The meat from game harvested outside the foot and mouth disease free zone may not be transported into the disease free area (Van Schalkwyk & Hoffman, 2010).

The primary responsibility for food safety rests with the food business operator as stated in the European Union Regulation (EC) No. 852 Chapter I Article I par 1 (Anonymous, 2004a).

According to these regulations it is necessary to ensure food safety throughout the food chain, starting with primary production. Food business operators must therefore, establish, implement and maintain hygiene control procedures based on HACCP (Hazard Analytical Critical Control Points) principles as described in the European Union Regulation (EC) No. 852 Article 5 par 1 (Anonymous, 2004a).

Table 2.1 Population numbers of commercially harvestable wildlife species in the different districts in Namibia (2007) (Brown, 2007)

District SVCF	Red hartebeest	Hartmann's zebra	Kudu	Gemsbok	Springbok
Bethanie	*	1 715	5 420	4 064	10 295
Karasburg	767	1 281	3 435	5 344	34 180
Communal conservancies	0	0	*	*	*
Keetmanshoop	1 761	0	4 685	21 225	93 785
Communal conservancies	0	0	*	*	7 000
Luderitz	0	1 030	2 580	8 086	13 129
Maltahohe	2 176	5 510	7 812	17 929	52 798
Mariental	2 359	347	18 593	37 230	254 050
Communal conservancies	0	0	0	*	*
Rehoboth	0	0	0	0	7 512
Gobabis	34 173	593	48 989	42 462	82 659
Grootfontein	4 601	421	55 959	16 312	1 224
Karibib	1 207	10 378	15 870	19 983	12 927
Communal conservancies	*	*	*	*	3 450
Okahandja	14 047	3 694	34 424	35 842	8 803
Okakarara	0	0	0	0	0
Communal conservancies	*	0	*	*	*
Omaruru	3 543	4 404	25 514	27 444	10 447
Communal conservancies					

Otjiwarongo	17 338	2 166	48 215	42 314	9 592
Outjo	5 982	9 606	43 388	33 431	21 986
Khorixas communal conservancies	*	2 500	2 600	5 000	27 000
Tsumeb	1 904	775	13 345	3 319	4 651
Otjinene communal conservancies	*	*	*	*	*
Windhoek	47 240	25 388	50 343	68 868	65 703
TOTAL #SVCF	**137 098**	**70 107**	**381 171**	**389 264**	**726 090**

** No data available, SVCF - South of the Veterinary Cordon Fence*

Only 3% of the commercially harvestable species exist north of the veterinary cordon fence, as these species tend to roam in arid to semi-arid areas. South of the veterinary cordon fence springbok make up the largest part of the wildlife population available for commercial harvesting, although the larger antelopes exceed springbok in biomass by a factor of about 4.5. When the off-take rates of predators, trophy hunting and personal use are taken into account, a conservative off-take rate varying from 7% for Hartmann's zebra and gemsbok, 8% for kudu and red hartebeest and 14% for springbok (Table 2.2) is derived.

Table 2.2 Off-take parameters for commercially harvestable wildlife species in Namibia (Brown, 2007)

Off take parameters	Red hartebeest	Hartmann's zebra	Kudu	Gemsbok	Springbok
Approximate population growth rate (%)					
No predators	20	15	25	20	30
Predators	15	12	15	15	25
Approximate trophy off-take rate (%)	2	2	2	3	3
Approximate own use off-take rate (%)	5	3	5	5	8
Estimated meat harvesting rate (%)					
No predators	13	10	18	12	19
Predators	8	7	8	7	14

In terms of income to land owners and conservancies, the game meat market has the current potential of generating revenue in excess of N$ 300 million annually (Brown, 2007). Latest

estimates are that approximately 85 tonnes of springbok meat are exported to the European Union annually and 720 tonnes of meat from different game animals to South Africa. Annually about 4 500 tonnes of game meat are used by farmers to feed workers (Lindsey, 2011). The additional income to harvesting teams, abattoirs, exporters and outlets could make the game meat industry worth in excess of N$ 500 million per year (Van Schalkwyk & Hoffman, 2010).

3. Sustainable harvesting

Long-term sustainable harvesting should always be a pre-condition when wildlife populations are harvested for meat production. The ideal harvesting system should allow for the management of a population structure without disrupting population growth (Hoffman, 2003). If the system is correctly designed and managed, it can result in sustainable harvesting. The applied harvesting methodology should adhere to all ethical requirements to ensure that harvesting is not negatively perceived within the consumer market. Game harvesting should be planned and implemented so as to ensure the optimization of the total wildlife production system (Van Schalkwyk & Hoffman, 2010).

Table 2.3 Potential value (N$) of sustainable game meat harvesting to land owners and conservancies in Namibia (2008) (Brown, 2008)

Wildlife type	Commercial farms	SVCF	NVCF
		Communal	Communal
		Conservancies	Conservancies
Springbok	44 429 457	2 027 718	1 101 240
Larger game	168 893 039	1 291 425	1 551 083

SVCF - South of the Veterinary Cordon Fence, NVCF - North of the Veterinary Cordon Fence

4. Characteristics of game / wildlife species

Africa is rich in fauna as the Pleistocene (world's recent period of repeated glaciations) did not exterminate the majority of mammal species as it did in Europe and northern America (Pollock, 1969). Namibia is richly endowed with wildlife (Mendelsohn, 2006) due to the remarkable increase in wildlife populations which resulted from the approach taken by communities and conservancies to promote the sustainable utilization of wildlife (NACSO, 2009).

As early as 1963 it was pointed out that African ungulates produced a higher biomass per hectare than domestic animals (Bourliére, 1963), but it can only be of interest for commercial harvesting if a fair percentage of these animals can be harvested annually (Von la Chevallerie, 1970). Large numbers of springbok are found in mixed farming systems together with sheep in the southern parts of Namibia. Springbok are both grazers and browsers and thus have a grazing advantage over sheep. The population density of springbok in Namibia is approximately 750 000 (Brown, 2007) and their annual growth rate is between 28 - 45% (Furstenburg, 2006a). Springbok are more alert during day time and are thus preferably harvested during the night, preferably during dark moon periods. Large herds result in quick and easy harvesting of the species.

The gemsbok is found in abundance in Namibia with an approximate population density of 400 000 (Brown, 2007) and an annual population growth of between 15 - 33%, depending on the environment. Gemsbok is found in large herds roaming in arid and semi-arid areas with grass plains which result in favourable conditions for commercial harvesting. These animals are extremely well adapted to the environment, survive harsh and extreme conditions and can go for long periods without water (Furstenburg, 2007a).

Kudu is found in smaller herds in dense bushes, often along the banks of rivers. The population density of kudu in Namibia is approximately 380 000 (Brown, 2007) with an annual growth rate of between 13 - 28%, depending on the area (Furstenburg, 2006b). Bush encroachment cause natural habitats of the kudu to become more suitable for this species and contributes to increased numbers available for commercial harvesting. Kudu is in particular important for commercial harvesting purposes due to its high dressing percentage and biomass obtained per carcass (Mostert & Hoffman, 2007).

The red hartebeest is exceptionally tolerant to dry areas and poor quality grazing. Herd numbers can range from 30 - 400 animals with an annual growth rate of 20 - 32% (Furstenburg, 2008). The herd structure of the red hartebeest makes it extremely suitable for harvesting as a group. The population density of red hartebeest in Namibia is approximately 140 000 (Brown, 2007). The red hartebeest are known to stay in their territories for long periods of time (Kok, 1975).

Hartmann's zebra (*Equus zebra hartmannae*) is found in drier mountainous areas with low rainfall. The mountain zebra is endemic to Namibia and larger in numbers than the plains zebra (Barnes *et al*., 2009). Although Namibia has a population of Hartmann's zebra of around 73 000 (Brown, 2007), commercial harvesting becomes essential in areas where the population densities exceed the carrying capacity. The Hartmann's zebra is listed by CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora, an international treaty with more than 144 member countries) in Appendix II as an endangered species that can be traded commercially, but only if it does not jeopardize their survival rate. Harvesting quotas limited to 4 animals per farm at a time are issued for commercial harvesting purposes. This regulation renders it extremely difficult for a professional hunting team to harvest a truck full of zebras.

The plains zebra (*Equus burchelli antiquorum*) is not currently listed in Appendix I or II. Population numbers are low (± 25 000) which limits the commercial harvesting of this species. Approximately 92% of the zebra's diet comprises of grass and the species thus competes with cattle in some farming areas. The annual population growth of the species is between 17 - 35% (Furstenburg, 2007c).

Eland is the largest antelope in Africa and regarded by various researchers as a species suitable for commercial harvesting due to its size, high reproductive rate and apparent independence of drinking water (Furstenburg, 2007d). In the dry regions of Namibia, eland can produce more meat than cattle and was therefore introduced on a number of farms (Comley & Meyer, 1997). Eland numbers amounted to 37 216 in 2004 (Barnes *et al*., 2009) and are currently estimated to be much higher (Lindsey, 2010).

Game has a superior meat production potential under the special conditions in Namibia compared to domesticated livestock since most game species were found to have higher carcass yields. It was reported by Hoffman and Bigalke (1999) that the dressing percentage of wild ungulates are usually between 56 - 66% of the live weight, which is in agreement with the work of several other authors who found dressing percentages of game to range from 50 - 66% (Talbot *et al*.,1965; Van Zyl *et al*., 1969; Conroy & Gaigher, 1982; Van Schalkwyk, 2004; Mostert, 2007).

Springbok (*Antidorcas marsupialis* – Zimmerman, 1780)

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Artiodactyla*
Family: *Bovidae*
Subfamily: *Antilopinae*
Genus: *Antidorcas*
Species: *Antidorcas marsupialis*

Namibia is the country with the largest springbok population in Africa (Comley & Meyer, 1997). The springbok in Namibia also tend to be larger than those found in South Africa which can be attributed to better vegetation and a more suitable climate. Farmers in the Karoo (South Africa) tried to increase the size of their animals by importing breeding material from Namibia, but after 2 - 3 years, the size of the springbok decreased again (Furstenburg, 2006a).

The springbok is classified as a gazelle with a white face and dark stripes running from the mouth to the eyes. It is covered in a reddish-brown coat appearing darker and then white on the lower third of the body as well as the backside. The back of the animal appears to have a slope because the hindquarters seem to be higher than the forequarters (Skinner & Smithers, 1990). Both males and females have black curved horns with those of the female being smaller (Comley & Meyer, 1997). Horns of larger males can be up to 48 cm in length. At 21 months of age the horns have the adult form and the ram's horns curve strongly backwards (Bothma *et al*., 1996).

The springbok male weighs between 31.1 kg and 47.6 kg and the female between 26.5 kg and 43.5 kg, although the body mass varies geographically (Robinson, 1979). It stands about 70 cm at the shoulders (Comley & Meyer, 1997). One of the characteristics of the springbok is a fold of skin running from the mid back to the rump. When excited, this fold opens to display a crest of white hair (Skinner & Smithers, 1990). Springbok also do not have moisture on the outside of its nose as this feature prevents the loss of moisture and excludes dust from the nose (Comley

& Meyer, 1997).

Springbok are found in south and southwest Africa, mainly in the countries of Namibia, Botswana, Angola and South Africa. They prefer to graze in dry, open grassland, semi-desert scrubs, riverbeds and pans with short grass (Comley & Meyer, 1997). The population densities and distribution of springbok in Namibia are shown in Figure 1. Also included in Figure 2.1 is the location of the abattoirs that are able to process game meat.

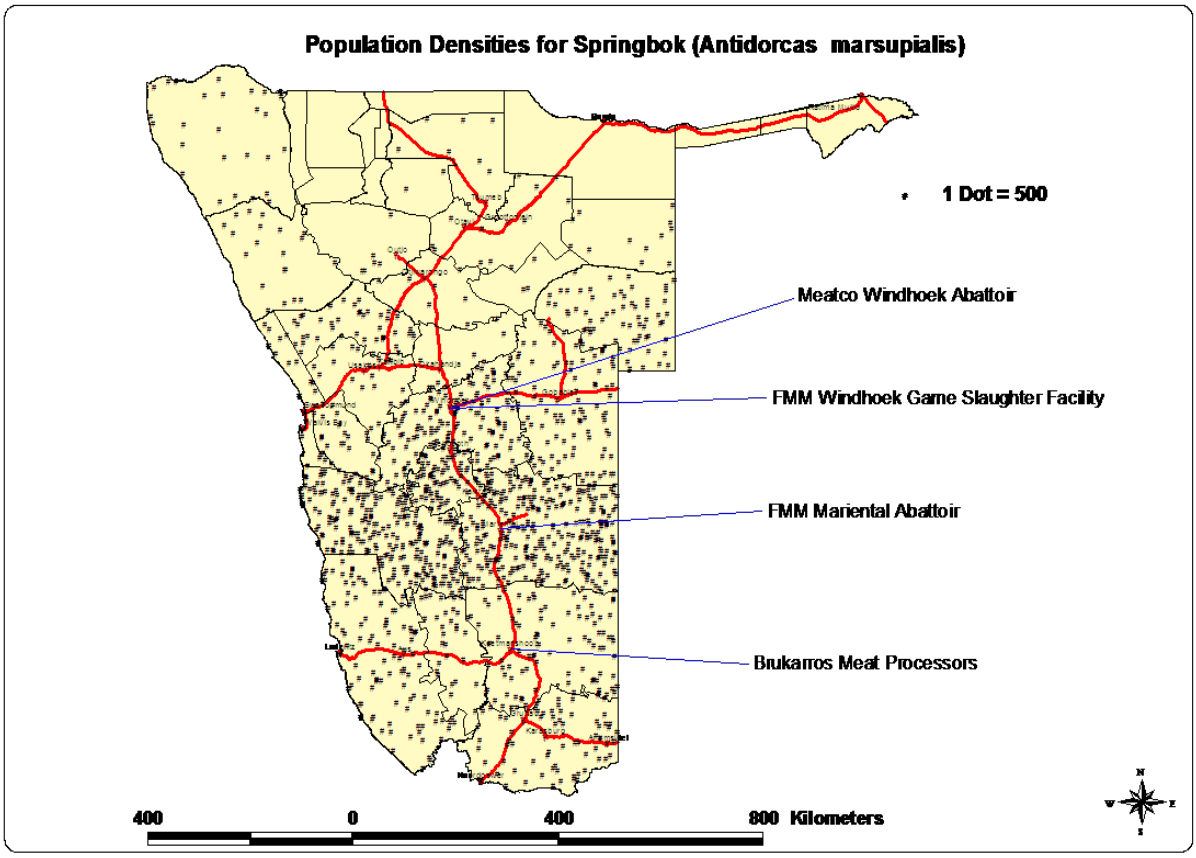

Figure 2.1 Population densities and distribution of springbok in Namibia (MET, 2007)

During the mating season most males wander together in search of females. Females live in herds with their off-spring and a few dominant males. The wandering males are of lower status for various reasons. Some are lower ranking due to being young or old. Others lost the competition with other males in the fight for oestrus females (Skinner & Smithers, 1990).

When frightened or excited, springbok make a series of stiff-legged vertical leaps up to 2.6 m high (Furstenburg, 2006a). This behaviour is known as pronking and is performed as a springy, high-stepping trot which is normally accompanied by head tossing with the back arched. The term pronking is derived from the fold of skin running from the shoulder to the tail which looks like a black line when closed. During pronking it opens to reveal white bristly hairs with glands underneath which release scents (Beta-springene) during the mating act (Comley & Meyer, 1997). The leaps are believed to also distract predators such as lions and cheetahs. When a predator or hunter pursues a springbok, it usually gallops with the ears folded back (Skinner & Smithers, 1990). Males snort loudly to mark their territories which usually appear as a continuous noise during rut (Comley & Meyer, 1997).

In previous years, springbok used to live in mega-herds called 'treks'. Nowadays springbok are mostly confined to private farms and game reserves and 'treks' are few and limited to remote areas of Angola and Botswana (Skinner, 1993). Springbok can also be contained relatively easily in normal sheep fencing and these fences have also limited the number of 'treks' that can occur.

Springbok usually mate throughout the year (Skinner & Louw, 1996; Furstenburg, 2006a) but often during the dry season and then lactate during the hot, wet season when resources are most abundant (Barnard, 1999). Skinner *et al*. (1992) reported that during rut anoestrous springbok ewes showed an oestrus response to territorial rams which later results in the synchronization of the birth of lambs. It was suggested that this phenomenon is an adaptation to reduce the impact of predators on newly born calves. Gestation is approximately 5.5 months (Comley & Meyer, 1997) and females generally reproduce every 2 years, starting between 1 - 2 years. Weaning usually occurs from 3 months to 1 year (Furstenburg, 2006a). Parental care is mainly by the mother since springbok tend to live in herds of females and offspring along with some dominant males (Barnard, 1999). In optimal conditions some ewes may produce two lambs during one year (Skinner & Louw, 1996).

Life expectancy of an average springbok is 7 - 9 years (Barnard, 1999). Knight (1993) calculated from annual census data that the gender ratio of adult springbok varied between 1 male to 1.3 females and 1 male to 2.3 females. During years of good rainfall, fewer females

were counted per male which is in agreement with the findings of Liversidge (1993) who found the birth ratio of males to be favoured by exceptionally high rainfall. The opposite was observed during drought periods where more females ensured the reproductive abilities of the springbok. Apparently 30% of a springbok population can be harvested and in years of exceptional rainfall when springbok may lamb twice, even up to 40% of a population (Skinner & Louw, 1996).

The springbok is an intermediate browser utilizing both grass and browse. Researchers in South Africa reported up to 68 different plant species found in the diet of springbok (Furstenburg, 2006a). Shifting between different food sources occurs seasonally, especially when natural supply of water is limited and during which time even flowers are eaten. These flowers have twice the moisture content of grass which is usually eaten in times of water availability. This allows the springbok to remain independent of a secure water supply which is a great advantage in a climate where droughts are common (Barnard, 1999). Nagy and Knight (1994) reported that springbok were able to survive without water if the diet contained 67% moisture.

Horak (1992) investigated arthropod and helminth parasites found internally or externally on springbok and observed differences in parasite infestations in different regions, but very low tick burdens. No evidence of documented deaths from parasite infestation in springbok can be found. Springbok has however been reported as susceptible to heart water (Neitz, 1944) and the zoonosis *Eysipelothriz rhusiopathiae* which causes skin lesions in humans (Skinner & Louw, 1996).

These characteristics: high birth rate, occurrence in large herds, wide distribution throughout Namibia, in regions suitable for harvesting (Hoffman & Wiklund, 2006), all make this species suitable for commercial harvesting and meat production and is also the reason why this is the most abundant species harvested in both Namibia and South Africa. Interestingly, the springbok has an exceptionally large *M. longissimus thoracis et lumborum* which is usually a preferred cut for 'biltong' (Skinner & Louw, 1996).

Gemsbok (*Oryx gazella* – Linnaeus, 1785)

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Artiodactyla*
Family: *Bovidae*
Subfamily: *Hippotraginae*
Genus: *Oryx*
Species: *Oryx gazella*

The gemsbok is a large, well-adapted game animal with a thick muscular neck covered with a dense skin. It measures 120 cm high at the shoulder with a body length of between 180 and 195 cm. Males weigh between 210 - 240 kg whilst females are smaller and weigh between 180 - 215 kg (Furstenburg, 2007a). Long, straight horns range from 60 - 150 cm in length. Gemsbok bulls have shorter and thicker horns than cows that are wider apart (Bothma *et al*., 1996; Lundrigan & Sanders, 2005).

Gemsbok are of a greyish colour with black and white markings on the face stretching down from the base of the horns to above the muzzle and sweep back in stripes over the eyes and cheeks. The markings on the face are also functional as the alternate black and white markings create cooling effects as light is reflected off the lighter parts and attracted to the darker patches (Comley & Meyer, 1997). Black colouring runs down the neck and around the under body, forming bands around all four legs. A stripe also runs up the spine, from the tail tip and ending in the short thick black mane. Black markings are also found on the front of all four legs. The lower portion of the legs, muzzle and under belly are all white, whereas the body and neck are a greyish or tan colour (Lundrigan & Sanders, 2005).

The gemsbok is able to decrease its body temperature from 45 º - 35.7 ºC to allow slower evaporative cooling (Estes, 1991; Kingdon, 1997; Buchart, 2003; Clark & Clark, 2005). At 45 ºC the blood would be too hot for the brain to function properly (Comley & Meyer, 1996) and therefore the gemsbok has a network of small capillary veins (*retae-meribillae*) in the nose

cooling down the air flowing through the nose, thereby also preventing unnecessary dehydration (Furstenburg, 2007a).

The gemsbok is the most renowned animal species in the Kalahari and other drier parts of the western parts of sub-Saharan Africa (Furstenburg, 2007a). It is found in open sandy grasslands and lighter open wood or scrublands in the desert regions (Comley & Meyer, 1997). It can survive in areas of low productivity and prefers stony plains with at least limited water access, but can survive in areas of dunes, rocky mountain areas and arid habitats with little seasonal water. The gemsbok is also more frequently found in open areas than in areas with increased tree density (Kingdon, 1997; Estes, 1991; Clark & Clark, 2005) – a phenomenon that makes it suitable for harvesting. The population densities and distribution of gemsbok in Namibia are shown in Figure 2.2.

The gemsbok is nomadic and group in herds of up to two hundred animals in times of good rain or while they migrate (Buchart, 2003; Clark & Clark, 2005). Usually family herds comprise 5 - 40 animals (Furstenburg, 2007a). In larger groups, females are dominant, although the herd remains a mixture of males and females. The leaders of the herd are usually identified by their positions in the herd. The lead female usually takes the front position. The male will lead by being aggressive and thereby directing the others (Buchart, 2003; Clark & Clark, 2005). This hierarchy usually lasts until a water scarcity arises whereby males start to dominate females (Estes, 1991; Kingdon, 1997).

Female gemsbok only comes into oestrus when conditions are favourable and they may not even breed during drought periods. However, in good years, they can come into oestrus within weeks after giving birth (Comley & Meyer, 1997). There is no specific breeding season for gemsbok as they breed throughout the year. Gemsbok only calf after the age of 3 years and a single young is usually born after 9 months of gestation.

Bulls are territorial as of 4 - 5 years of age until about 7 years when they are replaced by younger bulls. The ratio of males to females for optimal production is usually one bull for every 8 - 12 adult cows (Furstenburg, 2007a).The average life span of a gemsbok is approximately 18 years in the wild and 20 years in captivity (Lundrigan & Sanders, 2005).

The harsh conditions in which gemsbok exist lead to opportunistic feeding (Comley & Meyer, 1997). The gemsbok is usually a grazer, but will browse on roughage during droughts or when grasses are not available (Furstenburg, 2007a). It will also dig to find tubers and roots, wild melons and cucumbers which provide all the water needed to sustain the gemsbok. Grazing activities at dawn and dusk allow for the consumption of the condensation present on the grasses (Clark & Clark, 2005). A fully grown gemsbok needs approximately 7 - 9 l of water per day (Furstenburg, 2007a).

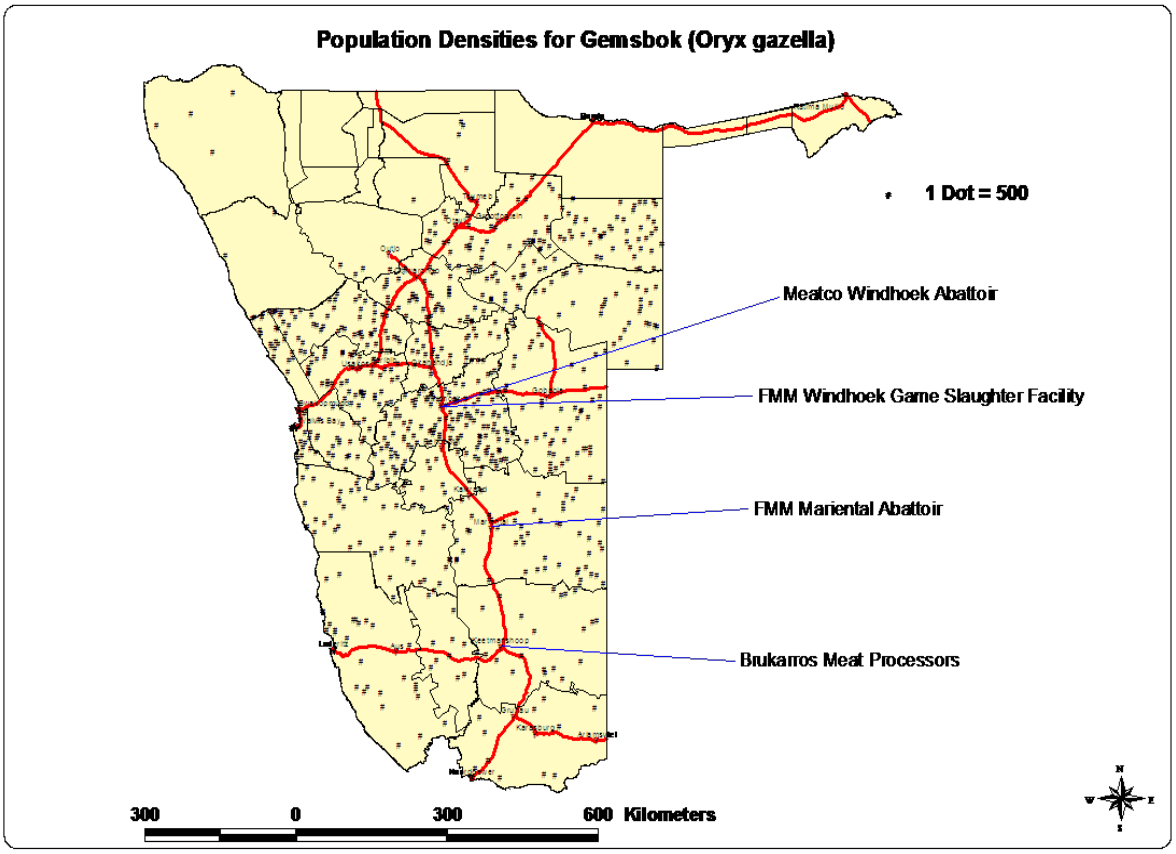

Figure 2.2 Population densities and distribution of gemsbok in Namibia (MET, 2007)

The gemsbok cannot tolerate acute parasite infections and are also sensitive to cold and wet conditions (Furstenburg, 2007a). Similar to springbok, gemsbok has a number of characteristics that make it suitable for sustainable harvesting. Also of value is the proximity of large densities of gemsbok to the central parts of Namibia where facilities are available for the dressing of these larger species (Figure 2.2).

Kudu (*Tragelaphus strepsiceros* – Pallas, 1766)

Kingdom: *Animalia*
Phylum: Chordata
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Artiodactyla*
Family: *Bovidae*
Subfamily: *Bovinae*
Genus: *Tragelaphus*
Species: *Tragelaphus strepsiceros*

The kudu is one of the five species of *Tragelaphus*. Males weigh approximately 250 kg and females 180 kg and are of the tallest antelopes with shoulder heights of about 140 cm (Comley & Meyer, 1997). They can be easily identified by their large ears, white nose stripe and the gigantic spiralling horns of the males. The horns of a male kudu measure 120 cm in length, while females have no horns; the sexual dimorphism in body size frequently leads to different meat yields (Hoffman *et al.*, 2009). The body colour of the kudu varies from reddish brown to bluish-gray with the darkest of the kudu found in the southern African populations. Alongside its back the kudu has six to ten white stripes and the tail tip is black with a white underside. Males have a beard which females lack and their body colour also darken with age (Estes, 1991).

The kudu cow is distinctly smaller and lighter than the bull (Skinner & Smithers, 1990). The age of bulls can be determined by the development of the horns. Horn buds are already visible 3 days after birth, but horns only develop after 5 months. It takes up to 2 years from birth to complete the first full twist. The second twist is visible at 2.5 years and it takes a further 3.5 years for the final twist. The buttocks (hind part of the animal – rump, topside, silverside, thick flank, aitchbone) of a kudu bull constitutes on average 29.2% of the total carcass weight compared to 24.2% in sheep (Bothma *et al.*, 1996). Huntley (1971) reported that the kudu carcass with a lean meat yield of 43.45%, in terms of good quality retail cuts, had a higher production potential compared to domesticated animals.

The kudu is found throughout Africa and roams in dense bush and open woodland in Namibia

(Comley & Meyer, 1997). During the rainy period kudu remain in the deciduous woodlands, while in the dry season they graze alongside river banks where vegetation is usually plentiful (Estes, 1991). The population densities and distribution of the kudu in Namibia are shown in Figure 2.3.

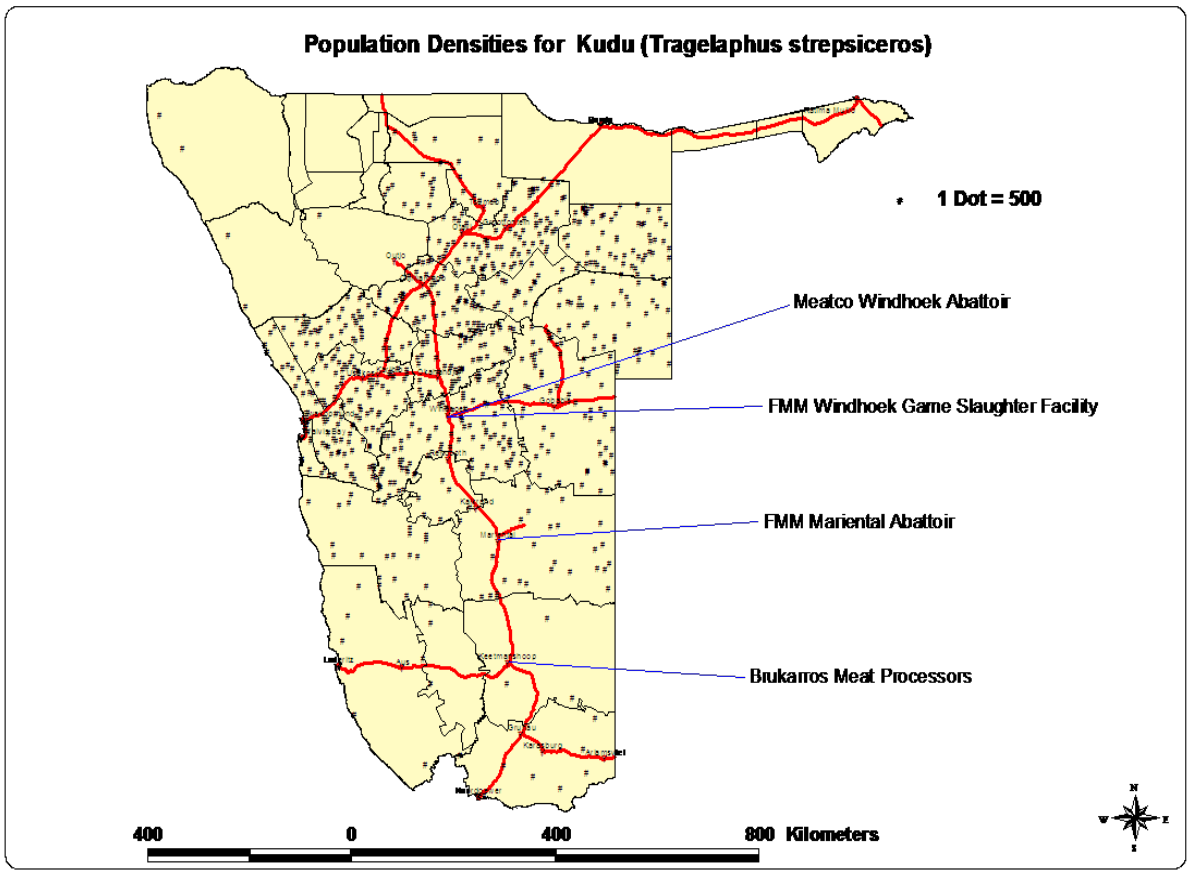

Figure 2.3 The population densities and distribution of the kudu in Namibia (MET, 2007)

Kudu do not migrate and are not territorial (Furstenburg, 2006b). Female kudu live in small herds of about 6 animals with their off-spring and no obvious hierarchical rank can be found in these groups (Estes, 1991). Sometimes the female groups combine to form larger groups, but this is temporary. Males live in single herds, which range in number from 2 - 10 animals and it is unclear if males have a distinct hierarchical rank in their groups (Estes, 1991).

The loud bark of the kudu is one of the loudest noises made by an antelope. Males usually

grunt loudly when fighting or during rutting (Comley & Meyer, 1997). Male bachelor herds do not overlap each other, but the area of one male may overlap that of two or three female herds. Males and females do not have any association with each other except during the mating season (Estes, 1991). A ratio of one bull (older than 5 years), to every 4 cows (older than 3 years) and not exceeding a ratio of one to eight, will ensure optimal production of a herd (Furstenburg, 2006b). Usually cows of 3 - 9 years of age comprise 47% of a natural population, while 18% are bulls younger than 8 years and 4% bulls older than 8 years (Mostert, 2007). The kudu is not an aggressive animal and only shows aggression when in captivity. In the wild fighting occurs only between kudu of the same size (Estes, 1991).

Kudu are well-known for their jumping abilities and clear fences 3 m and higher (Comley & Meyer, 1997). The kudu is a seasonal breeder in the southern parts of Africa with its breeding season being from May until early July (Furstenburg, 2006b). Well-nourished females can breed within 2 years from birth. There is a 9 month gestation period and calves are born when grazing is in abundance which is usually in late summer. Male kudu calves stay in the female herd for 1.5 - 2 years while the females remain longer (Estes, 1991). Population growth rates depend on the environmental conditions and vary between 13% in times of drought and 28% in good rainfall years (Furstenburg, 2006b). A mating ratio of one male to four females is preferred for optimal production (Mostert, 2007). The lifespan of a kudu is 7 - 15 years and it can even reach 22 years in captivity (Comley & Meyer, 1997).

The kudu is predominantly a non-selective browser (Comley & Meyer, 1997) and feeds on tree and shrub leaves, woody branches, pods, seeds, broad-leaved forbs and succulents (Furstenburg, 2006b). During the early stages of the growing season the kudu favours the young shoots of woody plants (Skinner & Smithers, 1990). The leaves from the Acacia bush form a major part of a kudu's diet. It has been noticed that kudu grazing on an acacia bush suddenly abandoned it, the reason being the sudden increase in tannin levels which makes it unpalatable (Comley & Meyer, 1997).

The kudu is highly susceptible to diseases like Foot and mouth disease, tuberculosis, rabies, anthrax and others, although heart water is seldom a problem. Kudu dying suddenly without displaying any previous symptoms, most probably has anthrax (Du Toit *et al.*, 1996). A healthy kudu can sustain up to 5 000 ticks without being affected (Furstenburg, 2006b).

Red hartebeest (*Alcelapus buselaphus caama – Pallas, 1766*)

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Artiodactyla*
Family: *Bovidae*
Subfamily: *Alcelaphinae*
Genus: *Alcelaphus*
Species: *Alcelaphus buselaphus*

The red hartebeest is the fastest antelope in Africa and is characterized by a sloping back with a long, narrow rostrum (Furstenburg, 2008). The red hartebeest is an extremely good runner easily reaching speeds up to 65 km/h (Comley & Meyer, 1997). Adult males weigh approximately 150 kg and adult females 120 kg (Furstenburg, 2008) with a shoulder height of 125 cm (Comley & Meyer, 1997). The body hair is approximately 25 mm long and is quite fine in texture. There are paler patches of hair on the rump and parts of the face which is thought to attract mates or to scare off predators (Kingdon, 1989).

Two species and eight subspecies of hartebeest have been documented (Furstenburg, 2008), which are distinguished from each other by coat colour, varying from pale brown to brownish gray and by horn shape. Sexual maturity may occur as early as 12 months, but this species does not reach its maximum weight until 4 years of age (Kingdon 1989). Both males and females have horns, although the horns of the males are thicker and stronger (Furstenburg, 2008). The hartebeest has a lifespan of 11 to 20 years (Nowak, 1997).

Although the red hartebeest usually lives in dry and harsh conditions, it finds the Namib regions in Namibia too arid and is thus found on the Kalahari sands in the eastern parts of Namibia (Comley & Meyer, 1997). The hartebeest previously roamed grasslands throughout the African continent from Morocco to north eastern Tanzania and south of the Congo to South Africa (Nowak, 1997). Populations have been drastically reduced due to hunting, environmental destruction and competition with domestic cattle. Nowadays the red hartebeest is found on

grassy plains (Comley & Meyer, 1997) in parts of Botswana, Namibia, Ethiopia, Tanzania and Kenya (Nowak, 1997).

The red hartebeest is well adapted to arid and semi-arid areas and prefers savannah-like plains. It can also survive in very cold areas like the highlands of Lesotho (Furstenburg, 2008). During the early rainy season in Namibia during November and December when grazing and open water are in abundance, they form large aggregations. The population densities and distribution of red hartebeest in Namibia are shown in Figure 2.4.

Red hartebeest bulls are very territorial and will often lose and regain their territory during their prime of 4 - 7 years (Comley & Meyer, 1997). They are known to socialize in organized herds. Within a herd there are 4 types of animals comprising territorial adult males, non-territorial adult males, groups of young males, and groups of females and young. Females within a herd form groups of 5 - 12 animals with up to four generations of off-spring in the group. It is thought that there are strong dominance relationships between females and that these groups define the social organization for the entire herd as fights between females have often been observed (Kingdon, 1989). Communication plays a major role via scent secretions from glands on the hoofs (Comley & Meyer, 1997).

Young males usually stay with their mothers for up to 3 years, but it can take up to 20 months before they join groups of other young males. At the age of 3 - 4 years, males may attempt to take over a territory and the females within it. Once a territory has been established, the male will defend it and does not usually leave. Males are aggressive and will fight if challenged. Females and their off-spring may move in and out of the territories freely, depending on the best grazing. Males lose their territory after 7 - 8 years (Batty, 2002). The red hartebeest does not migrate, although during extreme conditions, such as a drought, a population may significantly change their location (Verlinden, 1998).

Breeding occurs in areas defended by single males, preferably in open areas on plateaus or ridges (African Wildlife Foundation, 2008). Copulation is always interrupted if another male intrudes and the intruder is usually chased away. Reproduction is seasonal (Kingdon, 1989) with a mating season from September to February. For optimal production a ratio of 1 bull to 8 - 10 cows is preferred. Nowak (1997) reported that birth rates of the red hartebeest peak from

October to November in South Africa. Gestation is about 8 months where after a single calf is born (Comley & Meyer, 1997). Females isolate themselves in scrub areas to give birth (Schaller 1972; African Wildlife Foundation, 2008). The female hartebeest leaves her off-spring hidden in the scrubs for a few weeks and young hartebeest are weaned at the age of 4 months (Kingdon, 1989). The population growth of red hartebeest is 20 - 32%, depending on rainfall conditions (Furstenburg, 2008).

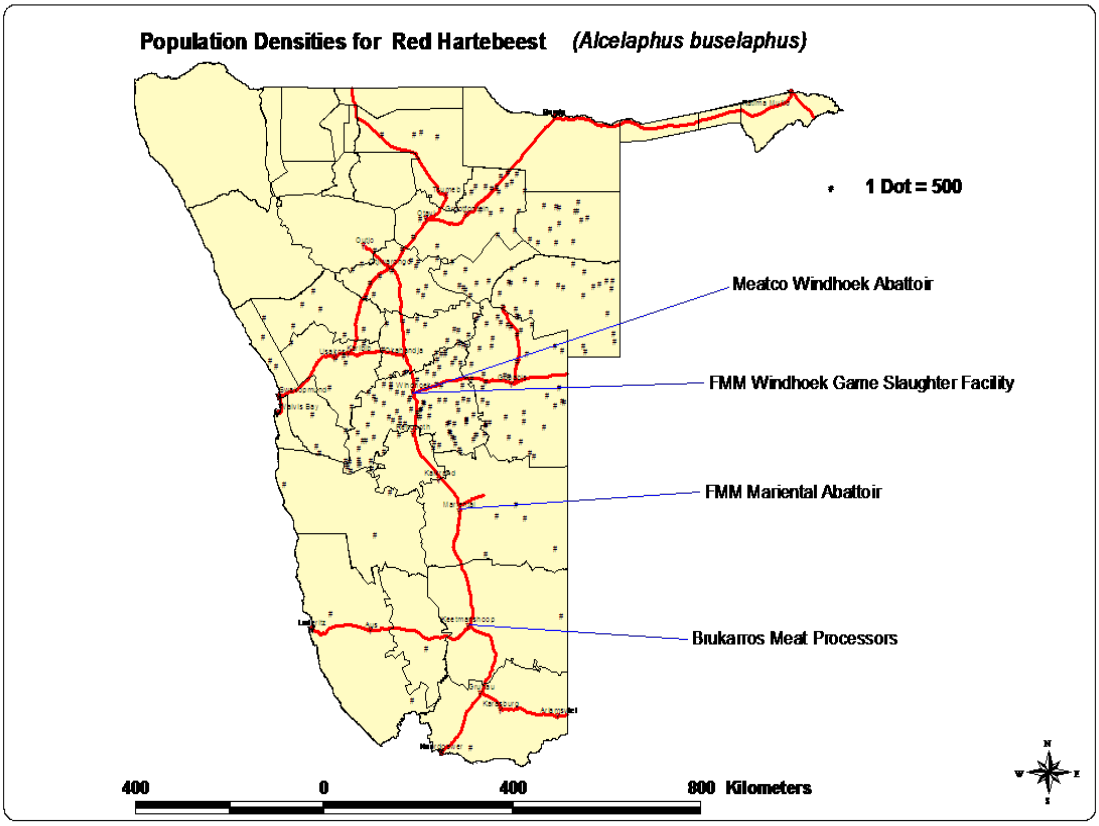

Figure 2.4 The population densities and distribution of red hartebeest in Namibia (MET, 2007)

The red hartebeest is a grazer that feeds almost entirely on grass (African Wildlife Foundation, 2008). More than 95% of their food in the wet season (October to May) is grass and grass seldom comprises less than 80% of their diet. The red hartebeest is exceptionally tolerant of poor-quality food. The long rostrum of the red hartebeest enhances mastication and allows it to crop grasses better. When succulent grasses are scarce during the dry season, the red hartebeest is able to eat the tougher grass species (Schuette, 1998). The red hartebeest is able

to digest a higher percentage of its food than other antelopes (Murray, 1993). The rumen of this antelope seems to be most comparable with that of cattle and thus better suited for high fibre diets. During times of water scarcity the red hartebeest obtain moisture from melons and tubers and will not need water. It has been observed that they will even drink saline water if necessary (Comley & Meyer, 1997).

Hartmann's mountain zebra (*Equus zebra hartmannae* – Linnaeus, 1758)

Kingdom: *Animalia*
Phylum: Chordata
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Perissodactyla*
Family: *Equidae*
Genus: *Equus*
Species: *Equus zebra harmannae*

There are two distinct subspecies (Furstenburg, 2007b) of mountain zebra (*Equus zebra*) namely the Cape mountain zebra (*Equus zebra zebra*) and the Hartmann's mountain zebra (*Equus zebra hartmannae*) which are both listed by the IUCN (International Union for Conservation of Nature) as endangered. Both subspecies are good climbers and have exceptionally hard and pointed hooves compared to other equines. The most important identification characteristic is the presence of a dewlap (longitudinal flap of skin that hangs beneath the lower jaw or neck), hanging from the throat (Lloyd, 1984).

The mountain zebra is a large striped member of the horse family. Adult mountain zebra have a head and body length of 210 - 260 cm and a tail length of 40 - 55 cm. Shoulder height ranges from 127 - 150 cm and they weigh between 204 - 350 kg. Adult Hartmann's mountain zebras are larger and taller than the Cape mountain zebra. The black stripes across the buttocks in the Hartmann's mountain zebra is also 2 - 3.5 cm wider than those of the Cape mountain zebra (Furstenburg, 2007b).

The heart of a mountain zebra is three times the weight of that of a plains zebra as it has to

compensate for the oxygen demands of the higher altitudes at which the mountain zebra live (Comley & Meyer, 1997). The mountain zebra can be distinguished from the plains zebra by the following (Furstenburg, 2007b):

- The belly of the mountain zebra lacks stripes and is white, while the stripes of the plains zebra extended around the belly and may have shady stripes in between;
- The stripes of the mountain zebra extend to the hooves but are absent at the bottom of the legs of the plains zebra;
- The mountain zebra has a dewlap below the neck, which is absent in the plains zebra;
- The ears of the mountain zebra are 4 - 6 cm longer than those of the plains zebra; and
- The mountain zebra prefers mountainous areas as a habitat, while the plains zebra roam flat areas.

In Namibia Hartmann's mountain zebra are found in mountainous areas and adjacent flat areas (Comley & Meyer, 1997) from south west Africa into extreme south west Angola, although their distribution is highly dispersed. They cannot survive in areas that are confined to plateaus and need access to mountain foots and slopes in different seasons (Furstenburg, 2007b). Their narrow hooves are adapted for walking in rocky mountains (Comley & Meyer, 1997).

A large number of Hartmann's mountain zebra were introduced into the western and eastern Cape by private owners before the Namibian border was closed for live exports of mountain zebra in 1998 (Furstenburg, 2007b). Cape mountain zebra are found only in South Africa (Nowak, 1999). The population densities and distribution of the Hartmann' mountain zebra in Namibia are shown in Figure 2.5.

Hartmann's zebra are gregarious and herds usually comprise of a dominant stallion with mares and foals, with other stallions in a separate group (Comley & Meyer, 1997). Strong dominance among mares in family groups is established by fighting with a series of biting and kicking blows (Furstenburg, 2007b). Although dominant mares are more likely to initiate most herd activities, there is no significant correlation between dominance and leadership (Penzhorn, 1988).

Mountain zebra often bathe and roll in dust and these dust patches are used regularly. They interact with one another through gentle nibbling of the head, shoulders and neck. The

Hartmann's zebra bark similar to the Burchell's zebra with alarm calls being a short, explosive snort (Comley & Meyer, 1997).

This species is mostly active in the early morning and late afternoon. The mountain zebra has no distinct breeding season and mating occurs throughout the year showing a peak from November to March (Furstenburg, 2007b). Females have a birth interval of 1 - 3 years and may remain reproductively active until about 24 years of age (Nowak, 1999). Gestation is usually 12 months where after a single foal is born (Comley & Meyer, 1997).

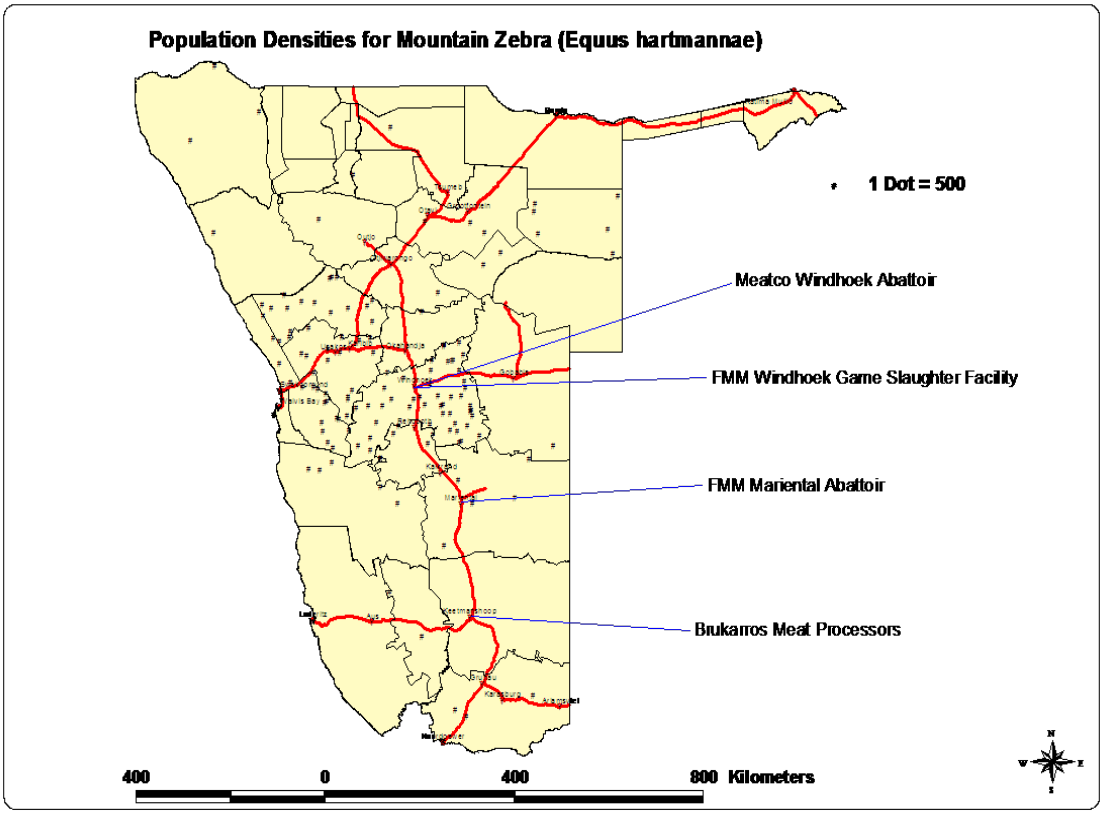

Figure 5. The population densities and distribution of the Hartmann's mountain zebra in Namibia (MET, 2007)

A new family group is formed when a bachelor stallion reaches social maturity at the age of 5 - 6 years, bonds with a sexually mature mare and acquires two to three additional young females. The stallion and the mares usually stay bonded in this group for life (Furstenburg, 2007b).

The life span of mountain zebra in the wild is usually 20 or more years. The oldest documented mountain zebra in captivity is a Hartmann's mountain zebra that was 29 years and 6 months (Klingel, 1990; Nowak, 1999). Young foals separated from their mothers are often kicked to death by older mares. Hartmann's zebra has an annual population growth of 17 - 35% (Furstenburg 2007b).

Both subspecies of mountain zebra are grazers (Comley & Meyer, 1997). Their primary diet comprises 92% grass and also includes shrubs and herbs. They compete directly with the red hartebeest by consuming large volumes of coarse fodder such as stems and plumes. Zebra are monogastric animals and do not ruminate (Furstenburg, 2007b). Cape mountain zebra of all ages also frequently utilize mineral licks, especially during the summer (Grobler, 1983). Mountain zebra are dependent on water and in times when there is a scarcity of open water, they dig deep with their hooves to find water in the soil (Comley & Meyer, 1997).

Burchell's zebra (*Equus burchelli antiquorum – Gray, 1824*)

Kingdom: *Animalia*
Phylum: Chordata
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Perissodactyla*
Family: *Equidae*
Genus: *Equips*
Species*: Equus burchelli*
Sub- species: *Equus burchelli antiquorum*

The male and female zebra are very similar and weigh between 290 and 340 kg with a shoulder height of approximately 140 cm. Plains zebra have a rounder appearance than mountain zebra (Furstenburg, 2007c). Stripe patterns are variable and in some areas of Africa the stripes are bold and cover the whole body. In other regions stripes are lighter or absent on the belly and lower legs. No two zebra have the same striping patterns (*cingula*), making individual identification convenient for researchers. It also acts as protection against predators during a

hunt since the mass of bouncing white and black stripes confuse predators. The stripes also help individuals to keep contact when chased by predators (Comley & Meyer, 1997). Males usually have thicker necks than females (Ciszek, 1999).

The plains zebra can be found in Africa, from southern Ethiopia in the north to eastern South Africa in the south and even as far west as Angola and Namibia (Ciszek, 1999). Populations are widespread in Namibia's extensive areas of relatively unmodified natural habitat (Figure 2.6). A single large protected population of plains zebra is confined by the fencing of the Etosha National Park, while smaller numbers are found on private ranches and communal lands. They are dependent on water and food supply and therefore either stay in the same area or migrate (Comley & Meyer, 1997).

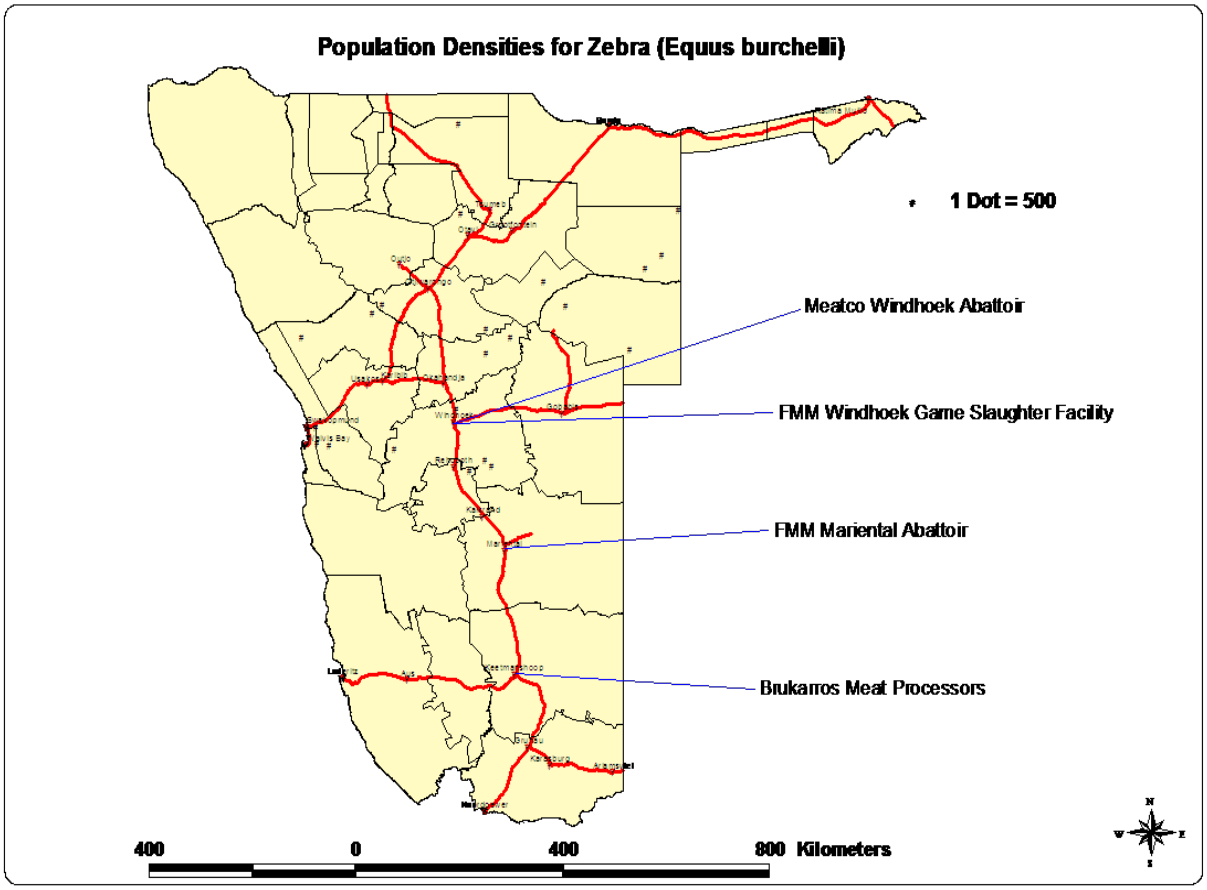

Figure 2.6 The population densities and distribution of plains zebra in Namibia (MET, 2007)

Plains zebra are social animals and roam in small groups of a stallion and 1 - 6 adult mares and their foals (Rubenstein, 1986) with a harem of bachelor herds (Comley & Meyer, 1997). There is a dominance hierarchy among the females in the group, with the stallion's first mate at the top and his most recently acquired filly at the bottom. Dominant breeding males do not allow other males to mate with the mares and they protect the group against predators by biting and kicking. The oldest of the adult mares usually leads the group from one area to another and they keep close proximity to available drinking water (Ciszek, 1999).

Plains zebra tend to keep close to other wildlife species, especially antelope. They are more dependent on water than any other plains game (Comley & Meyer, 1997). Zebra will seldom move further than 8 km from drinking water and prefer to drink water during the day and not at night (Furstenburg, 2007c).

The plains zebra communicates with others via a distinctive barking call similar to the sound made by flexing a sheet of metal. They also have an alarm snort during fighting or when injured (Comley & Meyer, 1997). The plains zebra has no distinct breeding season, although approximately 85% of mares give birth from October to March (Furstenburg, 2007c).

Gestation lasts about 12 months before a single foal of ≈ 30 kg is born. If the female is in good condition she may conceive again almost immediately, but otherwise the birth interval is 2 years (Nowak, 1983). Foals are weaned between 9 - 14 months (Furstenburg, 2007c). Sexual maturity is reached at 3 years of age, but males may not be able to earn access to a group of females until he is 6 years or older. The onset of oestrus in a female is at about 2 years of age (Nowak, 1983). The population growth of plains zebra is 15 - 29% and the average life expectancy approximately 22 years (Furstenburg, 2007c).

The plains zebra grazes mainly in open, short-grass savannah and can tolerate tall grass providing a bigger geographical area to roam when compared to many other African grazing animals (Nowak, 1983). Zebra therefore tend to be the first species to utilize an area especially after a veld fire (Furstenburg, 2007c). During the night, plains zebra stay in areas with shorter grass while one animal from the group is always on the lookout for predators. Plains zebra are reported to eat over 50 different species of grasses. They also occasionally browse on herbs,

leaves and twigs (Nowak, 1983). Upper and lower incisors make the zebra the only grazers able to chew off long grass rather than tearing off shorter grass (Comley & Meyer, 1997).

Zebras are not susceptible to most diseases except African horse-sickness. They are also known to have a resistance to infestation of ticks and are not carriers of foot and mouth disease (Furstenburg, 2007c).

Eland (*Tragelaphus oryx*)

Kingdom: *Animalia*
Phylum: *Chordata*
Subphylum: *Vertebrata*
Class: *Mammalia*
Order: *Artiodactyla*
Family: *Bovidae*
Subfamily: *Bovinae*
Genus: *Tragelaphus*
Species: *Tragelaphus oryx*

The eland was originally classed in a separate genus *Taurotragus*, but was later replaced in the genus *Tragelaphus* based on DNA studies and allozyme analysis, as well as the hybridization with the greater kudu and the sitatunga (Furstenburg, 2007d). The eland is the largest African antelope, weighing between 500 - 700 kg (Comley & Meyer, 1997). Hides have a uniform fawn colour with vertical white stripes on the upper body parts (Fahey, 1999).

Males and females have a large dewlap on the chest which continues to grow in males and even reaches the knees in old age (Comley & Meyer, 1997). Adult males are sometimes up to 35% heavier than females and can be seen from far (Furstenburg, 2007d). Bulls have dark curly hair on the forehead secreting a sweet-smelling odour (Comley & Meyer, 1997). Horns of 55 - 100 cm (5 year old) are straight and lie in a flat triangle which turns like a cork-screw towards the tip (Fahey, 1999; Furstenburg, 2007d).

Eland have a wide distribution in Africa (Furstenburg, 2007d) and live in both steppe and forests

(Fahey, 1999). Male and female eland do not show any territorial behaviour and are usually nomadic without specific home ranges (Furstenburg, 2007d). They are usually found in mixed herds, but may wander off to form male only herds (Comley & Meyer, 1997). Eland are equally at home in semi-desert areas than in woodlands and even live on the outskirts of marshlands in coastal areas. Eland were exported to Russia and the United States of America and are farmed commercially (Furstenburg, 2007d). The distribution of the eland population in Namibia is shown in Figure 2.7.

Eland keep in herds of up to twenty five individuals, although larger herds of females and calves have been observed (Fahey, 1999). Bulls sometimes give an aggression-like display, but will seldom fight and bodily contact rarely occurs (Furstenburg, 2007d).

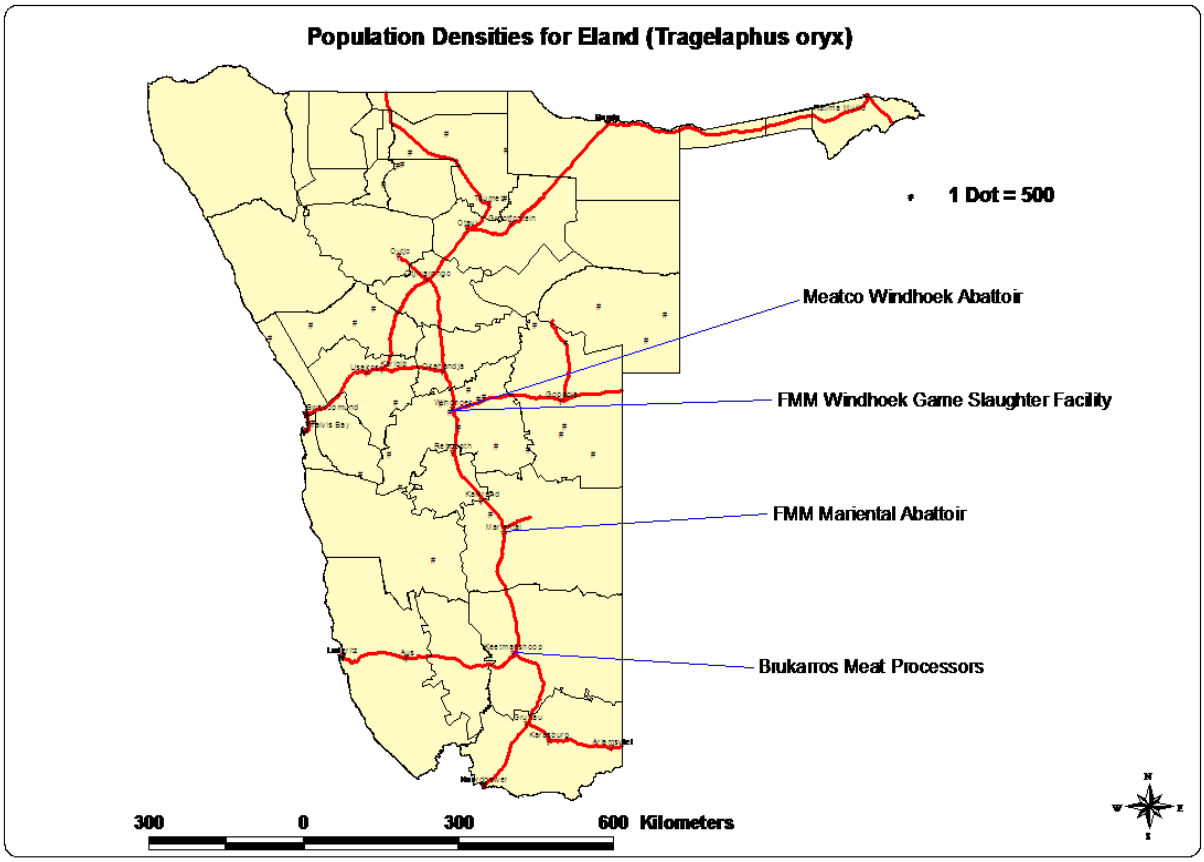

Figure 2.7 The population densities and distribution of plains zebra in Namibia (MET, 2007)

Eland bulls rub their foreheads in mud as part of the courtship and rub it off again against the ground and bushes as part of the mating show (Comley & Meyer, 1997). There is often more than one adult male in a herd, but a strict dominance hierarchy is maintained (Fahey, 1999).

Cransac and Aulagnier (1996) demonstrated that age does not explain the hierarchical organization of captive eland, but that matrilineal genealogy has a significant influence on dominance relationships. Males sometimes make a strange clicking noise by running a tendon over the knee joints which can be heard for hundreds of meters. Eland also have an alarm bark and usually puff and bark while grazing. They are also good jumpers and can leap some three meters off the ground (Comley & Meyer, 1997).

Eland do not have a particular breeding season, but calving peaks in September and October (Furstenburg, 2007d). Gestation lasts for 9 months and only a single calf is born (Fahey, 1999). A cow can reproduce up to 13 times in her expected lifespan of up to 18 years. Calves start to feed on vegetation as from 1 month and are weaned after 4 months (Furstenburg, 2007d).

Eland are classified as browsers (Codron, 2006), mixed feeders or even grazers (Gagnon & Chew, 2000, Sponheimer *et al*., 2003) and usually graze in open areas (Fahey, 1999). Wallington *et al*. (2007) reported that in areas where browse is readily available, larger browse content was found in their diet. Several studies showed that the grass component of an eland's diet is more than 33% at any time of the year (Furstenburg, 2007d).

They require food with high protein content due to high metabolic rates, a narrow thermal neutral zone and large quantities of urea in their urine (Furstenburg, 2007d). Eland often dig up tubers, especially in the African Kalahari (Comley & Meyer, 1997). Von la Chevallerie (1970) reported that the protein intake of eland was about twice as high as that of grazing cattle and that when the protein intake of the cattle was insufficient for maintenance; eland were still thriving on the same grazing.

Eland can be easily tamed (Duncan & Monks, 1992) and its meat has long been reported as the best game meat in South Africa due to its higher fat content (Stevenson-Hamilton, 1947). Barnes *et al*. (2009) reported 37 216 head of eland in Namibia in 2004.

5. Conclusion

Many authors agreed that populations of wildlife in Namibia are increasing on freehold land (Erb, 2004; Gödde, 2008; Lindsey, 2011). In Namibia the percentage of biomass from wildlife increased from 8% in 1972 to 18% in 1992 and 29% presently (Barnes & de Jager, 1996; Saltz, 2004). In a study conducted by Lindsey (2011), most respondents suggested that the abundance of wildlife is potentially higher for some species. They also mentioned that the diversity of wild ungulates has also increased over the past five years.

The potential of meat production from various wildlife species has also long been recognized (Ledger *et al*., 1967; Skinner, 1984). The major wildlife species in Namibia under consideration for commercial game meat export are springbok, gemsbok, kudu, zebra and to a lesser degree, eland. The suitability of these species for commercial meat production is not only based on their population numbers, but also on other factors such as their reproductive performance, the fact that they occur in large herds in easily accessible regions, their suitability for commercial harvesting and proximity to processing facilities.

Game are counted by officials of the Ministry of Environment and Tourism visiting all farms, communal and protected areas by the Ministry of Environment and Tourism and based on these numbers, quotas are issued for trophy hunting, live sales, own use and harvesting for commercial meat production. Long term studies of wildlife population dynamics and aerial surveys will however produce more reliable results, but these approaches are both expensive and time consuming (Caughley & Sinclair, 1994).

The behavioural characteristics of wildlife species are some of the most important factors to consider when producing and harvesting game for commercial meat production. Species differ from one another in terms of their behaviour and this must be taken into consideration when harvesting procedures are followed. The game meat industry in Namibia is underutilized and has the same potential as the cattle and small stock industry in export markets.

CHAPTER 3

GAME / WILDLIFE USES

Natural resources have different economic values and in resources economics these values are often categorized in a frame work of total economic value, comprising direct use values, indirect use values and non-use values. Direct use represents tangible goods with a market value, while indirect use values are derived from the resource's value in ensuring ecological function and non-use values are derived from the use of the preservation of the resource (Barnes *et al*., 2009).

The Convention on Biological Diversity, of which Namibia is a signatory, was adopted in Brazil in 1992 (CBD, 2010), focuses on conservation of biodiversity, promoting the sustainable use of natural resources and the assurance of equitable distribution of the revenue derived from biodiversity production systems to the beneficiaries. Promoting the direct use of wildlife in Namibia would create economic incentives for investing into wildlife resources on private, communal and state land.

1. Wildlife inventory

A national wildlife inventory was completed in 2004 which enabled the development of a set of wildlife accounts for Namibia. These accounts conformed to IEEA methodology which included flow accounts detailing the contributions made by the use of the resource to the national economy with asset accounts detailing the capital asset value of the resource. Non-use values were derived from the use of preservation of the resource, either for future use (option value), mere existence (existence value), or bequeath to future generations (bequest value) (Barnes *et al*., 2009).

Approximately 2 million larger wild animals contribute to the physical wildlife asset base in Namibia which produced a gross output of some N$ 1.5 billion and directly contributed N$ 700 million to the gross national product (GNP). The wildlife use sector represented approximately 2.1% of GNP in 2004, compared with 4.6% for agriculture, 5% for fishing, 6.8% for mining and

3.4 % for tourism. It is anticipated that growth in game / wildlife use values will triple the economic contribution in the next 30 years, bringing it close to its spatial potential. The game / wildlife assets in Namibia were estimated to have a value of N$ 10.5 billion in 2004 (Barnes *et al.*, 2009).

2. Value of game / wildlife use

The direct economic contribution of the game / wildlife sector results in indirect multiplier and linkage effects. Examples are the use of transport services for commercial game harvesting, where value are added in the transport sector, or the purchasing of food for a tourism lodge creates further value addition. A national accounting social matrix model (SAM) of the Namibian economy developed by Lange *et al*. (2004) was used by Barnes *et al*. (2009) to derive a value added multiplier factor, which was used to measure total economic contribution. It was then calculated that for every N$ 1.00 contributed to the Namibian GNP through wildlife use, a further N$ 0.86 is contributed indirectly as a result.

The estimated value of Namibia's use of game / wildlife resources in 2004 is depicted in Table 3.1. Values are given as gross output, the direct contribution of wildlife use to the GNP and the total of the direct and indirect contributions which game/wildlife use made to GNP. Indirect contribution included the multiplier effect in the broader economy. Total output in the wildlife use sector was N$ 1.5 billion while the sector contributed N$ 700 million of direct value to the GNP. Total values amounted to N$ 1.3 billion (Barnes *et al.*, 2009).

Table 3.1 Estimated gross output, direct and total contributions to the GNP from wildlife utilisation in Namibia (2004)

Wildlife use	**Total**
Gross output in wildlife use sector (N$ '000, 2004)	
Gross output	1 474 889
Direct contribution to GNP by utilisation (N$ '000, 2004)	
Wildlife viewing	434 289
Hunting tourism	134 451
Live game	70 045
Commercial meat	4 365
Small scale meat	16 125

Ostrich farming	11 217
Crocodile farming	1 955
Guano farming	3 400
Meat processing	3 083
Taxidermy	12 133
Crafts production	8 591
Total	699 653
Total (direct and indirect) contribution to GNP (N$ '000, 2004)	
Total impact	1 301 354

Wildlife in Namibia is traditionally marketed by means of non-consumptive tourism, trophy hunting, sale of live game and sale of game meat (Erb, 2004). The direct use values of Namibia's wildlife resources come from diverse activities embracing several sectors of the economy. Wildlife viewing is one of the most important components of leisure tourism activities driven by keystone large mammals. Non-consumptive wildlife viewing generated some 62% of the total wildlife Gross National Product (GNP) contribution (Barnes *et al.*, 2009).

Consumptive use of wildlife is often a result of trophy hunting tourism involving high value species. Biltong hunting tourism usually takes place on private land, mainly involving plains game. Some processing of wildlife occurs including taxidermy for hunted trophies, biltong manufacturing, meat processing for export and crafts manufacturing using ostrich eggs and hides / skins (Barnes *et al.*, 2009).

3. Community-based natural resource management programs

The community-based natural resource management (CBNRM) programs in Namibia are based on the understanding that if resources have sufficient value to local inhabitants, who have exclusive rights of use, benefit and management, then this will create incentives for sustainable utilization (Mendelsohn, 2006; NACSO, 2009). This enabled communities in communal areas to establish and register communal conservancies, thereby managing wildlife within these areas, both for wildlife viewing and for hunting tourism (Barnes *et al.*, 2009). Communities increased their income from all community-based natural resource programs from zero in 1994 to more than N$ 42 million in 2009 (NACSO, 2010).

Conservancies obtain benefits from various sources such as tourism, trophy hunting, craft sales, small enterprises and wildlife sales (Mendelsohn, 2006). Lodges and camps earned N$ 16.95 million (52%) of all conservancy income in 2008. The income from direct wildlife utilization was N$ 12.2 million (38%) comprising trophy hunting, safari hunting, own-use hunting and hunting for the local market with harvest and sale permits (NACSO, 2010). Trophy hunting generated an income of N$ 9.9 million of which 83% was from concession fees and 17% from meat distribution.

A total of 25 concessions extending over 29 conservancies were allocated to professional hunters by the end of 2008. Of the total income from the CBNRM programs approximately N$ 3.0 million was in the form of game meat distributed to the members of the conservancies which was an important benefit to local households. Additional economic benefits are the value of local management institutions and capacity building which includes the training of those associated with the conservancies (NACSO, 2010). Today over sixty conservancies are already registered with the authorities and it is envisaged that about 66 will be registered by the end of 2011.

4. Tourism

The Namibian tourism industry is the strongest driving force behind the growth of the wildlife industry. Tourists to the country increased almost fivefold between 1990 and 2005 (Mendelsohn, 2006) and this sector is envisaged to grow by 6.9% per annum between 2008 and 2017 (WTTC, 2006). The country's Tourism Satellite Accounts indicated that in 2006 tourism established directly, as well as indirectly, through support industries to the tourism sector, approximately 75 000 jobs (18.7% of employment) and N$ 6.6 billion (14.2%) to the GDP (NTB, 2008).

Lindsey (2011) revealed that among 250 respondents (farmers), 25.5% derived their income from ecotourism. Ecotourism is practised over approximately 88 000 km^2 of freehold land in Namibia. The mean percentage income from ecotourism across all respondents was 6.8%, while farmers interviewed attracted on average 353 tourists per year to their farms and recorded an occupation rate of 725 on average per year.

5. Live game sales

Until recently, live sales were a feasible option for managing wildlife populations, however auction prices reached a peak and are now declining and are approximately half that obtained for commercial meat sales (Brown, 2008). The marketing channels for selling live game are: direct sales from wildlife dealers to game ranchers (30% of all animals sold); sales at wildlife auctions (16% of all animals sold); live exports, mainly to South Africa (46% of all sales); and farmer to farmer sales within the country (8% of all animals sold) (Mendelsohn, 2006).

Lindsey's study (2011) among 250 farmers revealed that 17.3% of respondents sold live wild animals. The percentage of the income derived from live sales was related to the percentage of income from livestock (the higher the income from livestock, the lower the income from live sales) and wildlife diversity (the higher the diversity, the higher the income from live sales). Live sales are usually undertaken every three to five years and the most common species sold live are gemsbok, red hartebeest, eland, springbok and blue wildebeest (Uahengo, 2012a).

The economic output of wildlife and tourism on freehold land (N$ 1.4 billion) is fast approaching that of livestock (N$ 1.9 billion). Wildlife based land use are found to be more popular among younger farmers, while the numbers of tourists and hunters will continue to increase in future and wildlife based land use will be less affected by climate change than livestock farming (Lindsey, 2011).

Table 3.2 Wildlife numbers exported live to neighbouring countries in 2007 and 2011 (Uahengo, 2012a)

Species	2007	2008	2009	2010	2011
Black wildebeest	340	121	40	25	27
Blesbok	25	35	48	38	0
Blue wildebeest	843	283	178	143	159
Burchell's zebra	161	67	62	26	88
Common impala	0	0	60	60	0
Eland	691	726	562	264	180
Giraffe	257	193	152	138	179

Red hartebeest	3576	2664	1210	779	680
Kudu	807	330	277	192	56
Oryx	9645	8376	5728	3383	2643
Nyala	2	0	0	0	0
Ostrich	25	85	80	20	0
Roan	48	31	6	0	0
Sable	9	4	6	11	0
Springbok	3026	2775	1361	1278	2366
Waterbuck	10	0	17	17	0
TOTAL	19465	15690	9787	6374	6378

6. Trophy hunting

Trophy hunting is an element of the Namibian tourism industry, contributing approximately 14% to the total tourism industry with revenue of at least N$ 134 million. Prices paid by trophy hunters for the experience are high and the industry is important, due to both its potential to generate revenue and its role in creating incentives for conservation (Humavindu & Barnes, 2003). It offers recreational hunts on private land to upper-income hunters from abroad through hunting packages comprising mainly of plains wildlife species. Trophy hunting, however, gives the lowest return per unit area when considering the low percentage of trophy animals on a game ranch (Mostert & Hoffman, 2007).

Namibian landowners with sufficient fenced-in wildlife stocks can register with the Government as hunting farms and offer hunting operations in accordance with Nature Conservation Ordinance No. 4 of 1975 as amended (Anonymous, 1975). On public land, Government and community conservancies can offer hunts. Trophy hunting is only allowed if accompanied by a registered hunting guide. Hunters usually choose between different hunting packages varying in numbers of animals from each species. The trophy industry is dominated by low value plains game hunts on private farms, unlike in Botswana where the industry is dominated by high value key species hunts on public land. Only 3% of the Namibian trophy animal off-take can be classified as involving high value key species, compared with 21% for Botswana (Humavindu & Barnes, 2003).

Barnes *et al.* (2002) described trophy hunting as an important financial component in community

wildlife use initiatives on communal land. Some 24% of the income earned in the wildlife industry accrues to poorer communities through wages, rentals, or royalties (Humavindu and Barnes, 2003). The majority of species hunted by trophy hunters from 2006 - 2009 is depicted in Table 3.

Table 3.3 Major wildlife species trophy hunted in Namibia (2008 & 2009) (Uahengo, 2010b)

Species	2006	2007	2008	2009*
Oryx	4935	5881	5845	3416
Kudu	3239	3849	3193	1832
Warthog	3724	5092	4230	2519
Springbok	3294	3875	3704	2055
Red hartebeest	2307	3038	2679	1587
Steenbok	999	1375	1229	704
Blesbok	951	1325	1204	746
Hartmann's zebra	1275	1817	1820	1075
Blue wildebeest	1198	1560	1532	891
Eland	767	1144	1002	582
Common impala	775	1153	1127	672
Black wildebeest	908	1159	1163	707
Burchell's zebra	517	699	732	386

**Data for 2010 & 2011 not available*

7. Hunting tourism / Safari hunting

Although hunting tourism has long been an important part of the Namibian tourism and wildlife policy, this sector remains poorly explored in economic terms (Sameulsson & Stage, 2007). Namibia is one of the most preferred hunting destinations in Africa and trophy hunting earns more foreign currency for Namibia than it does for South Africa. Humavindu and Barnes (2003) suggested that trophy hunting is five times more important as a contributor to the national economy in Namibia than to South Africa. Moreover, only Tanzania earns more foreign currency from trophy hunting than Namibia (Agriforum, 2007). The number of trophy hunters increased from 181 in 1994 to 775 in 2009 (77%), while the number of common species trophy hunted per year, increased from 4 828 to 18 709 (74%) over the same period (Uahengo,

2012b).

A study by Lindsey (2011) whereby 250 farmers were interviewed revealed that safari hunting was the second-most widely practised form of game / wildlife use, covering an area of approximately 128 000 km^2 with 48.9% of safari hunting occurring in the Otjozondjupa region. This is mainly due to the wildlife diversity in the north. The percentage of income derived from safari hunting was related to the age of the respondent, region and whether properties were within conservancies or not. Fourteen percent of the study's respondents sold management hunts.

8. Commercial harvesting and biltong hunting

Sixteen percent of 250 respondents in Lindsey's study (2011) derived income from wildlife harvesting. This form of game / wildlife use was found to be related to wildlife diversity (diversity was higher on land where animals were harvested) and the specific area of Namibia (commercial harvesting was more common in the small stock area than in the large stock area). Twenty-four percent of respondents derived income from selling biltong hunts. Ecotourism played an important role in this form of game / wildlife use, as well as region. Biltong hunting is most commonly practised in Oshikoto, Erongo and Kunene regions. The income derived from biltong hunting was higher in the small stock area than in the large stock area.

9. Own consumption

Lindsey's study (2011) revealed that 92% of 250 respondents use meat from game / wildlife for own consumption. Own use consumption was related to the income from livestock (own users are more reliant on income from livestock), wildlife biomass and whether farmers were members from conservancies or not. Eighty-one percent of conservancy members shoot for own use. Biomass was found to be higher on farms where respondents do not shoot for own consumption.

10. Land uses

A study by Lindsey (2011), where a sample of 250 farmers were interviewed including

respondents from eight different regions, revealed the percentage distribution of farmers engaging in various land use types. The land uses including game /wildlife use and is depicted in Table 4.

Table 3.4 Percentage of farmers engaging in various land use types (Lindsey, 2011)

	Livestock production	Ecotourism	Safari hunting	Shoot-and sell (own consumption)	Wildlife harvesting	Biltong hunting	Live sales	Management hunts
Total	92.3	25.2	35.7	39.9	16.1	23.8	17.3	13.7
Zone								
Small stock	88.9	34.1	44.4	51.1	20	22.8	24.4	17.8
Large stock	93.5	22	32.5	35.7	14.6	26.7	14.6	12.2
Region								
Erongo	90	20	50	40	0	30	0	0
Hardap	90	20	30	55	10	15	20	15
Karas	89.3	40.7	50	46.4	25	28.6	25	17.9
Khomas	83.3	29.2	29.2	41.7	8.3	4.2	8.3	8.3
Kunene	100	40.7	14.8	37	22.2	51.9	7.4	11.1
Omaheke	83.3	8.3	8.3	8.3	0	8.3	0	0
Oshikoto	100	33.3	50	50	16.7	50	16.7	33.3
Otjizondjupa	97.6	9.76	36.6	36.6	22	17.1	31.7	19.5

11. Constraints

Only part of the total game / wildlife stock can be used at any one time. Reasons are 1) prohibitions of game meat processing in protected areas by Government policies, 2) only some animals are suitable for harvesting, 3) animals harvested are limited to a sustainable annual yield or less, 4) some animals cannot be viably harvested from an economic point of view as they are too remote from human settlements and the required infrastructure, or have restricted markets for their products (Barnes *et al.*, 2009).

12. Conclusion

Current wildlife use conforms to Government policy. Uses and the different combinations thereof are practised differently depending on the locality and terrain (Barnes *et al.*, 2009). Current combinations of game / wildlife use will, however, change in future as landowners maximise returns on their land while opting to spread risks within the constraints of resource

and markets (Barnes, 1998, 2001).

Despite on-going growth in the game / wildlife industry, Namibia farmers have clearly not engaged in wildlife-based land use to its full potential, or nearly as fully as their counterparts in South Africa and Zimbabwe (Lindsey, 2011). Investigations into reasons for this phenomenon should be undertaken.

CHAPTER 4

LEGISLATIONS, ACTS AND REQUIREMENTS

The game harvesting industry in Namibia is regulated by the Ministry of Environment and Tourism through the Nature Conservation Ordinance No. 4 of 1975 (Anonymous, 1975). The Ordinance and the associated regulations make provision for the rules and regulations pertaining to local and commercial harvesting of game animals, registering of game harvesting teams, as well as for the registration of hunting farms with suitable game species populations (Nakamhela & Müseler, 2007).

1. Nature Conservation Ordinance

The applicable chapter in the Nature Conservation Ordinance for the harvesting of game is Chapter III (Sections 25 – 51). Section 25 empowers the Minister from time to time to determine hunting seasons during which game of any species or gender may be hunted. The Minister may further restrict the number of any species or gender of game which may be hunted during a hunting season. The Nature Conservation Ordinance contains self-explanatory schedules.

Each schedule contains the game species for that applicable category of huntability or otherwise. The Minister has the power to change any species from one schedule to another. However, such amendment is not applicable in respect of any farm or any piece of land of at least 1 000 hectares in size and enclosed in a game proof fence. Thus, farmers can decide how many of any species they want to hunt. The only exception to this is the species which are categorized in the Schedules for Protected and Specially Protected Game. For these categories a hunting permit has to be obtained.

Section 29 of the Nature Conservation Ordinance stipulates that the owner of a farm or a piece of land of at least 1 000 ha in size and enclosed in a game proof fence is the owner of all huntable game on the land. Section 35 of the Ordinance permits the owner of a farm who has the right to hunt game, to lease that right to another person. Section 38 of the Ordinance

contains a prohibition against night hunting without the Ministry's written permission. Such permission can be granted by the Ministry in terms of Chapter IV: Problem Animals. Night harvesting for commercial purposes is allowed in terms of the regulations. Section 47 stipulates that only a farmer of a farm of at least 1000 hectares in size and enclosed by a game proof fence may sell game or game meat, subject to having obtained a permit from the Ministry.

The Nature Conservation Ordinance was amended *inter alia* by the Nature Conservation Amendment Act 5 of 1996 (Anonymous, 1996a). This amendment introduced the concept of the communal conservancy. Even though communal conservancies are usually not fenced, the 1996 Amendment Act stipulates in the newly introduced section 24 A (4) that a conservancy shall have rights and duties with regard to the consumptive and non consumptive use and sustainable management of game in the conservancy, in order to enable the members of such conservancy to derive benefits from such use and management.

Subsection 24 A (5) specifies that the provisions of Part III (which should be read as Chapter III), i.e. the right to hunt harvestable game, apply to a conservancy committee. This subsection applies the rights and duties of Chapter III with respect to game to conservancies, even though the conservancy is not at least 1 000 hectares in size and even though the conservancy is not enclosed by a game proof fence. Section 44: *Fences* of the Communal Land Reform Act 11 of 2005 makes it an offence to erect a fence on communal land without the necessary permission granted. The further provisions of this Act relate more to the land and rights of occupation and use of the land.

The Parks and Wildlife Management Bill of 2005, Part VIII: *Wildlife Farms and Game Proof Fences* recognizes the adverse environmental effect of game proof fences or any fence or barrier which restrict the movement of wildlife, and stipulates that any person who wants to erect such a fence first need to have an environmental impact assessment conducted and with the results apply for permission to erect the fence.

The regulations under the Ordinance as stated in Government notice No. 240 of 1976 (Chapter XVI: Game Proof Fences) define the requirements for a game proof fence, as well as a jackal proof fence. The relevance thereof is found in Chapter III of the Ordinance itself (not the regulations), in which the land owner's property rights and hunting rights over game are

contained. Section 29 of the Ordinance stipulates that the owner of a farm, which is enclosed with a game proof fence or an adequate fence, or the owner of any piece of land which is not less than 1 000 ha in extent and enclosed with a game proof fence, shall be the owner of all huntable game on the land.

2. Harvesting regulations

The relevant Namibian legislation for harvesting teams is Chapter XII of the Regulations under the Nature Conservation Ordinance. This Chapter contains the requirements for the registration of a night harvesting team. A farmer may only employ a registered night harvesting team. This chapter therefore contains the qualifications and levels of expertise required of all the members of the harvesting team, the specifications of the vehicles and of other equipment such as lighting, which are to be used during harvesting. The registration of the harvesting team also requires that the Ministry of Environment and Tourism be provided with the names of the entire team, being the team leader, the marksmen, the drivers and the light operators.

The harvesting team leader is required to provide a report to the Ministry within five days after the completion of any culling operations. This report must include *inter alia* the amount of head, neck and body shots that were made by each marksman, as well as the number, gender and species of the game shot, how many females were in gestation, including the size of the foetus. Section 124 of Chapter XII stipulates that where 50 or more small game, or 20 or more large game are to be shot at one time for marketing purposes, then the Minister may grant approval to the farmer of a game proof fenced farm to have such animals shot at night, provided that the harvesting operations are completed within 4 successive days.

Section 125 stipulates that where a night harvesting permit is granted for export of the meat for an overseas market, then the carcasses shall be inspected by a health inspector or veterinarian, and such inspector or veterinarian is empowered to give the harvesting team instructions on how the carcasses are to be handled. Section 125 empowers the Ministry to allocate a nature conservation official to supervise the night harvesting operations. This official has the powers to inspect the equipment and the activities of the harvesting team. This includes the power to prohibit any team member to take part in the operations or to totally cancel the culling operation, if the official finds that any provisions of the ordinance or the regulations are being violated.

3. The Parks and Wildlife Management Bill

The Parks and Wildlife Management Bill of 2005 was drafted to repeal the Nature Conservation Ordinance No. 4 of 1975. No confirmation could be obtained about when enactment of the Bill can reasonably be expected. One of the objectives of this new Bill is to give effect to the Namibian Constitution by establishing a legal framework to provide for and promote the conservation of wildlife and wildlife habitats, and the mutually beneficial co-existence of humans with wildlife, within and as part of the natural environment of Namibia and the sustainable use of wildlife and wildlife habitats (Erb, 2004).

The Bill also gives Conservancies the responsibility to draft and submit conservancy management plans to the Ministry and the Communal Land Board, which must include a description of the wildlife management objectives of the conservancy. The management plans must be submitted at the latest on the anniversary of the registration of the conservancy and must be reviewed every five years with the Ministry. An impediment to the current Bill seems to confirm that a greater devolution of management powers away from the Ministry and more toward local level is not envisaged by the Bill.

The Bill additionally makes provision in Part VII: *Wildlife Management Units*, Section 41: *Registration of Wildlife Management Units* for the registration of Wildlife Management Units. These organizations will have the right to manage wildlife within the unit. However, the units must submit annual reports on the implementation of the management plans to the Ministry. The reports must include all introductions and off-takes of wildlife from the unit. The Bill maintains the categorization of huntability of game, by distinguishing between protected and specially protected species in section 48. The Bill also maintains the stipulation that hunting shall only occur with a hunting permit, and that the Minister shall declare hunting seasons from time to time.

Part XI of the Bill: Trade in Wildlife and Wildlife Products formulates the basic principles under which trade in wildlife and wildlife products will take place. The details will be contained in regulations under the Act, when promulgated. Again all activity under this chapter has to be approved by the Ministry with a permit. Section 69 states further that any export and import of wildlife and wildlife products shall only be permitted in accordance with CITES. Section 74

states that no person other than a registered night culling/harvesting unit may cull/harvest wildlife at night for commercial purposes.

4. Competent authority (DVS)

In Namibia the Namibian Directorate of Veterinary Services (DVS) in the Ministry of Agriculture, Water and Forestry is the competent authority on animal health, animal disease control, disease monitoring and surveillance. Certification of exports of animal and animal products is done by the Official Veterinarians of the Directorate. The legislations pertaining to the export of game meat to any other country are governed by the requirements of the particular importing country. Official veterinarians are required to make certain health attestations which cover both animal health and public health conditions (Kamwi & Magwedere, 2007).

There is a difference in definition for large and small game between the South African (and thus Namibian) legislation and the European Union legislation. The South African Meat Safety Act No. 40 of 2000 (Anonymous, 2000) defines gemsbok, kudu, hartebeest and zebra as large game (Category B) and springbok as small game (Category C). The definition section in the European Union legislation, Regulation (EC) No. 854, Annex I (Anonymous, 2004a), defines small wild game as "*wild game birds and lagomorphs living freely in the wild"* (paragraph 1.7). A lagomorph is any plant eating mammal with two pairs of incisors in the upper jaw specialized for gnawing, i.e. rabbit and hare. Large wild game is defined as "*wild land mammals living freely in the wild that do not fall within the definition of small wild game"* (paragraph 1.8).

All the species suitable for commercial harvesting in southern Africa would thus be classified as large wild game in the European Union legislation. Certification of exports of animal and animal products in South Africa and Namibia is done by the competent authority of the exporting country. The legislations pertaining to the export of game meat to any other country are governed by the requirements of the particular importing country. Official veterinarians are required to make certain health attestations which cover both animal health and public health conditions (Kamwi & Magwedere, 2007).

5. Legislation and guidelines for game meat export

5.1 Export to South Africa

The following legislations and guidelines are applicable to the export of game meat from Namibia to South Africa (Kamwi & Magwedere, 2007):

- *South African requirements*
  - Codex Alimentarius – Recommended International Code of Hygiene Practise for Game (CAC/RCP 29-1983, Revision 1, 1993) (Anonymous, 1993a);
  - Meat Safety Act No. 40 of 2000 (Anonymous, 2000) and draft game meat regulations (Anonymous, 2004d); and
  - Veterinary Procedural Notices (Anonymous, 2005c).

- *Namibian requirements*
  - Animal Diseases and Parasites Act No. 13 of 1956 and its regulations as amended (Anonymous, 1956);
  - Prevention of Undesirable Residues in Meat Act No. 21 of 1991 as amended (Anonymous, 1991);
  - Animal Protection Act No. 71 of 1962 as amended (Anonymous, 1962); and
  - Veterinary Circulars.

5.2 Export to the European Union

Apart from Namibian requirements, the following legislations and guidelines are applicable to the harvesting, dressing and export of game meat from Namibia and South Africa to the European Union (Kamwi & Magwedere, 2007):

- Council Decision 79/542/EEC as regards certification requirements for imports into the community of certain live ungulate animals and their fresh meat (Anonymous, 1979);
- Council Directive 92/45/EEC on public health and animal health problems relating to the killing of wild game and the placing on the market of wild-game meat (Anonymous, 1992);

- Council Directive 93/119/EC on the protection of animals at the time of slaughter or killing (Anonymous, 1993b);
- Council Directive 96/23/EC on measures to monitor certain substances and residues thereof in live animals and animal products (Anonymous, 1996b);
- Council Directive 98/83/EC on the quality of water intended for human consumption (Anonymous, 1998);
- Council Directive 2002/99/EC laying down the animal health rules governing the production, processing, distribution and introduction of products of animal origin for human consumption (Anonymous, 2002a);
- Commission Regulation No. 178/2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety (Anonymous, 2002b);
- Commission Decision 2003/73/EC-amending Decision 97/468/EC as regards the inclusion of Estonia and Namibia establishments in provisional lists of third country establishments from which Member States authorize imports of wild game meat (Anonymous, 2003a);
- Council Directive 2003/99/EC on the monitoring of zoonosis and zoonotic agents;
- Commission Regulation No. 1441/2007 (Anonymous, 2007) amending parts of Regulation No. 2073/2005 on microbiological criteria for foodstuffs (Anonymous, 2003b);
- Commission Regulation No. 852/2004 on the hygiene of food stuffs (Anonymous, 2004a);
- Commission Regulation No. 853/2004 laying down specific hygiene rules for food of animal origin (Anonymous, 2004b);
- Commission Regulation No. 854/2004 laying down specific rules for the organization of official controls on products of animal origin intended for human consumption (Anonymous, 2004c);
- Commission Regulation No. 2073/2005 on microbiological criteria for foodstuffs (Anonymous, 2005a);
- Commission Regulation No. 2075/2005 laying down specific rules on official controls for *Trichinella* in meat (Anonymous, 2005b);
- Commission Decision 2008/752/EC amending Annexes 1 and 11 to Council Decision 79/542/EEC as regards certification requirements for imports into the community of certain live ungulate animals and their fresh meat (Anonymous, 2008).

- Commission Regulation No.810/2010 amending Commission Regulation 206/2010 laying down lists of third countries, territories or parts thereof for the introduction into the European Union of certain animals, fresh meat and the veterinary certification requirements (Anonymous, 2010b).

6. Impediments

The current practice in Namibia of declaring a harvesting season for only a few winter months does not enable the local game producers to ensure a constant supply of game throughout the year to the game abattoirs, resulting in abattoirs being reluctant to commit processing capacity to game. With an open hunting season, the game harvesting, processing and marketing industry will be in a position to conduct activities more efficiently (Nakamhela & Müseler, 2007). Although not yet abolished, the Director of Parks and Wildlife Management from the Ministry of Environment and Tourism does not object to all-year hunting as long as veterinary regulations and requirements are met (pers. comm. Beytell, B. 2008). It is recommended that the current harvesting season be extended to at least 10 months of the year, provided that game animals are harvested in a sustainable manner and that the quality of the meat is consistent throughout the harvesting season.

For commercial harvesting purposes only night harvesting is currently allowed by the Namibian Ministry of Environment and Tourism. This ruling was introduced because of the cooler night temperatures, fewer insects and the fact that game animals will not run away that easily when a light is shown upon them at night. However, it has been scientifically proven (Laubscher, 2009) that when a trained hunting team is used for harvesting, there are only small differences in pH values between game animals shot during the day and those shot during the night. It should be recommended to the Ministry to also allow day harvesting for commercial harvesting purposes, provided that game animals are shot and eviscerated hygienically.

Another impediment in Namibia is the requirement for the landowner to acquire a permit with a quota for the number of game animals to be harvested. The term landowner is used in its widest meaning including farmers in conservancies. In the seventies, when game numbers were dwindling and when the Nature Conservation Ordinance was promulgated, it was understandable that it was necessary to have legislative and regulatory restrictions imposed so

as to ensure that game is not over-utilised. Currently the Ministry of Environment and Tourism is understaffed and therefore game numbers inspections do not take place as often as needed by farmers and hunters supplying game meat to commercial markets. The delay between the inspections and the actual harvest often result in numbers being inaccurate since game animals move from one farm to another, especially in the rainy seasons. A mechanism can be developed whereby land owners determine sustainable off-take figures and where the Ministry of Environment and Tourism only does spot checks to verify if sustainable harvesting practices are followed. Heavy fines can be introduced for those who do not comply and over-exploit the resource.

Harvesting in communal areas is in itself not an impediment because the supply is more than the demand. The procedure of organizing a harvest on communal land must be simplified. Decisions to allow harvesting are vested in a committee and not in an individual. The historical conditions which necessitated the restrictive provisions as contained in the Nature Conservation Ordinance No. 4 of 1975 are not prevalent any longer. The continued applicability of these restrictive provisions is a serious obstacle to the realization of the Namibian game meat potential. Unfortunately the provisions of the hunting permits and quota setting by the Ministry of Environment and Tourism have been taken over into the Parks and Wildlife Management Bill and were not favourably amended to support the development of the Namibian game meat industry (Nakamhela & Müseler, 2007).

A further impediment towards the development of the Namibian game meat potential is the current practice that partially dressed carcasses (carcasses with abdominal viscera removed) may be hunted and exported (hide/skin-on) to South Africa under the direct supervision of a veterinary official. The game is allowed to be placed in a refrigerated truck, sealed and exported to an approved game meat processing plant in South Africa. The Namibian Directorate of Veterinary Services concluded this arrangement with the veterinarians in South Africa, due to a lack of facilities to dress and process game carcasses (pers. comm. Kamwi, J. A. 2008). Annually about 10 000 game animals are exported to South Africa in this way and this practice takes away job opportunities for Namibians and acts as an disincentive to the Government of Namibia's aim for value-addition within Namibia (Government of the Republic of Namibia, 2004).

7. Conclusion

Numbers of game have increased exponentially and their commercial and economic value is being realised to great benefit by landowners for consumptive uses. It can easily be argued that the commercial value could serve as an economic incentive for game producers not to overexploit the valuable resource (Nakamhela & Müseler, 2007).

The current practice in Namibia of declaring a harvesting season for only a few winter months does not enable the local game producers to ensure a constant supply of game throughout the year to the game processing facilities, resulting in existing facilities being reluctant to commit processing capacity to game. The informal market for game harvesting, dressing and processing in Namibia is therefore huge, as many of these activities are undertaken by biltong hunters from South Africa, who at times are also accompanied by their own harvesting teams.

CHAPTER 5

GAME HARVESTING AND DRESSING

Namibia has a number of regulations that apply to the sustainable use of game animals which are applicable when the harvesting of game animals for commercial game meat production is used to remove excess animals (Nature Conservation Ordinance No. 4 of 1975). Countries importing game meat, such as South Africa and the European Union, also lay down specific rules and regulations whereby countries willing to export game meat, must abide. Each of the harvesting teams should have a well-documented and implemented hygiene management system, as required by the importing country, in place, before the meat harvested will be allowed to be exported by the competent authority, which is the Directorate of Veterinary Services in Namibia.

1. Game harvested for meat production

Huge quantities of game meat are produced in Namibia and considerably more than was previously noted (Lindsey, 2011). Laubscher *et al*. (2007) estimated that 3 400 tonnes of game meat were produced in Namibia annually during the period 2001 – 2005 compared to the estimates of Lindsey's study (2011) estimating 16 000 to 23 000 tonnes produced annually. Most meat is produced from safari hunting, followed by own use (consumption). Game meat shot harvested with shoot-and sell permits or night harvesting permits for export only represent 24% of the total. Off-take as a proportion of species seems to be on the increase, although gemsbok, kudu and springbok are the species producing most of the meat (Lindsey, 2011).

2. Areas approved for harvesting

Game should not be harvested from areas which are subject to official prohibition of harvesting, whether the prohibition is for reasons of conservation, animal health, animal or plant chemical control, or any other reason (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993). In Namibia, game animals may only be harvested from the OIE recognized Foot and Mouth Disease (FMD) free zone without vaccination (Figure 6). In Namibia this zone extends south of

the Veterinary Cordon Fence which extends from Palmgrave Point in the West to Gam in the East of Namibia (for bovine, ovine, caprine, wild and farmed game). The meat should be obtained from animals originating in areas which are free of OIE (Office Internationale des Epizooties) / World Animal Health Organisation) notifiable diseases prior to slaughter (Kamwi & Magwedere, 2007).

3. Requirements for harvesters

Harvesters should note any abnormal condition they detect in the live game animal, or during the evisceration or bleeding of a game carcass, and such abnormal condition should be reported to an inspector if that game carcass is taken to a game establishment (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993). Harvesters are required to be registered and must meet certain requirements understanding the normal disposition of the animal (Meat Safety Act No. 40 of 2000).

For meat exports to the European Union harvesters must be trained in health and hygiene and must have sufficient knowledge of the pathology of wild game and of the production and handling of wild game and wild game meat after harvesting to be able to undertake an initial examination of wild game at the point of harvesting. Training of harvesters should cover at least the following subjects (Regulation (EC) 854/2004, Section 4, Chapter 1, paragraph 1 - 5):

- the normal anatomy, physiology and behaviour of wild game;
- abnormal behaviour and pathological changes in wild game due to diseases, environmental contamination or other factors which may affect human health after consumption;
- the hygiene rules and proper techniques for the handling, transportation, evisceration, etc. of wild game animals after killing and;
- legislation and administrative provisions on the animal and public health and hygiene conditions governing the placing on the market of wild game.

Results from a study by Atanassova *et al*. (2008) concluded that freshly shot game has a very good hygienic status when all requirements are properly carried out. They detected a connection between the shooting methods of expertly and non-expertly shot animals and the

occurrence of *Enterobacteriaceae* which can cause meat spoilage, as lower levels of *Enterobacteriaceae* were found in expertly shot roe and red deer (11%) than in non-expertly shot animals (31.3% in roe deer, 40% in red deer) .

4. *Ante mortem* inspection

If an animal is under stress when harvested, the quality and shelf-life of the meat will be negatively affected. The meat of stressed animals may discolour. Blood supply to the muscles is increased and this can result in poor bleeding and meat that is not tender. Only game which passed the *ante mortem* inspection and that are seemingly alert may be shot (Van Schalkwyk & Hoffman, 2010). *Ante mortem* inspections must be carried out by the harvester prior to the harvesting operation (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993; Meat Safety Act No. 40 of 2000).

If no abnormalities were observed among the animals during the examination, no abnormal behaviour was found before harvesting and there was no contamination to the environment, the trained person must attach a numbered declaration to the shot animals stating the condition of the animals, the date, time and place of the killing (Regulation (EC) No. 854/2004, Chapter II, paragraph 4(a)). For meat exports to the European Union, harvesters must comply with the requirements imposed by the European Union to permit the monitoring of certain residues and substances in accordance with Council Directive 96/23/EC.

5. Shooting

Game should be shot in the field in a humane manner (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993). Shooting must be done by a competent marksman, ensuring immediate death. Only head shots are allowed for commercial harvesting. This is essential to limit decay and contamination of the meat (Van Rooyen *et al.*, 1996). Game killed with thoracic and abdominal shots are subject to secondary inspection (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 61). For meat exports to the European Union, shooting must be executed in accordance with Council Directive 93/119/EC.

6. Bleeding

Game intended for commercial purposes must be bled without delay (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993) and preferably within 10 minutes of being shot (Van Schalkwyk & Hoffman, 2010). Blood is an ideal growth medium for bacteria and when not well-bled, a carcass will deteriorate faster (Van Rooyen *et al.*, 1996). Bleeding is done by means of severing the jugular vein and carotid artery on either side of the neck (throat slitting) with a clean sterilized knife. In any event, the bleeding must be carried out before the animal regains consciousness. All animals which have been stunned (shot) must be bled by incising at least one of the carotid arteries or the vessels from which they arise (Regulation (EC) No. 854/2004, Chapter III, paragraph 1).

The knife used for bleeding must be washed and sterilised before each cut. Large numbers of bacteria are found on the skin of any animal and contaminate knives when cutting through the skin. A system for sterilising the knives should be available. Ideal would be water at a minimum of 82 ºC, but since this is sometimes not practical; an approved chemical steriliser in an enclosed holder which is fitted to the harvesting vehicle should be used instead.

When large numbers of game are harvested several knives should be used to prevent cross-contamination between carcasses. A two-colour knife system is often recommended to ensure the effective sterilization of the knife not in use. Workers bleeding the game must wash their hands between each carcass with bactericidal (food grade approved) soap and potable warm water (42 º - 45 ºC) (Van Schalkwyk & Hoffman, 2010).

The different categories must be bled in the following ways (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 62):

- category A (large animals) may be bled in a lying position;
- category B (medium animals) held on a ramp at a minimum of 20 º ; and
- category C (small animals) may be bled in a lying position.

Wounded animals requiring a second shot must be condemned if a time period of 10 min is exceeded after the first shooting. All suspect animals, including those that have been wounded, must be identified and clearly marked. Detained carcasses can either be totally condemned or

passed conditionally. Suspect carcasses must be separated or fully covered in plastic when transported to the export abattoir for examination by the State Veterinarian.

On the Suspect Carcass Form, which must accompany the consignment to the game handling facility, the following should be indicated by the Game Meat Examiner (Van Schalkwyk & Hoffman, 2010):

- species, age, gender and weight of game animal;
- part of carcass affected;
- possible cause of detention; and
- additional observation made during hunting.

7. Evisceration in the field

If the shooting site is far from the field abattoir, the intestines and stomach should be removed from the carcass. Care must be taken to ensure that the abdominal cavity and the cut surfaces are not contaminated with rumen content, dust or dirt (Ebedes & Meyer, 1996). This should be done within 15 – 20 min after the animal has been shot. A knife with a rounded cutting edge is needed for this purpose. Evisceration is easier when the carcass is in a hanging position with the head hanging downwards. It is advisable to staple the cut skin of the abdominal wall together for transporting (Van Rooyen *et al*., 1996).

8. Transport of harvested game to field abattoir

Game carcasses should be transported to a field abattoir within 2 h of bleeding. The neck slit area must not be contaminated when transporting the carcass to the field abattoir/depot (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 65). Vehicles used for harvesting Category C (small game - Namibian and South African category) game or springbok (considered as large game by the EU) must be (Van Schalkwyk & Hoffman, 2010):

- designed with a corrosion resistant hanging frame to bleed carcasses in a hanging position;
- designed to provide sufficient space (no heaping) between carcasses to allow effective air flow for cooling;

- corrosion resistant and free from holes and cracks;
- durable, non-toxic, smooth surfaced and impervious;
- resistant to impact;
- easily cleanable;
- free from equipment or loose objects, other than what is required for the harvesting of game; and
- designed in such a manner that the animal's feet are not touching the ground while in transit.

Vehicles used for the harvesting of Category B (medium) game must:

- comply with the requirements above; and
- have a hoist and a ramp manufactured at a minimum slope of 20 º for hanging of game.

9. Partial dressing of the game carcasses at the field abattoir

Carcasses must be transferred from the collecting vehicle to a clean slaughter frame at the field abattoir in such a manner as to avoid contamination. Labels must be provided for the identification of each carcass and its organs (Ebedes & Meyer, 1996) as maintaining traceability is essential for export purposes. At the field abattoir the heads and feet may be removed provided that it can still be correlated with the carcasses when meat inspection is done. Horns may be removed with part of the cranium and stored separately (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 64). In specific cases like the zebra, heads and feet are not cut off at the field abattoir/depot since the skin has more value when the skin of the head and feet is also preserved.

Partial evisceration, normally restricted to the removal of the intact gastrointestinal tract, serves to reduce the weight and bulk of the carcass and to speed cooling. Such removal should be restricted to those parts which will not increase exposure to contamination to an unacceptable level and which the controlling authority determines are not required for inspection. A game carcass should not be skinned or dressed beyond the extent required in the Codex guideline (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993). Incision lines for opening the hide or skin must be spear cuts from the inside to the outside. A clean sterilized knife must be used.

Lactating udders and reproductive organs are regarded as condemned material and must be removed with the skin on in such a way as to prevent contamination. Contact with outer surfaces and soiled equipment must be avoided at all times. Carcasses may not be washed and soiled or contaminated areas must be cut off (Van Schalkwyk & Hoffman, 2010).

The trachea and oesophagus are cut loose from the surrounding muscles, from the lower jaw to the breastbone and the diaphragm is cut away from the ribs. The trachea, oesophagus, lungs and heart (red offal) are hung in enclosed bags next to the carcass (Van Rooyen *et al.*, 1996). It must be kept identifiable with the carcass of origin until inspection (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 65).

The game meat inspector at the field abattoir must inspect each carcass and matching viscera, head and feet and any abnormalities must be noted down in a report to be forwarded to the game meat processing facility. If a game meat inspector is not available at the field abattoir/depot, the viscera, heads and feet must be transported with the carcasses to the game abattoir, while maintaining identification between the carcasses and the organs. Lockable fly-proof containers must be available during evisceration for the collection of condemned material (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 66).

Continuous cleaning and sanitation should be practiced throughout the evisceration process at the field abattoir (Clean-as-you-go). Workers must continuously clean and sanitize all hooks, knives, tools and other equipment used during evisceration with warm water (82 º - 87 ºC) or chemical sterilizer (1 - 2 ppm free chlorine) to prevent contamination. The temperature and chlorine level of the water must be tested throughout the harvesting process. The chemical data sheets of all detergents and sanitizers, as well as the dilutions and contact times must be available on site. When the floor surface becomes covered in blood and dirt it should be swept clean (Van Schalkwyk & Hoffman, 2010).

10. Chilling of game carcasses

Partially dressed carcasses and offal must be chilled within 12 h of harvesting to a temperature not exceeding 7 °C, but when the ambient temperature is more than 15 °C, it must be chilled

within 4 h of being killed (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 67). Where the ambient temperature is sufficiently low to achieve the required temperature, carcasses should be placed under refrigeration soon after harvesting, either in a game depot, game establishment or other specifically approved facility (Codex Alimentarius CAC/RCP 29-1983, Revision 1, 1993).

Veterinary maturation of meat destined for the European market is necessary. This is a control process whereby the Foot and Mouth disease virus is deactivated. Carcasses must be submitted to maturation at a temperature above 2 ºC and below 7 ºC for at least 24 h before de-boning. All carcasses that have gone through the maturation period should have a pH of less than 6.0. The pH values of at least 10% of randomly chosen carcasses should be recorded as recommended by Namibian Veterinary Authorities (Kamwi & Magwedere, 2007). The maturation period starts when the door of the refrigerated truck is closed after the last carcass have been placed in the refrigerated truck. This requirement is described in Commission Decision 2008/752/EC amending Annex I and II of Council Decision 79/542/EEC as regards certification requirements for imports into the Community of certain live ungulate animals and their fresh meat.

Maturation of the meat is critical regarding meat quality. Game has a high metabolic rate and incomplete maturation may occur. Conditions before shooting may increase metabolism (Fink, 1992; Kappelhof, 1999). Cooling of carcasses is hampered due to aponeuroses which firmly surround the muscles and the often, thick hairy skin (Altemeier *et al.*, 1998). If the glycogen reserves are reduced by stress, meat maturation and acidification can be impaired resulting in game meat which is tough, has a limited shelf life and a higher pH (Hofmann, 1987; Fink, 1992; Deutz, 2000).

11. Vehicles transporting harvested game

Vehicles used for the transport of partially dressed carcasses must comply with the standards for a meat transport truck according to the requirements for Food Premises under the South African Health Act No. 61 of 2003 (Anonymous, 2003c). If partially dressed carcasses and offal need to be held in a refrigerated truck for periods exceeding 8 h, the refrigerator unit must have the potential to chill such carcasses to a core temperature of less than 7 °C within 24 h of being

off-loaded.

Carcasses must hang away from the floor in such a way as to ensure optimal air flow between carcasses and to avoid contact between skin surfaces and exposed meat of the body cavities. Edible rough and red offal transported in the same load space as the carcasses must be packed in closable leak proof containers (or bags) (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 68). These organs must preferably hang together with the carcasses.

Game meat can only be marketed commercially if it was transported to a game handling establishment as soon as possible after the *ante mortem* inspection. The viscera must accompany the body and must be identifiable as belonging to a given animal (Regulation (EC) 854/2004, Chapter II, paragraph 3). If no trained person is available to carry out examinations on the body, then the head (except for tusks, antlers and horns) and all the viscera except for the stomach and the intestines must accompany the body (Regulation (EC) No. 854/2004, Chapter II, paragraph 4 (c)). The heaping of carcasses should be avoided while travelling to the game handling establishment (Regulation (EC) No. 854/2004, Chapter II, paragraph 6).

12. Hygiene control

An adequate supply of chlorinated, drinkable water (river or dam water is not acceptable) must be available at the field abattoir, as well as on the vehicle that transport the carcasses. All washing should be preferably done with warm (42 º - 45 ºC) running water. No cloths may be used to dry meat, equipment or hands (Ebedes & Meyer, 1996).

An approved Hygiene Management System must be implemented by the management of the field abattoir which includes hygiene controls for harvesting. Control measures must be taken to ensure that no contamination of meat and edible products occur (Paulsen & Winkelmayer, 2004). All workers must be trained in correct harvesting techniques including principles of hygiene practices (Van Schalkwyk & Hoffman, 2010).

13. Receiving of game carcasses at the game processing plant

Flaying and final dressing of the partially dressed game meat carcasses may only be done in a

game meat processing plant. Carcasses must be offloaded and removed to the holding chillers without delay. In the case where the refrigerated truck is used to hold carcasses before dressing, the doors must be closed when not loading out (Meat Safety Act No. 40 of 2000, Part V, Section 11.(1)(h), paragraph 69).

14. Dressing and portioning of carcasses

Incision lines to a hide or skin must be made with a spear cut from the inside to the outside with a clean sterile knife. Separate knives must be used for cutting the skin and the rest of the carcass (Van Rooyen *et a*l., 1996). Mechanical flaying knives cannot be used for this purpose. Contact of the exposed meat with platforms, walls, floors, outer surfaces of the hide or skin and any soiled equipment must be avoided.

All organs received separately at the game processing plant must be available and identifiable for meat inspection. Final washing with water is allowed to remove bone chips and blood from the carcass. For exports to South Africa, substances (such as vinegar) intended to prevent spoilage by inhibiting the activities of insects, or the development of bacteria or moulds, may not be applied to the meat unless it applies with the requirements for chemical usage as described in the South African Foodstuffs, Cosmetics and Disinfectants Act No. 54 of 1972. Exports to the European Union must adhere to the regulations regarding the use of cleaning chemicals in Decision 2006/330/EC, amending Decision 2005/432/EC, as well as EU regulation 810/2010 amending EU regulation 206/2010, depending on the type of product to be exported (Anonymous, 2010b).

Approved carcasses may be halved and quartered before or after chilling. Any further cutting must be done in an approved cutting plant (Meat Safety Act No. 40 of 2000, Part V, Section 11. (1)(h), paragraph 71, 72, 73). Un-skinned game carcasses may only be skinned and placed on the market if it was handled separately from other food before skinning and not frozen. The de-skinned carcass must undergo a final inspection in accordance with Regulation (EC) No. 854/2004 (Regulation (EC) No. 854, Chapter II, paragraph 8). Cutting and boning must be organized in such a way as to prevent or minimize contamination. Meat intended for cutting must be brought into the workrooms progressively and as needed.

During cutting, boning, trimming, slicing, dicing, wrapping and packaging, the meat must be maintained at a temperature of not more than 7 ºC with an ambient temperature of not more than 12 ºC. Where premises are approved for different species, cross-contamination must be avoided by separating the operations of different species in either space or time (Regulation (EC) No. 854, Chapter V, paragraph 2).

15. Controls at the game handling facility

The official veterinarian at the game processing facility will verify that the seal of the truck off-loading the partially dressed carcasses is not broken and that the seal number corresponds with the seal number as indicated on the Game Harvesting Control Document and that the amount of partially dressed game carcasses and their tag numbers concur with information provided.

The official veterinarian will record the temperatures. Continuous thermo-control recording is recommended from loading of the carcasses to arrival and unloading at the game meat handling facility. The recording must provide the accurate actual time and temperature analyses covering all phases of harvesting and transport (Van Schalkwyk & Hoffman, 2010).

The primary responsibility for food safety rests with the food business operator (Regulation (EC) No. 852, Chapter I, Article I, paragraph 1) and it is necessary to ensure food safety throughout the food chain, starting with primary production (paragraph 2). Food business operators must establish, implement and maintain hygiene control procedures based on HACCP (Hazard Analytical Critical Control Points) principles (Regulation (EC) No. 852, Article 5, paragraph 1). This is applicable to the harvesting of game for meat exports to the European Union. Records must be available of observations, checks, results, laboratory analyses and corrective actions taken (Meat Safety Act No. 40 of 2000, Part III, Section 11. (1)(e), paragraph 47).

Personnel must be trained in hygiene procedures and personal hygiene and records thereof must be kept (Meat Safety Act No. 40 of 2000, Part V, Section 11. (1)(f)). In order to comply with EU regulations on the monitoring of specific residue in meat (Council Directive 96/23/EC), the testing for residue of Lead (Pb) and Cadmium (Cd) in kidneys and liver of game animals harvested for commercial purposes is compulsory.

16. Quality control of meat

As the local consumption and export of game meat from Africa increase, it is becoming increasingly important to maximize its quality in order for it to compete with that of domestic species. One of the major quality aspects that can be controlled through proper management is the use of harvesting techniques suited to the specific species being harvesting and the efficiency of minimizing *ante mortem* stress. It has been shown that the terrain and the specific behaviour of the targeted species influence the harvesting technique(s) to be employed. Although very little scientific proof exists that the harvesting techniques used in the industry maximize the meat quality, the techniques are efficient and work.

The hygienic handling of the carcasses prior to skinning and de-boning is another crucial factor when it comes to the quality of the product being produced. The commercial harvesting teams in Namibia are subject to stringent legislations, regulations and monitoring to ensure a quality game meat product to the discerned consumer. Most of these were derived from the formal red meat industry and may require further refining.

An aspect that warrants further research, as pertaining to the different methods of harvesting of the various game species, is a more intensive quantification of the effect of the boma harvesting on the meat quality of the animals. Aspects within this scenario that require analysis include the lairage duration (time from chasing to the start of harvesting), as well as the aspects that are linked to this (such as duration of chasing by the helicopter into the boma). It is obvious that these requirements (and recommendations that are derived from the research) will differ from species to species. The effect of species and environmental conditions on the time period before removal of the stomachs and intestines also needs elucidation.

Personal observation have also indicated that the cooling regimes in the refrigerated trucks need to be investigated further as there are quality issues (colour stability and drip loss) with the meat further down the supply chain when the protocols and cold chain are not maintained. This is of particular importance with the larger species (zebra, wildebeest, eland, etc.) when the surface area to volume ratio is such that rate of chilling is slow.

17. Conclusion

Namibia is in a privileged position to have competent authorities which oversee the sustainable harvesting, hygienic dressing and processing of game meat. These authorities ensure that standards of importing countries are maintained and that Namibia is ensured of an export market for its meat and meat products.

CHAPTER 6

GAME MEAT MARKETS

Significant quantities of game meat are produced in Namibia in informal and formal ways (Lindsey, 2011). Production estimations of between 3 400 tonnes (Laubscher, 2007) and 16 – 23 000 tonnes (Lindsey, 2011) annually are observed by some authors.

1. Demand for game meat

The way we eat is changing, as can clearly be observed from conferences and lectures on the consumer of the future, trend in food consumption and changing in consumer demands. Meat is still a central part of eating patterns. There are changes with regard to the way meat consumption is distributed across different kinds of meats (Grunert, 2006).

There is a clearly defined demand for meat from species such as springbok, gemsbok and kudu in some countries of the European Union (Olivier & Van Zyl, 2002). It is also anticipated that the demand for game meat will increase (Carruthers, 2008) both locally and internationally (Jansen van Rensburg, 2001). Namibian game meat has to compete with other red meats such as beef and lamb (Meat Board of Namibia, 2010), as products from different species are sold in the same markets (Cattaneo & Pellegrini, 1995).

2. Consumer behaviour

Research has shown that consumers are poorly educated regarding the nutritional benefits and cooking methods of game meat (Crafford *et al*., 2003). Therefore the marketing of game meat on a larger and more organized scale could be beneficial and increase profits to both game ranchers and game meat processors (Hoffman, 2001). The correct marketing strategy and the availability of game products requiring less cooking time are imperative for the sustainability of game meat in consumer markets (Radder & Le Roux, 2005). In a study by Laubscher *et al.* (2007) it was stated that low customer awareness in terms of healthiness and cooking recipes inhibits the growth and expansion of the game meat industry. Poor marketing of game meat

compared to beef also limits the opportunities for growth in this sector. The study also stated that the seasonality of the supply of game meat and lack of storage on a national level further contributes to the lack of development in the industry.

A survey conducted at restaurants in South Africa reported that the majority of respondents (86%) indicated that they would eat game meat (Hoffman *et al*., 2003). Seventy-six percent of the respondents indicated that they would eat game meat because they like the taste, while reasons for not eating game meat include being afraid that wildlife will become extinct (3%). Two percent of the respondents considered game meat as typical of Africa.

Environmental concerns resulted in consumers showing more interest in free-range and organic products (Crafford *et al*., 2003). Game meat can be marketed as an organic product as game ranching conforms to the general requirements for organic meat production in southern Africa (Hoffman & Bigalke, 1999). These requirements include minimal damage to the environment, prohibition of agro-chemical pesticides and the careful attention to the impact of farming on the environment and the conservation of wildlife (Lampkin & Padel, 1994; Madge, 1995). In recent years, consumers have an increased awareness of the health status of food they consume (Hoffman & Wiklund, 2006) and therefore question the origin of food products (De Montzey, 2001).

3. Attributes of game meat

The gamey flavour of meat is often related to progressive stage of meat ripeness, spoilage of meat by incorrect bleeding methods, or meat from old animals. It is imperative that game carcasses be adequately bled after cropping. Pietersen (1993) ascribed the gamey taste of game meat to the relative high levels of polyunsaturated fatty acids in the meat. Von Chavellerie (1972) found a definite difference between species with regard to flavour acceptability. The flavour of the springbok proved to be superior, while red hartebeest was less acceptable than other species.

The colour of meat is one of the most important criteria when consumers select meat, as consumers discriminate against meat that is too pale or too dark. Southern African game meat is often perceived to be dark and unattractively red. Apart from stress, another explanation for

the darker colour is the fact that game animals are more active than traditionally farmed game, because of the myoglobin build-up in the muscles (Hoffman & Wiklund, 2006)

According to a study undertaken by Food & Livestock Planning Inc. (2010), features and benefits of game meat from Namibia are typically tied to novelty (uniqueness) and flavour profiles, as well as the exotic images it portrays. Game meat can offer a healthy alternative to consumers. The fat content of game meat is less than 3% and significantly lower than that of livestock (Schönfeldt, 1993). Research on muscle tissue from wild animals has indicated that the percentage of polyunsaturated fatty acids in game meat is substantially higher than in meat from domesticated animals (Crawford *et al*., 1970; Mostert & Hoffman, 2007; Hoffman, 2008). Various authors also concluded that the ratio of polyunsaturated fatty acids to saturated fatty acids is more important than the total fat content (Wood *et al*., 2003) from a health point of view.

Aidoo and Haworth (1995) noted the energy value of game meat as less than 500 kJ per 100 g (as would be expected with a low fat content) and viewed with the high protein content of game meat (Smit, 2004), can be regarded as a nutrient-dense food ideal for the discerning consumer. It is however essential that consumers are educated on the health advantages of game meat compared to other red meats (Radder, 2002).

4. Game meat production in Namibia

Game producers often sell game meat to local butcheries or as private sales at their properties. These are mostly sold as carcasses, parts of carcasses or unselected cuts. Prices appear to have increased significantly in recent years, from an average N$ 12.00 per kg three years ago, to averaging N$ 17.40 per kg in 2010 (Lindsey, 2011). In 2011 producer prices decreased again to approximately N$ 12.00 per kg due to an all-time low in the export of game meat to other countries (pers. comm. Marais, W. 2012).

Prices paid to farmers for game meat are lower than prices paid for beef and lamb, as a portion of the price paid by the game meat handling facility is deducted to pay the harvesting team (Van Schalkwyk & Hoffman, 2010). Game producers are at times paid higher prices for selected cuts and processed products such as biltong and droëwors. It was also observed that prices for game meat in the retail market are generally higher than meat from domestic livestock (up to

33.3% for whole carcasses and 15 - 46% for selected cuts) (Lindsey, 2011).

Namibia has a history of small scale attempts to commercially export game meat to the international markets. During the early 1990s Windhoek Wild (Pty) Ltd exported kudu, gemsbok and springbok meat to Switzerland. This export plant was however closed soon after the Chernobyl accident in Europe which resulted in all game meat sold in European markets being perceived as contaminated with radio-active substances (pers. comm. Raith, W. 2008). Exports of game meat recommenced in 2003 when Farmers Meat Market Mariental Abattoir (Pty) Ltd was approved by the European Union to export de-boned springbok meat to the European Union and Norway. This facility exports approximately 70 - 85 tonnes of deboned springbok meat to the European markets annually.

Table 6.1 Deboned springbok meat exported from Namibia (2003 – 2011)

Deboned springbok meat exported (tonnes)	2003	2004	2005	2006	2007	2008	2009	2010	2011
Farmer\s Meat Market (FMM) Mariental Abattoir	*EU export approval* 45 t	25 t	85 t	0	0	80 t	70 t	45 t	0
FMM Windhoek							*RSA export approval* 10 t	15 t	0
Brukarros Meat Processors						*EU export approval*	17 t	35 t	28 t
Namaqua Meat North									*RSA export approval*
Meatco Windhoek									*RSA export approval*

Another facility in the south of Namibia, Brukarros Meat Processors (Pty) Ltd, received approval for the export of deboned springbok meat to the European Union in 2008 and exported almost

17 tonnes to various overseas markets during 2009 (Meat Board of Namibia, 2010). In addition, approximately 720 tonnes of game meat were exported to South Africa, representing approximately 3 – 5 % of game meat produced in Namibia (Lindsey, 2011).

Table 6.1 depicts the tonnage of springbok meat exported to South Africa and the European Union as from 2003. Whereas springbok meat is well known in international markets, meat of the larger game species is still unknown in overseas markets (MET, 2008). To date, no facility exists to export meat or processed meat products from large game species to overseas markets. In Namibia, game meat is often utilized to produce biltong. This is a traditional form of dried meat consumed in southern Africa.

South Africa is the largest producer and consumer of biltong made from beef or game meat. The name originates from the Dutch word “bil” meaning buttock and “tong” meaning strip (Sattar *et al.*, 2003). Other processed products manufactured from Namibian game are salami and smoked game meat, products with a high potential market value in overseas niche markets. No value-added processed game meat products have been exported from Namibia to the European Union yet.

5. Contribution of game meat to rural food security

Game meat from freehold farms contribute significantly to food security in Namibia as large quantities of meat from Namibia remain in the country. It contributes to food security as it is an important source of the rations for farm workers. These workers receive on average 3.8 kg of game meat per week, which is 1.8 times more than the amount of meat from domestic animals received, if extrapolated to the number of freehold workers on the farm.

Approximately 4 500 tonnes of game meat is used as food on farms. Game meat potentially benefit 33 000 people on farms if families are taken into account. The food security benefit of game meat is unlikely to be threatened by the rising value of game meat as meat from lower value species and damaged meat from body shots will always be available for farm workers (Lindsey, 2011).

6. World venison and game meat production and trade

6.1 Production

Statistics from 2010 indicated that the United States of America was the larger producer of game meat in the world, followed by Papua New Guinea and Nigeria (Figure 6.1).

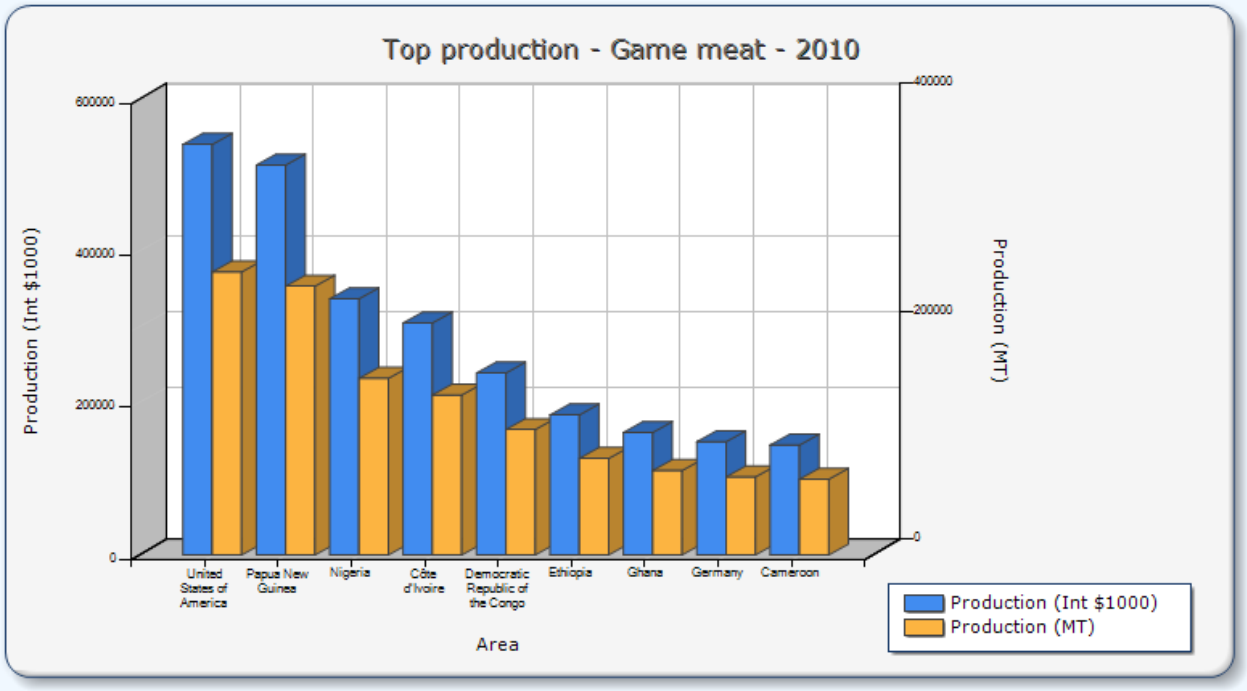

Figure 6.1 World game meat production 2010 (FAOSTAT, 2012)

South Africa produced 43 500 tonnes, Zimbabwe 35 200 tonnes and Botswana 23 200 tonnes of game meat in 2010 (Table 6.2). No official figure for game meat produced in Namibia is available, although it is estimated that close to 5 000 tonnes are produced annually (Lindsey, 2011).

Table 6.2 World production of game meat in 2010 (FAOSTAT, 2012)

Country	Metric tonnes produced 2010
Papua New Guinea	235 900
Nigeria	155 000
Ivory Coast	140 400
DRC	110 100
Ethiopia	84 700
Ghana	74 100
Germany	68 500
Cameroon	66 500
Argentina	50 000
Marocco	46 700
South Africa	43 500
Congo	39 600
Zambia	35 700
Zimbabwe	35 200
Niger	27 500
Gabon	25 100
Kenia	25 100
Mali	23 700
Botswana	23 200

6.2 Imports

Countries in the European Union imported most of the game meat and venison in 2009 (Figure 6.2), with Germany, Belgium and France at the top of the list (Official data for 2010 and 2011 not available).

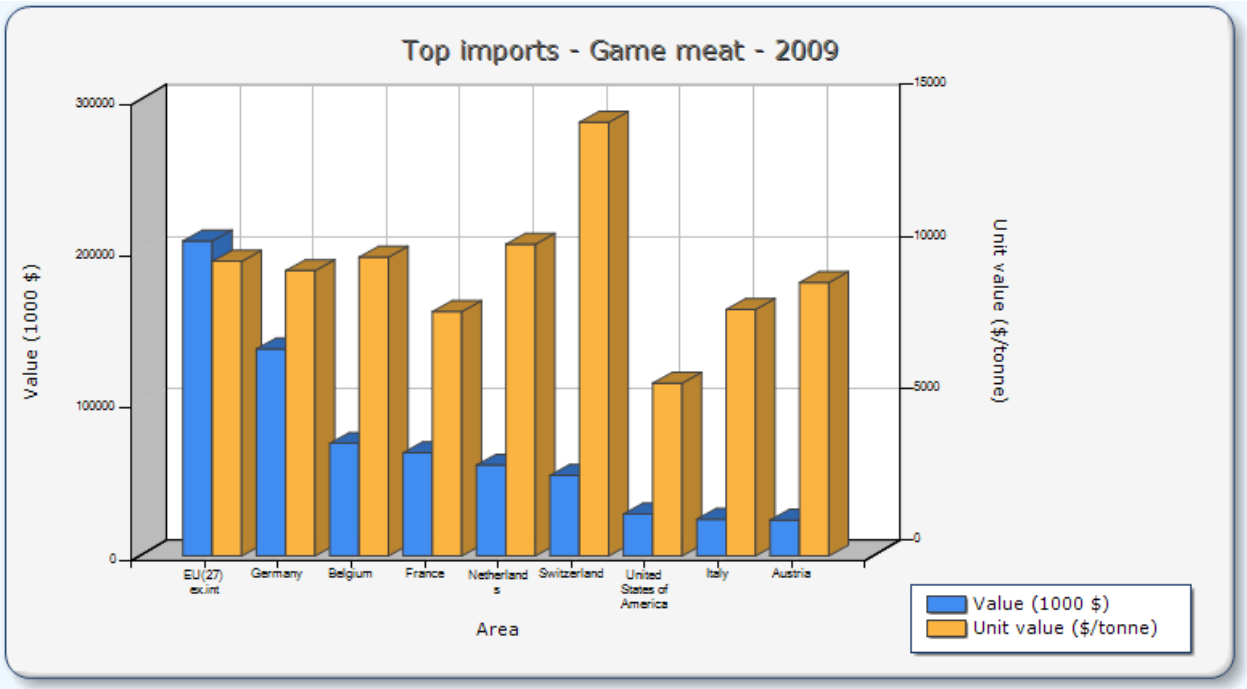

Figure 6.2 World imports of game meat 2009 (FAOSTAT, 2012)

The United States of America imported 4 853 tonnes of game meat in 2009. It is interesting to note that smaller countries like France, the Netherlands and Switzerland imported more game meat than the US (Table 6.3).

Table 6.3 World imports of game meat in 2009 (FAOSTAT)

Country	Metric tonnes imported 2009
EU 27	21 386
Germany	14 510
Belgium	7 534
France	8 449
Netherlands	5 826
Switzerland	3 715
US	4 853
Italy	2 983
Austria	2 627
Sweden	1 681

6.3 Exports

In 2009 New Zealand exported the largest amount of game meat and venison (Figure 6.3), followed by the Netherlands, Belgium and South Africa (No official data for 2010 and 2011 is available).

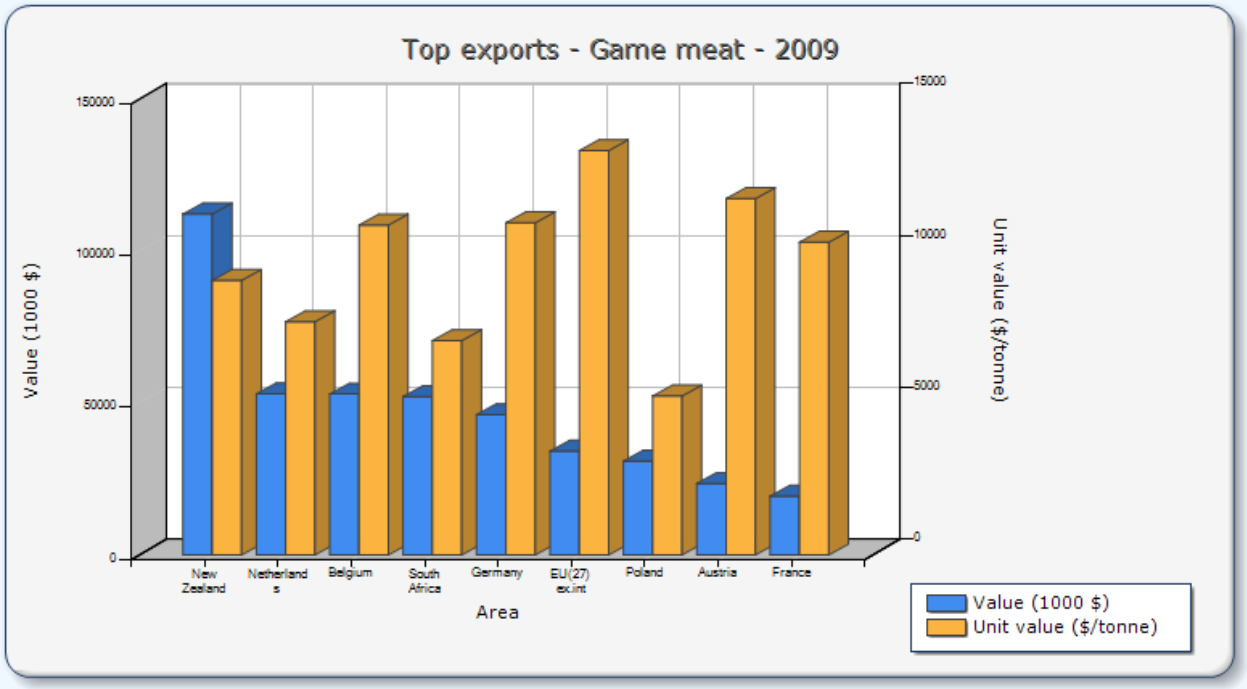

Figure 6.3 World exports of game meat and venison 2009 (FAOSTAT, 2012)

It is interesting to note that small countries such as the Netherlands, Belgium and Germany are some of the top exporting countries of gam meat and venison (Table 5.4).

Table 6.4 World exports of game meat and venison 2009 (FAOSTAT)

Country	Metric tonnes exported 2009
New Zealand	12 415
Netherlands	6 905
Belgium	4 876
South Africa	7 386
Germany	4 225
EU (27)	2 566
Poland	5 899
Austria	2005
France	1 881
Italy	1979

In order to be eligible for export of game meat to the European Union, a processing facility needs to be accredited by the European Union. This has obvious implications for the competition on the export market, as not all potential exporters are eligible (Table 6.5). In Africa, only Namibia and South Africa have accredited facilities.

Table 6.5 Countries with facilities approved to export game meat to the European Union

Country	Date of approval to export to the EU
Argentina	1/6/2005
Australia	26/1/2007
Canada	11/7/2005
Chile	5/6/2003
Croatia	29/1/2007
Greenland	6/4/2006
Namibia	4/2/2003
New Zealand	27/2/2007
Tunisia	6/12/1999
South Africa	26/10/2004
United States	22/12/2004
Uruguay	30/4/2002

7. Marketing options for game meat

Laubscher *et al*. (2007) presented the following proposal for the promotion and marketing of Namibian game meat:

Table 6.6 Proposals to promote and market Namibia game meat (Laubscher *et al*., 2007)

Media	Aggressive marketing of game meat via print and electronic media (online marketing, creative website).
Branding	Product branding and naming of game meat.
Consumer websites	Most associations have websites designed for their members and products. These websites often comprises information such as nutritional and health benefits, preparation and cooking tips, recipes, quality assurances and safety information and suppliers.
Consumer shows	These are events such as home and garden shows, women's shows etc. catering for the general consumer. Booths at these shows are intended to create awareness among consumers. Samples and brochures can be distributed.
Industrial and agricultural shows	Booths can disseminate information and connect actors within the value chain.
Food festivals	Free taste samples can be provided - it also offers an excellent opportunity for meat preparations and demonstrations.
Culinary programs	The opportunity is there to develop partnerships with the Namibia Institute for Culinary Education (NICE) offering training programmes for chefs. The industry can donate game meat for learner chefs to learn how to prepare, cook and present game meat for fine dining.

Consumer sampling program	Samples of game meat in the form of small meat balls, burgers etc. can be distributed at charity events.
Community barbeques	A serious of barbeques can be arranged during summer in several rural communities.
Sponsorships	Major events in communities can be sponsored by the actors in the game meat industry and can be combined with the consumer sampling programmes.
Special events	These can include partnerships with local hotels, a game meat week extravaganza
Media advertising	These include billboards, bus-, newspaper- and radio advertisements.

8. Market challenges

Laubscher *et al.* (2007) mentioned the following challenges which efforts to grow demand in the industry face:

Table 6.7 Challenges faced by the Namibian game meat industry (Laubscher *et al.*, 2007)

Quality and consistency	It is important that only superior quality products be sold or given as samples. Quality is determined by pre-slaughter stress levels and proper handling and packaging of the meat.
Cost	One of the major cost limitations is that consumers are not willing to pay a huge price differential over other types of meat.
Market positioning	In specific niche markets venison and game meat is considered food for royalty, while in North America it is food for peasants.
Value-added products	Game meat and venison are mostly sold as meat cuts. Processors should however also investigate possibilities of adding value to game meat.

Lindsey (2011) mentioned the following limitations to the potential of exporting game meat:

Table 6.8 Factors limiting the export of game meat (Lindsey, 2011)

Supply	Consistency of supply is prevented by the limitation of some forms of harvest to specific seasons;
Facilities	Lack of facilities for storage of meat;
Harvesting	Wildlife harvesting is difficult and costly, especially in some types of terrain;
Exports	The absence of European Union approved facilities for processing large game;
Revenue	Game meat is often exported to South Africa and then sometimes re-exported to the European Union, resulting in a loss of revenue for Namibia;
Awareness	Lack of awareness in target markets of health advantages of game.

9. Game meat as an organic product

Although game meat can easily be sold as an organic product, game meat producers, however, are of the opinion that the costs of maintaining certification exceeds the benefits, as producers usually only allow for game to be harvested every second year on the farm. It is also well-known that the premiums paid for game meat in organic markets are small and thus do not have any substantial effect on profit margins (pers. comm. De Villiers, C. 2012).

10. Conclusion

The demand for game meat from Africa is undeniably on the increase (pers. comm. Deleersnyder, L. 2012) as game meat offer a healthy alternative to discerning customers. The seasonality of game harvesting for commercial markets, strict regulations/controls, lack of skills and limited processing capacity, however, contribute to the difficulty of supplying regional and international markets.

CHAPTER 7

ECONOMIC ANALYSES - NAMIBIAN GAME MEAT VALUE CHAIN

Understanding the economic values of natural resources is important to ensure that investments in their conservation are efficient and benefit society (Humavindu and Barnes, 2003). The total economic value of natural resources consists of several components comprising direct use value, indirect use value, option value and existence value (Pearce and Turner, 1990).

In Namibia, policies on wildlife have specifically encouraged its utilisation through tourism and consumptive harvesting. The aim is to increase wildlife's economic direct use value, thereby creating economic incentives for investments in wildlife, both on private and public land (Humavindu & Barnes, 2003).

1. Introduction

The economic analysis of a value chain is an important tool when decisions have to be made regarding the upgrading of the specific value chain. Assessing cost structures allows for the identification of critical control points that need to be addressed. Compilation of economic data also allows for the monitoring of the progress in upgrading the value chain, both for the operators and the facilitators.

Analyses of costs deliver data that assist with the creation of awareness among operators about the potential of value-addition, cost drivers and the rationale for price negotiations. Economic analyses usually include an assessment of the following:

- Production and marketing costs at each stage of the chain and the cost structure along the different chain stages;
- Overall value added by the chain and the shares of the different stages;
- The performance of operators (capacity, productivity, profitability).

Value-addition is measured for the wealth created in the economy. In systems of national

accounting, as per definition, total value-addition is equivalent to the total value of goods and services produced in the economy for consumption and investment (GDP), net, or depreciated. The sales value or revenue achieved by the value chain is then divided by the value chain operators and the intermediate goods, inputs and operational services (GIZ ValueLinks Manual, 2009).

2. Methodology

Analysing a value chain involves a whole series of different methods. The most essential method is value chain mapping, meaning a visual representation of the value chain system. The map identifies business operations, chain operators with their linkages, as well as chain supporters within the value chain.

Value chain mapping is followed by quantifying and describing the chain in detail including numbers and figures of actors and products, or market shares in the particular segments of the chain. In this study, personal, face-to-face interviews were conducted with the different value chain actors, using structured questionnaires[1] that were designed for each component of the value chain, in order to obtain data for the value chain analyses. The questionnaires comprised relevant data tables and open-ended questions. Respondents were encouraged to add any additional information where possible. Therefore, the data retrieved is a mix of qualitative and quantitative data.

The subsequent economic analyses of the value chain are the assessment of the chain performance in terms of economic efficiency. This includes the value added along the stages of the value chain, the cost of production and the income of operators. The economic performance is usually benchmarked with competing chains in other countries or similar industries (GIZ ValueLinks Manual, 2009).

3. Value Chain Mapping

Chain mapping is the core of the value chain analyses. It serves an analytical and communication purpose as it reduces the complexity of the value chain comprising of diverse

[1] Questionnaires are attached in Annexure 1.

functions, various stakeholders, relationships and dependencies to an understandable visual model (GIZ ValueLinksModel, 2009).

3.1 Value chain maps for Namibian game meat, beef, lamb/mutton and goat meat

3.1.1 Game meat

Game is usually harvested for commercial meat production by registered harvesting teams operating all over the country. The carcass is only partially dressed at the field abattoir (skin/hide still on) and then transported to a game handling facility where it is de-skinned, de-boned, packed and stored (chilled or frozen) until ready for dispatch. Traders distribute the meat to wholesale and retail markets, as well as restaurants.

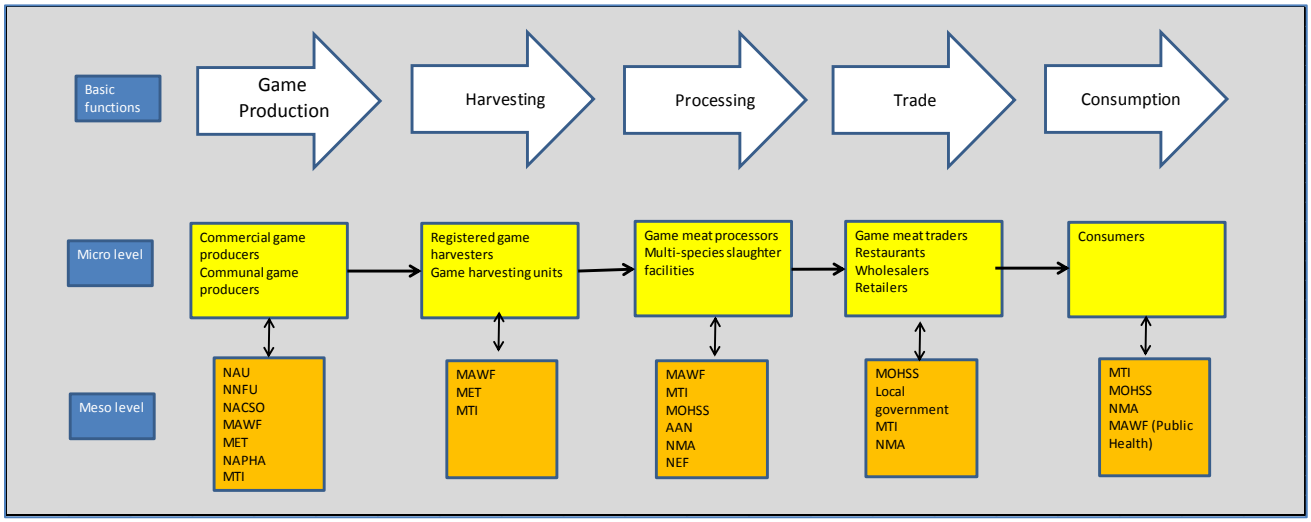

Figure 7.1 Mapping of Namibian game meat value chain

3.1.2 Beef and lamb

Cattle and sheep are usually procured from livestock producers directly, or from auctions held from time to time across the country. The animals are slaughtered at local abattoirs. Most of the sheep/lamb slaughtered are exported as carcasses or on the hoof to South Africa, where they are processed further, packed and stored (usually chilled) until ready for dispatch to the wholesale and retail markets, or restaurants.

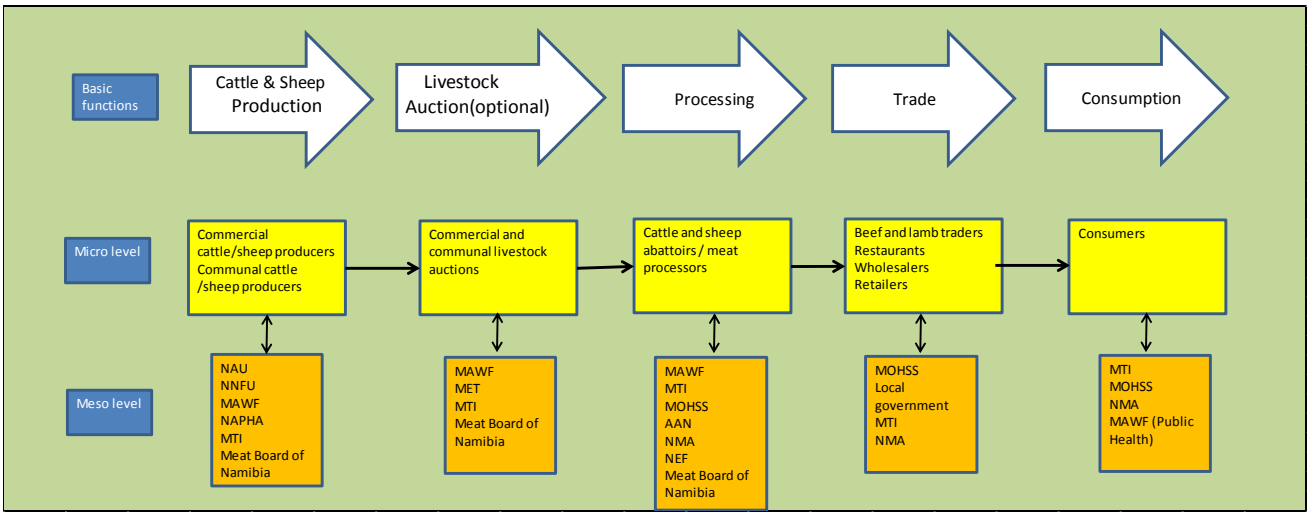

Figure 7.2 Mapping of Namibian beef and lamb value chain

3.1.3 Goats

Currently there is no developed (formal) meat market for goats in Namibia as goats are exported live to South Africa to be sold for religious purposes. This is a niche market and goat farmers receive high prices for their live goats (Small goat: N$ 450.00, medium goat: N$ 600.00, large goat: N$ 800.00).

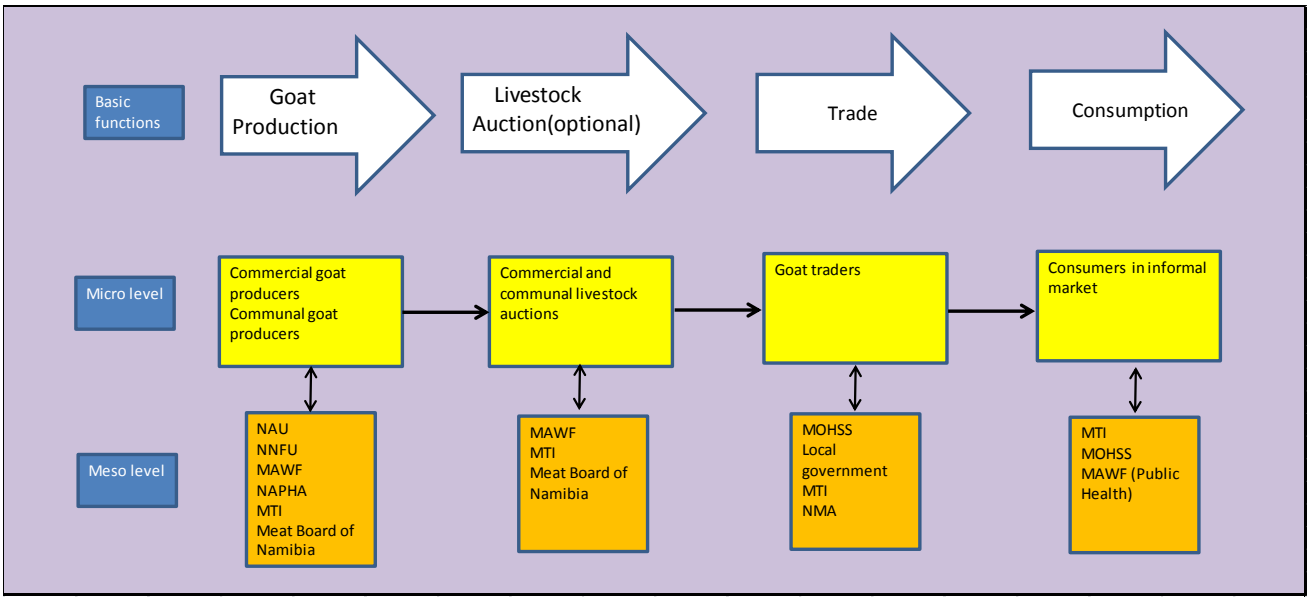

Figure 7.3 Mapping of Namibian goat value chain

4. Quantification - Namibian game meat, beef, lamb/mutton and goat value chains

Note:

The following quantification of the Namibian game meat value chain includes only economically harvestable game species such as springbok, gemsbok, kudu, red hartebeest, zebra and eland.

4.1 Production

4.1.1 Wildlife inventory

Table 7.1 Population numbers of harvestable game species on freehold land in Namibia (Lindsey, 2011)

	Erongo	Hardap	Karas	Khomas	Kunene	Omaheke	Otjozondjupa	Oshikoto/ Oshana/Omusati	Total
Springbok	38 234	332 946	239 470	71 491	14 409	25 683	35 769	4 623	762 625
Gemsbok	66 057	111 764	32 970	83 460	36 155	41 093	119 230	11 599	502 328
Kudu	52 150	609 62	29 500	52 082	54 756	41 093	141 089	17 567	449 199
Red Hartebeest	8 474	35 170	3 471	54 023	5 764	39 258	38 419	1 849	186 428
Eland	4 129	2 345	781	7 117	8 646	7 705	56 303	2 774	89 800
Hartmann Zebra	11 299	22 665	868	17 468	9 956	1 834	13 910	3 194	81 194

Table 7.2 Population numbers of harvestable game species in communal conservancies in Namibia (excluding Caprivi) (NACSO, 2011)

	North Central Conservancies	North West Conservancies	Southern Conservancies
Springbok	10 060	93 250	18 035
Gemsbok	160	20 560	59
Kudu		2 600	392
Red hartebeest	260		
Eland	49	13 (observed)	
Zebra	54	27 030	

Table 7.3 Population numbers in protected areas in Namibia (Barnes *et al.*, 2009)

	Springbok	Gemsbok	Kudu	Red hartebeest	Eland	Burchell's zebra	Hartmann's Zebra
Protected areas north of the Veterinary Cordon Fence (2004)	33 811	11 450	2 063	1 468	1 704	18 098	8 564
Protected areas south of the Veterinary Cordon Fence (2004)	1 771	3 115	1 484	115	524	0	4 347
Total	35 582	14 565	3547	1 583	2 228	18 098	12 911

4.1.2 Cattle inventory

Table 7.4 Cattle numbers in commercial and communal areas in Namibia (DVS, 2010)

Cattle	2001	2002	2003	2004	2005	2006	2010*	% change
Cattle total	**2 508 570**	**2 329 553**	**2 336 094**	**2 349 700**	**2 219 330**	**2 383 960**	**2 389 892**	**0.25%**
Commercial	912 315	862 480	947 377	892 347	792 897	748 405	730 578	-2.38%
Communal SCA	319 665	336 231	343 045	278 845	363 576	350 027	413 549	18.15%
Communal NCA	1 276 590	1 130 842	1 045 672	1 178 508	1 062 857	1 285 528	1 245 764	-3.09

* *2011 Figures not available*

4.1.3 Sheep inventory

Table 7.5 Sheep numbers in commercial and communal areas in Namibia (DVS, 2010)

Sheep	2001	2002	2003	2004	2005	2006	2010	% change
Sheep total	**2 369 809**	**2 764 253**	**2 955 454**	**2 619 363**	**2 663 795**	**2 660 252**	**1 378 861**	**-48.17%**
Commercial	2 104 397	2 498 956	2 671 148	2 373 195	2 407 639	2 384 250	1 001 078	-58.01%
Communal SCA	182 609	173 529	192 248	192 249	193 230	204 301	314 982	54.18%
Communal NCA	82 803	91 768	92 058	53 919	62 926	71 701	62 801	-12.41%

4.1.4 Goat inventory

Table 7.6 Goat numbers in commercial and communal areas in Namibia (DVS, 2010)

Goats	2001	2002	2003	2004	2005	2006	2010	% change
Goats total	**1 769 055**	**2 110 092**	**2 086 812**	**1 997 172**	**2 043 479**	**2 061 403**	**1 690 467**	**-17.99%**
Commercial	598 482	654 838	595 367	562 493	577 995	568 808	275 180	-51.62%
Communal SCA	192 561	549 990	526 542	529 074	536 435	509 245	509 973	0.14%
Communal NCA	678 012	905 264	964 903	905 605	929 049	983 350	950 314	-7.94%

4.1.5 Game utilisation

4.1.5.1 Marketing channels and producer prices for live game

Most live game animals are procured either directly from the game producer or via game auctions. Live game exports to South Africa and other neighbouring countries like Botswana, Zimbabwe, Tanzania and Angola are subjected to an export levy of N$ 20.00 per head of small game and N$50.00 per head of large game.

Table 7.7 Live game exports to neighbouring countries 2007 – 2011 (Uahengo, 2012a)

Species	2007	2008	2009	2010	2011
Springbok	3 026	2 775	1 361	1 278	2 366
Oryx	9 645	8 376	5 728	3 383	2 643
Kudu	807	330	277	192	56
Red hartebeest	3 576	2 664	1 210	779	680
Burchell's zebra	161	67	62	26	88
Eland	691	726	562	264	180

Table 7.8 Auction and producer prices for live game from Namibia 2011 (Brown, 2012)

Live game sales	Gender	Auction price (N$/head)	Producer price (N$/head)
Springbok	Breeding animals	1 200.00	450.00
	Mature males	2 850.00	750.00
Gemsbok	Breeding animals	2 600.00	1 100.00
	Mature males	2 700.00	1 100.00
Kudu	Breeding animals	3 250.00	1 600.00
	Mature males	6 500.00	3 500.00
Red hartebeest	Breeding animals	2 450.00	1 200.00
	Mature males	3 950.00	1 750.00
Eland	Breeding animals	5 600.00	3 400.00
	Mature males	14 500.00	4 000.00
Burchell's zebra	Male/Female	8 500.00	4 200.00
Hartmann's zebra	Male/Female	8 000.00	3 900.00

4.1.5.2 Marketing channels and producer prices for trophy game

Table 7.9 Number of trophy hunters and game animals trophy hunted 2000 – 2009 (NAPHA, 2012)

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009*
Number of trophy hunters	4 486	4 936	4 852	4 773	5 364	5 781	6 346	7 699	7 297	4 449
Game animals trophy hunted	15 931	17 444	18 438	18 734	22 216	24 735	27 001	35 032	32 335	18 746

** Data for 2010 and 2011 not available*

Table 7.10 Producer prices for trophy hunted game animals in Namibia 2012 (Fryer, 2012)

Trophy hunt prices (N$/head)	Springbok	Gemsbok	Kudu	Red hartebeest	Zebra	Eland
2012	2 500.00	5 600.00	10 000.00	5 600.00	8 500.00	12 000.00

4.1.5.3 Marketing channels and producer prices for commercially harvestable game species

Table 7.11 Producer prices for commercially harvestable game species (2007 – 2011) (Anonymous, 2012a)

Prices N$/kg (skin-on)	2007	2008	2009	2010	2011
Springbok	15.00	16.00	18.00	17.00	17.00
Gemsbok	12.00	13.00	13.00	13.00	15.00
Kudu	11.00	12.00	12.00	12.00	15.00
Red hartebeest	11.00	12.00	13.00	13.00	13.00
Eland	12.00	13.00	13.00	13.00	15.00

4.1.6 Quotas allocated to game producers for harvesting economically viable game species in private and communal areas

4.1.6.1 Private / commercial areas

The Ministry of Environment and Tourism is responsible for the allocation of quotas for game harvesting in Namibia. Quota setting for private/commercial areas or farms usually range between 15 – 20% of the game population observed / counted in that specific area or farm. For fenced-offed farms, the quota allocated for game harvesting is based on the type and specification of the fencing (Uahengo, 2012a).

4.1.6.2 Communal areas / conservancies

Specific quotas are allocated to communal areas/conservancies by the Ministry of Environment and Tourism on an annual basis. These quotas are reviewed each year in October/November or any other month predetermined for this purpose. These allow the conservancy and the

Government to review information collected through various monitoring programmes. Quota setting for harvesting of game must form part of and be compatible with, the management plan for each conservancy.

Table 7.12 Quotas allocated for game harvesting in communal land/conservancies (2011) (Matongo, 2012)

Wildlife use quotas allocated to communal conservancies by MET (2011)					
Conservancy	**Species**	**Trophy hunting**	**Other uses**	**Festival**	**Total**
//Gaingu	Springbok	60	520	20	600
	Gemsbok	2	1		3
	Kudu	2	2		4
	Zebra	2	3		5
Tsiseb	Springbok	30	720	50	800
	Kudu	4			4
	Zebra	6			6
Otjimboyo	Springbok	15	50	5	70
	Gemsbok				
	Kudu	4	1	1	6
Ohungu	Springbok	6	6		12
	Gemsbok				
	Kudu	1			1
Sorris sorris	Springbok	25	243	32	300
	Gemsbok	6			6
	Kudu	3			3
	Red hartebeest	2			2
	Hartmann's Zebra	6			6
Doro!Nawas	Springbok	20	210	20	250
	Gemsbok	20	110	20	150
	Kudu	4			4
	Red hartebeest	2			2
	Hartmann's Zebra	20	35	5	60
Doro!Nawas	Springbok	8	22	5	35
	Gemsbok	6	9		15
	Kudu	9	36	5	50
	Hartmann's Zebra	5	5		10
/Audi	Springbok				

	Gemsbok	3			3
	Kudu	4			4
Torra	Springbok	40	730	30	800
	Gemsbok	30	100	20	150
	Kudu	30			30
	Hartmann's Zebra	30	110	10	150
#Khoadi Hoas	Springbok	20	70	10	100
	Gemsbok	20	25	5	50
	Kudu	12	53	5	70
	Hartmann's Zebra	12	58		70
	Eland	2			2
Ehirovipuka	Springbok	45	25	10	80
	Gemsbok	35	3		40
	Kudu	8	7		15
	Eland	6			6
Omatendeka	Springbok	60	70	20	150
	Gemsbok	25	22	3	50
	Kudu	8	2		10
	Hartmann's Zebra	20	10		30
	Eland	6			6
Okangundumba	Springbok	20	120	10	150
	Gemsbok	3	2		5
	Kudu	20	36	4	60
	Hartmann's Zebra	5	5		10
Otjambangu	Springbok	24	128	8	160
	Gemsbok	8	2		10
	Kudu	16	21	3	40
	Hartmann's Zebra	5	10		15
Ozondundu	Gemsbok	5			5
	Kudu	12	25	3	40
	Hartmann's Zebra	5			5
Anabeb	Springbok	16	227	7	250
	Gemsbok	10	10		20
	Kudu	1			1
	Hartmann's Zebra	10	50		60
Sesfontein	Springbok	40	140	20	200
	Gemsbok	30	60	10	100
	Hartmann's Zebra	15	5		20
Puros	Springbok	60	580	10	650
	Gemsbok	30	206	14	250

	Kudu	4			4
	Hartmann's Zebra	20	98	2	120
Orupembe	Springbok	15	230	15	260
	Gemsbok	15	179	6	200
	Kudu	3			3
Marienfluss	Springbok	20	170	20	100
	Gemsbok	40	215	5	260
	Zebra	10	6		16
Sanitatis	Springbok	40	320		360
	Gemsbok	40	80	120	
	Hartmann's Zebra	20	45		65
Okondjombo	Springbok	30	60	10	100
	Gemsbok	15	13	2	30
	Kudu	2			2
	Hartmann's Zebra	20	47	3	70
Kunene	Kudu	6	9	5	20
Uukolonkhadi	Gemsbok	3	4	1	8
	Kudu	3	4	1	8
Uukwaluudhi	Springbok	15	175	10	200
	Gemsbok	4	2		6
	Kudu	2			2
	Red hartebeest	5			5
Sheya Shu Uushona	Springbok	20	320	10	350
King Nehale					
King Nehale	Springbok	20	260	20	300
George Mukoya	Gemsbok	1	2	2	5
	Kudu	3	4		7
N#a Janga	Gemsbok	4	4	2	10
	Kudu	2	2	1	5
	Eland	2	1		3
Nyae nyae	Springbok	8	42		50
	Gemsbok	10	35		45
	Kudu	8	40		50
	Red hartebeest	8	6		14
Ondjou	Gemsbok	3			3
	Kudu	3	1		4
	Eland	1	1		2
Kwandu	Kudu	2	2		4
	Eland	1	1		2

Salambala	Kudu	4	1		5
	Hartmann's Zebra	10	50		60
Sobbe	Kudu	3		2	5
	Hartmann's Zebra	3	1		4
Mayuni	Kudu	2			2
Mashi	Kudu	3	1		4
	Red hartebeest				
	Hartmann's Zebra	5			5
Balyerwa	Kudu	3	1		4
	Red hartebeest				
	Hartmann's Zebra	8	2		10
Wuparo	Kudu	4	5	1	10
	Red hartebeest				
	Hartmann's Zebra	2			2
Dzoti	Kudu	2	1		3
	Red hartebeest				
	Hartmann's Zebra	3			3
Oskop	Springbok		50		50
	Gemsbok		5		5
//Huibes	Springbok	1	1		2
	Kudu	1	1	1	3
!Knob!Naub	Springbok		140	10	150
!Gawachab	Springbok		5		5
Gamaseb	Springbok		300		300
	Gemsbok		2		2
!Han/Awab	Springbok		85	15	100

4.1.7 Livestock utilisation

4.1.7.1 Marketing channels and average producer prices for cattle, lamb/sheep and goats

Table 7.13 Marketing channels for cattle and beef cuts (Meat Board of Namibia, 2012)

Cattle production and exports	2011 Total
Export of live cattle	N$ 840 395 417.25
Ton exported	45 894 53
%	62.80%
EU/Norway exports	N$ 367 072 709.20
Ton exported	8 392
%	11.50%
Africa exports	N$ 388 388 483.33
Ton exported	15 873.00
%	21.70%
Export of cans	N$ 62 251 810.00
Ton exported	2 924.00
%	4%
Total ton exported	73 083.53
Total ton produced	85 822.73
%	85.20%
Total value of exports	N$ 1 658 108 419.78

Table 7.14 Marketing channels for sheep and lamb/mutton cuts (Meat Board of Namibia, 2012)

Sheep production and export	2011 Total
Export of live small stock	N$ 191 545 924.05
Ton exported	5 398
Export of carcasses	N$ 436 038 153.62
Total ton exported	12 570
Total ton exported	17 967
Total ton produced	18 962
Total value for exports	N$ 627 584 077.67

Table 7.15 Namibian carcass prices (average for all grades) for cattle and sheep (2007 – 2011) (Meat Board of Namibia, 2012)

Average producer price (all grades)	2007	2008	2009	2010	2011
Cattle (N$/kg dressed weight)	16.52	20.6	20.46	19.1	23.8
Sheep (N$/kg dressed weight)	18.82	20.47	21.02	22.65	30.24

Table 7.16 Current (2012) Namibian carcass and live weight prices of cattle and sheep (Meat Board of Namibia, 2012)

Cattle	N$/kg dressed weight	Standard value (N$ /head live weight)	Sheep	N$/kg dressed weight	Standard value (N$ /head live weight)	Goat	N$/head live weight
A grade	33.00	6647.00	**A grade**	41.00	676.00	**Small**	400.00
B grade	29.50	6647.00	**B grade**	35.00	676.00	**Medium**	550.00
C grade	27.00	6647.00	**C grade**	34.00	676.00	**Large**	800.00

4.2 Harvesting

4.2.1 Harvesting seasons

Shoot and sell permits for the harvesting of game for own use and local consumption can be obtained through-out the year. Night culling permits for commercial harvesting can only be obtained during the harvesting seasons prescribed by the Ministry of Environment and Tourism.

Table 7.17 Harvesting seasons for export of commercially harvestable game meat in Namibia (MET, 2010)

	Harvesting seasons for export
Springbok	1 April - 31 August
Gemsbok	
South of Windhoek	1 April - 31 August
Gemsbok	
North of Windhoek	1 April - 30 June
Kudu	1 May -31 August
Hartmann's zebra	1 May -31 August
Red Hartebeest	1 May -31 August (upon approval)

4.2.1 Harvesting teams registered with the Ministry of Environment and Tourism

The registration of night culling/harvesting teams are valid for the period 1 April of the current year until 31 March the following year, for example 1 April 2011 - 31 March 2012. The following night culling teams are currently registered with the Ministry of Environment and Tourism.

Table 7.18 Harvesting teams currently registered with MET (2011 – 2012) (MET, 2012)

Night culling/harvesting teams	
1	Suidwes Culling Team
2	Jumanji Night Culling Team
3	Swartrand Night Culling Team
4	Die Ou Manne Night Culling Team
5	Koes Night Culling Team
6	Kalahari Night Culling Team
7	Nossob Night Culling Team
8	Bertus Pretorius Night Culling Team
9	Brink and van der Merwe Night Culling Team
10	Rooiduin Night Culling Team
11	Mos-Mar Night Culling Team
12	Ooste Night Culling Team

4.2.2 Producer prices

Table 7.19 Average prices paid to game producers for skin/hide-on carcasses (N$/kg) (Anonymous, 2012a)

Prices (N$/kg skin/hide-on)	2007	2008	2009	2010	2011
Springbok	15.00	16.00	18.00	17.00	18.00
Gemsbok	12.00	13.00	13.00	13.00	15.00
Kudu	11.00	12.00	12.00	12.00	15.00
Red hartebeest	11.00	12.00	13.00	13.00	13.00
Eland	12.00	13.00	13.00	13.00	15.00

4.2.3 Operational costs

Table 7.20 Average operational costs incurred by game harvesting teams (N$/kg) (Anonymous, 2012b)

Operational costs (N$/kg)	2007	2008	2009	2010	2011
Marksmen	5.50	5.75	5.75	6.00	6.00
Field abattoir	1.25	1.25	1.50	1.50	1.50
Refrigerated truck	2.00	2.50	2.50	3.00	3.00
Total	**8.75**	**9.50**	**9.75**	**10.50**	**10.50**

4.2.4 Labour

Table 7.21 Labour costs (average wages and number of labourers - harvesting team) (Anonymous, 2012b)

	2007	2008	2009	2010	2011
Labour costs (N$)					
Per harvest	100.00	150.00	150.00	200.00	250.00
Per month	1 500.00	1 800.00	2 000.00	2 000.00	2 000.00
Labourers per harvest					
Number	8 -18	8 - 18	8 - 16	8 - 14	8 - 11

4.3 Processing

4.3.1 Game meat processing capacity

Most of the facilities approved for game meat exports to neighbouring and/or international countries can easily handle 100 large game and 300 small game every second day of a working week. However, most of these facilities also slaughter/ handle other species such as cattle and sheep/lamb.

4.3.2 Carcass weights

Table 7.22 Average carcass weights of economically harvestable game species (skin-off) and livestock (Van Schalkwyk, 2011c)

	Springbok	Gemsbok	Kudu	Red harte-beest	Zebra	Eland	Cattle	Sheep /Lamb
Carcass weight (kg bone-in)	21.0	78.0	125.0	72.0	90.0	275.0	260.0	16.0
Deboned meat (kg)	15.8	58.5	93.8	54.0	67.5	206.3	195.0	11.2

4.3.3 Game meat processed

Table 7.23 Game meat (springbok) processed for export markets (2003 – 2011) (Van Schalkwyk, 2012c)

Deboned springbok meat exported (tonnes)	2003	2004	2005	2006	2007	2008	2009	2010	2011
Farmers Meat Market (FMM) Mariental Abattoir	*EU export approval* 45 t	25 t	85 t	0	0	80 t	70 t	45 t	0
FMM Windhoek							*RSA export approval* 10 t	15 t	0
Brukarros Meat Processors						*EU export approval*	17 t	0	28 t
Namaqua Meat North									*RSA export approval*
									RSA export approval

Table 7.24 Biltong exported to South Africa 2011

	Closwa	Other biltong processors	RSA biltong hunters
Tonnes processed 2011	327	160	150

4.3.4 Purchase prices

Table 7.25 Purchase prices for commercially harvestable game species (carcass, N$/kg) (Anonymous, 2012a)

Prices (N$/kg skin/hide-on)	2007	2008	2009	2010	2011
Springbok	15.00	16.00	18.00	17.00	18.00
Gemsbok	12.00	13.00	13.00	13.00	15.00
Kudu	11.00	12.00	12.00	12.00	15.00
Red hartebeest	11.00	12.00	13.00	13.00	13.00
Eland	12.00	13.00	13.00	13.00	15.00

4.3.5 Selling prices for hides and skins

Table 7.26 Average prices (N$ per piece) for wet, salted hides and skins (Davidou, 2012)

Skin/hide prices (N$/piece)	2007	2008	2009	2010	2011
Springbok	10.00	12.00	15.00	20.00	25.00
Gemsbok	15.00	30.00	15.00	30.00	40.00
Kudu	85.00	85.00	85.00	90.00	100.00
Red hartebeest	15.00	18.00	18.00	20.00	25.00
Eland	140.00	150.00	150.00	165.00	165.00
Zebra	1 500.00	1 500.00	1 600.00	1 800.00	1 800.00

4.3.6 Operational costs

Table 7.27 Operational costs incurred by the game handling/processing facility (Anonymous, 2012c)

Operational cost (N$/kg)	2007	2008	2009	2010	2011
Fixed costs	3.50	3.50	4.00	4.00	4.50
Variable costs: Deboning, processing, packaging, storage and labour costs	4.00	4.00	4.50	5.50	5.00
Transport to the market	2.50	2.55	2.50	2.60	2.60
Marketing and advertising costs	0.10	0.10	0.20	0.20	0.20

4.3.7 Labour costs

Table 7.28 Average number and wage of labourers at export game meat handling facilities (Anonymous, 2012c)

	2007	2008	2009	2010	2011
No. labourers	50-70	50-70	50-70	50-70	40-60
Wage (N$/month)	3 000.00	3 300.00	3 600.00	3 900.00	4 000.00

4.3 Wholesale (local and export)

4.3.1 Average wholesale prices

Table 7.29 Namibian average wholesale prices for beef, mutton/lamb and game meat 2011/2012 (Hartlief, 2012; NamCo, 2012)

	Beef (N$/kg)	Large game (N$/kg)
Rump	56.50	45.50
Sir(loin)	56.50	85.80
Silver side	52.90	48.90
Top side	55.50	48.90
Fillet	114.00	96.90
T-flank	51.50	45.50
Bolo	48.90	34.90
Trimmings	36.95	24.50
Bones	7.00	7.00
Liver	24.40	24.40
Offal	34.00	n/a
Other		
Oxtail	55.50	n/a
Tongue	51.90	n/a
	Lamb & mutton (N$/kg)	**Springbok**
Leg (de-boned)	65.00	33.00
Loin (de-boned)	85.00	102.00
Fillet	90.00	102.00
Trimmings	35.00	24.50
Shanks	70.00	28.50
Bone	5.00	6.50
Liver	20.40	20.40
Offal	20.00	n/a
Other		
Tail fat	52.00	n/a
Shoulder	45.00	

Table 7.30 South African average wholesale prices for beef, lamb and game meat 2011/2012 (Just Lamb, 2012; Mosstrich, 2012)

	Beef (N$/kg)	Large game (N$/kg)
Rump	65.00	55.00
Sir(loin)	65.00	80.00
Silver side	48.00	55.00
Top side	48.00	55.00
Fillet	100.00	85.00
T-flank	45.00	55.00
Bolo	65.00	32.00
Trimmings	35.00	25.00
Bones	n/a	1.50
Liver	n/a	6.00
	Lamb & mutton (N$/kg)	Springbok (N$/kg)
Leg	65.00	45.00
Loin	77.00	110.00
Fillet	90.00	110.00
Trimmings	43.00	25.00
Shanks	68.00	28.00
Bone	4.00	1.50
Liver	9.00	6.00
Offal	30 per head	n/a

Table 7.31 Average European wholesale prices for Namibian beef and game meat 2011/2012 (Anonymous, 2012d; Deli-Ostrich, 2012)

	Beef (Euro/kg)	Large game (Euro/kg)
Rump	7.00	8.50
Sir(loin)	12.00	16.00
Silver side		8.50
Top side	8.00	8.50
Fillet	15.6	16.50
T-flank	3.15	8.50
Bolo	5.70	5.00
Trimmings	2.30	3.00
Bones	n/a	n/a
Liver	n/a	n/a
Offal	n/a	n/a
Other	n/a	n/a
	Lamb & mutton (N$/kg)	Springbok (N$/kg)
Leg	8.50	8.20
Loin	13.50	15.90
Fillet	14.50	14.90
Trimmings	2.40	3.00
Shanks	n/a	n/a
Bone	n/a	n/a
Liver	n/a	n/a
Offal	n/a	n/a
Other Shoulder	6.50	n/a

Table 7.32 Average United States wholesale prices for venison 2011/2012 (Bur Oaks Red deer Venison Steaks, 2012; Grande premium Meats, 2012; Speciality Meats and Gourmet, 2012)

Species	Meat cut	US$/lb.	US$/kg
Elk	Rib eye steak	19.95	43.89
	Tenderloin	29.95	65.89
	Stew meat	9.95	21.89
	Sirloin	17.45	38.39
	Flat iron	12.95	28.49
	Flank steaks	16.95	37.29
Red deer	Tenderloin	30.95	68.09
	Rib eye steak	21.95	48.29
	New York Loin	19.95	43.89
	Flank steaks	14.95	32.89
	Flat iron steaks	11.95	26.29
	Stew meat	9.95	21.89
	Chuck meat	8.95	19.69
	Ground meat	6.85	15.07
Fallow deer	Tenderloin	31.95	70.29
	Whole loin	20.95	46.09
	Sirloin butt	16.95	37.29
	Flank steaks	16.95	37.29
	Stew meat	9.95	21.89
	Chuck meat	7.95	17.49
	Ground meat	6.85	15.07
Antelope	Boneless shoulder	46.00	101.20
	Ground meat	9.00	19.80
	Patties	17.00	37.40
Venison	Chuck meat	38.00	83.60
(any species)	Strip loin	25.00	55.00
	Tenderloin	34.00	74.80
	Short loin	24.00	52.80
	Stew meat	8.50	18.70
	Trimmings	7.00	15.40
	Medallions	26.00	57.20

4.4 Retail (local and export)

4.4.1 Average retail prices

Retailers usually cover their expenses (packaging, marketing and transport costs) by adding a percentage to purchase price. The following is an indication of the mark-up added by retailers.

Table 7.33 Mark-up percentage on meat sales from different species

Species	Price difference between wholesale and retail prices (%)
Beef	+ 10
Mutton &lamb	+ 12
Game meat	+ 12

4.4.2 Demand for game meat

Table 7.34 Demand for African game meat in local, RSA and international markets (Mosstrich, 2012; Deli-Ostrich, 2012, De Haan, 2012, Van Schalkwyk, 2012)

Demand in tonnes (de-boned meat)	Local	RSA	EU	US
Springbok	200	180	500	45
Large game species	600	50	200	45
All game species	800	230	700	90

5. Role of livestock and game in the ecosystem

Both livestock and game are part and parcel of the natural ecosystem and have evolved with it over many millennia. Where mismanagement of game and livestock largely contribute towards land degradation, the opposite is also true. Degraded rangeland can only be restored by using livestock and game as “tools” to improve fertility, moisture contents and microbe activity of the soil. Secondly, adequate resting time for recovery of grasses after utilisation is required to allow perennial grass plants to develop and maintain strong root systems to survive droughts and other calamities like fire.

Currently, domesticated livestock (cattle, sheep, goats and donkeys) are seen as the major culprits in the poor rangeland condition and productivity. However, by utilising these correctly is also the only means to improve the rangelands. Many farmers and others are of the opinion that game farming is the solution to degraded rangelands. This cannot be further from the truth. Enough evidence exist that rangeland condition on many game farms is worse than in adjacent livestock farming areas, mainly due to the fact that wild game cannot easily be moved to allow for animal impact and long enough rest periods.

It is not unrealistic to envisage a situation in future where domesticated livestock will have to be incorporated into wildlife areas in a planned manner to improve rangeland condition and productivity. The current trend in Namibia is that livestock farmers are more and more including wildlife as browsers to enhance their incomes and to broaden the utilisation regime of rangelands.

The idea should not be to replace cattle with wildlife, but rather to include more browsers to better utilise all strata of the rangeland and enhance income. The role that wildlife, mainly the mega herbivores are playing in trophy hunting and eco-tourism is well documented (pers. comm. Kruger, B. 2012).

6. Effects of livestock and game on land degradation

Currently, the degraded state of Namibia's rangelands is most pronounced in the areas of soil erosion, bush encroachment, loss of perennial grasses and deforestation. Erosion, albeit only slight to moderate in degree, is happening in over 90 % of the country. With regards to bush encroachment, it is known that more or less 30 million ha from Rehoboth in a northernly direction (31.5 % of Namibia's total surface area) is subject to this phenomenon. More or less 2 million ha in the south (representing 2.4 % of Namibia's total surface area) is subject to bush encroachment.

The causes of bush encroachment are wide, varied, and intricate. A wide range of factors have been listed as contributors. These include exclusion of occasional fires, replacement of most of the indigenous browsers and grazers by domestic livestock, restriction of movement of livestock through the construction of fences, poor grazing management in general, leading to the loss of

perennial grasses.

The effects on ecosystem processes from current livestock management practices include 1) negative impacts on the water cycle with bare and/or capped soils resulting in poor infiltration of water into the soil, high evaporation rates, high run-off, and erosion; 2) negative impacts on the mineral cycle where the soil surface is repeatedly grazed bare, resulting in little or no conversion of soil surface litter into organic matter in the soil; and 3) loss of biodiversity due to these hostile conditions in which many perennial plants are lost, leaving behind a largely annual grass community dominated by a few species.

The weakened grass sward also promotes bush encroachment, often resulting in poor tree and understory biodiversity. Most importantly, microbial activity in the soil is drastically reduced, and conditions for movement to a perennial grass sward succession become very limited. The overall result of these factors is a shorter growing season of poorer quality grasses and reduced productivity per hectare. There is no green flush of perennial grasses in the spring and no perennial grass growth from small rainfall events (Draft Namibia Rangeland Management Policy, 2012).

The major challenge faced by livestock farmers and managers of game farms and protected area, is to find practical ways to implement Namibia's rangeland management strategy currently being developed. This will not be easy and will require coordinated efforts of all role players that include government, farmers, development agents and the livestock and wildlife industry in general. A mixture of adequate incentives and targeted regulation will be required to achieve this (pers. comm. Kruger, B. 2012).

7. The impact of climate change on wildlife and livestock and future business prospects

It is expected that the impact of climate change will be more severe on livestock than wildlife. Namibia's long term carrying capacity is already exceeded in many areas. Climate change will result in the shrinkage of the northern and eastern productive areas and the productive areas for small stock will retreat from the west and expand towards the north and east. Large stock will most probably be replaced by small stock in these areas. It is also envisaged that farm land will

decline from 64 million ha to 57 million ha by 2050 (11% decline). Cattle numbers are predicted to decline with 24% and small stock numbers with 16 % by 2050, resulting in a mean loss of 28% of livestock revenue by 2050.

The areas predicted to experience the greatest loss in primary agricultural productivity, are set to experience the largest increase in the variety of wildlife species and numbers as cattle and small stock will be replaced by wildlife and tourism. This gain in species diversity will most probably be attributed to the fact that Namibia is rich in species that can adapt to dry, warm and arid conditions. The socio-economic implications of climate change on the farming sector, on rural populations and supporting services are likely to be severe (Turpie *et al.*, 2010).

8. Contribution of livestock and game to CO_2 emissions

Livestock are already well-known to contribute to greenhouse gas (GHG) emissions. *Livestock's Long Shadow,* a 2006 report by the United Nations Food and Agriculture Organization (FAO), estimates that 7,516 million metric tonnes per year of CO_2 equivalents (CO_2e), or 18 % of annual worldwide GHG emissions, are attributable to cattle, buffalo, sheep, goats, camels, horses, pigs, and poultry.

However, Goodland and Anhang (2009) showed that these figures are wrongly calculated and estimate that livestock and their by-products actually account for *at least* 32 564 million tons of CO_2 emissions per year, or 51 % of annual worldwide GHG emissions. Taken into consideration that the total world cattle population was 1.3 billion in 2009 (Meat Board of Namibia, 2012) and Namibia only has 2.39 million (0.18%), the actual contribution of Namibia's livestock and game to worldwide CO_2 emission, is negligible. Opposed to vehicles, livestock on natural rangelands can be used as a tool to improve rangeland condition in order to serve as a carbon sink. More research is needed on this topic (pers. comm. Kruger, B. 2012).

9. Impact of HIV / AIDS on livestock and game farming

During a wage study conducted in 2010, it was found that 18.4% of respondents in the survey (84/457) indicated that they are aware of the HIV / AIDS cases amongst their farm workers. Awareness increased as from 2006 with an average of 9.5%. Where HIV/AIDS incidents

occurred, employees received counselling and 59.5% (50/84) employers specified that the workers received antiretroviral medication. Sixty five percent of the employers in the survey were subjected to an awareness action. Opportunities were also given to workers to undergo voluntary testing (Agricultural Employers' Association, 2010). The impact of HIV / AIDS on the farming sector is believed to be insignificant.

10. Survey results from qualitative research conducted in commercial and communal areas

Game and livestock producers were requested to complete a questionnaire (Annexure A) specifically designed to obtain data for the financial modeling of the economic analyses of the game meat value chain. Three commercial and three communal game and livestock farmers in the east, west, north and south of Namibia completed the questionnaires (24 game and livestock producers in total). Primary data were collected during January to February 2012 from the producers and were captured as real time parameters into the financial model. A summary of the results are shown in Annexure 3.

11. Financial modeling – mixed farming enterprises (livestock and game)

The financial model as compiled for the purpose of the economic analyses of the formal game meat value chain in Namibia focused on the financial feasibility of individual farming enterprises with mixed farming, including species such as game, cattle, sheep and goat. Besides the calculation of the financial feasibility, the model also compared different farming enterprises in terms of gross margins and labour productivity.

Different areas within Namibia have different rangeland carrying capacities (Figure 7.4) and are naturally suited for specific livestock and game species. This results in certain species being more manageable and profitable in certain areas. In the south and the west, long-term stocking rate is in the order of 10 – 20 kg/ha, in the central and northern regions 20 – 40 kg/ha and in the north-east 40 – 60 kg/ha (Mendelsohn, 2006).

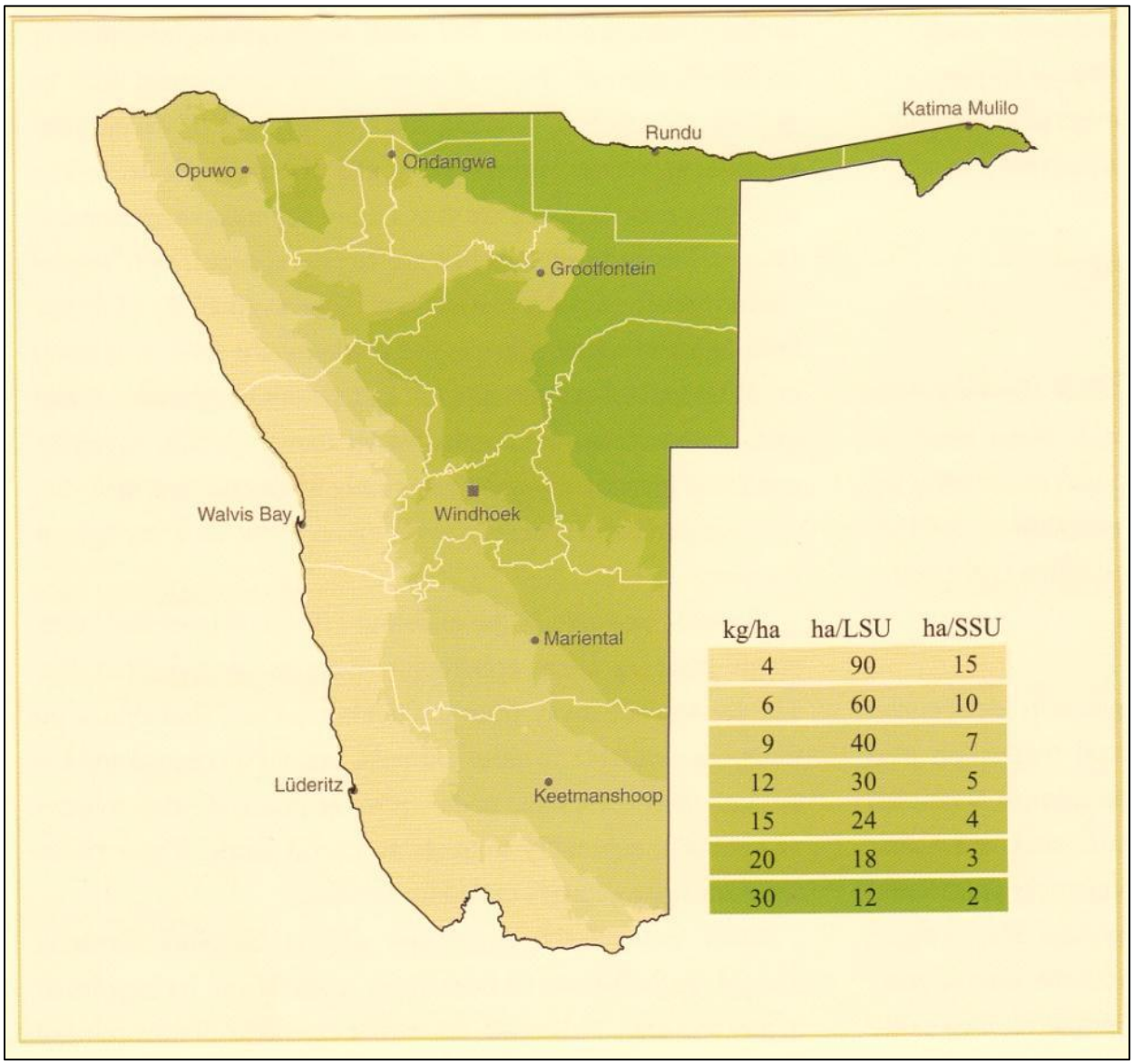

Figure 7.4 Rangeland carrying capacity in Namibia

There is a rough relationship between rainfall and carrying capacity - for each percent decrease in rainfall there is on average (across the rainfall gradient in Namibia) a decrease of 1.24% in carrying capacity (Figure 7.5). However, it is not a linear relationship. Below 300 mm of rainfall there is a 1.1% decline in carrying capacity. At about 350 mm the ratio increase to 1.3% and above 400 mm it is about 1.6% decrease in carrying capacity per 1% decline in rainfall.

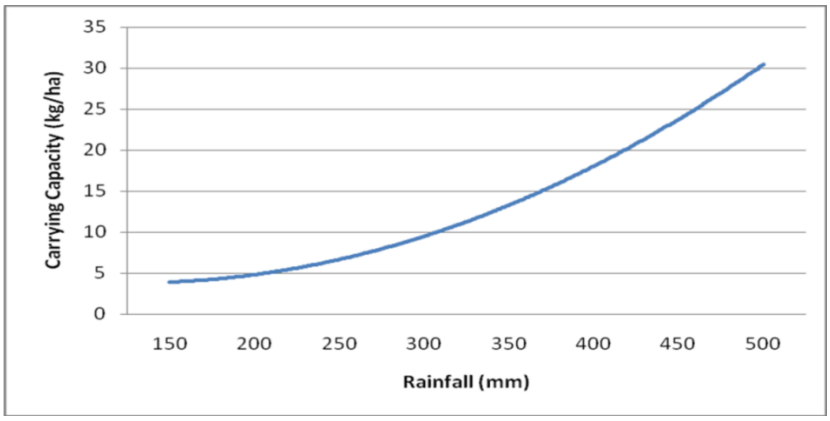

Figure 7.5 Relationship between rangeland carrying capacity and rainfall in Namibia (Turpie *et al.* 2010)

Average annual rainfall in Namibia varies from 650 mm in the Caprivi area to less than 50 mm along the Atlantic coast. Around the towns of Tsumeb, Grootfontein and Otavi higher rainfall occurs due to the highlands in the surrounding areas.

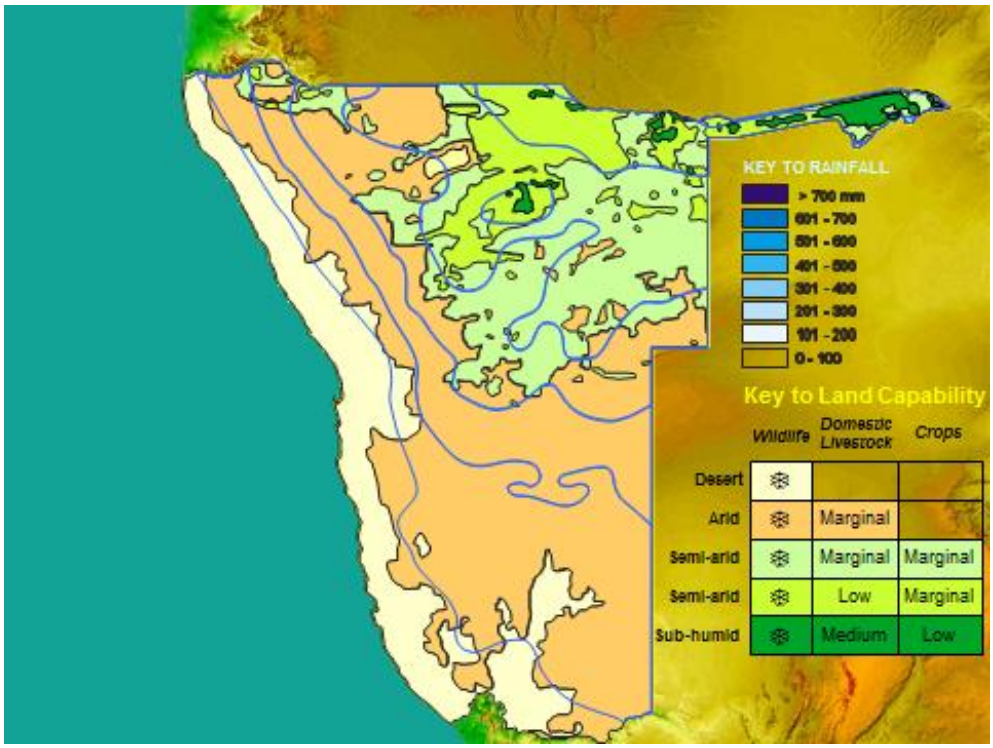

Figure 7.6 Average rainfall (mm) in different areas of Namibia (Mendelsohn, 2006)

12. Farming enterprises from which income is generated

Livestock and game production (farming) systems are important enterprises in Namibia. More land is used for agriculture than any other activity. Despite the high proportions of farmland, agriculture contributes a low percentage to Namibia's GDP – only about 5% (N$ 4 billion) (Mendelsohn, 2006). The Namibian manufacturing sector contributes 14.4% (N$ 12 billion) followed by mining with 8.8% (Total GDP = N$ 81 billion). Processing of meat contributes about 0.5% to the GDP (NMA, 2012). The total direct added value contribution of the wildlife-use sector (wildlife viewing, trophy hunting, live game and meat sales) represents approximately 2.1% of the GDP, compared to 3.4% for the tourism industry (CBS, 2004).

Over the past three decades cattle and sheep numbers decreased within Namibia with 10% and 15% respectively, while game numbers increased tremendously. This in effect means that the contribution of game and tourism to the GDP increased steadily. Since the inception of the economic recession and the European debt crises, the tourism and game industries experienced a decrease in its growth numbers, as Europe and European tourists are the main market for the Namibian game and tourism industry. The European debt crises had a major effect on the purchasing power and real income of Europeans which in turn has a direct influence on the Namibian game industry.

13. Farming practices of respondents

Apart from the far west where the Namib Desert is prominent, the south of Namibia is the most arid part of the country. The arid nature of the south means that small stock (sheep and goat) is usually the preferred enterprises from which income is generated. Cattle and game are however part of the farming business in the south, where livestock and game producers seem to be quite diverse in their involvement in a variety of enterprises.

The northern and eastern part of Namibia, and to lesser extent the western part, are more suited for cattle farming and larger variety of game species due to its higher rangeland carrying capacity. This results in the scenario that most livestock and game producers in northern and eastern Namibia generates lower income from small stock. The upper north of Namibia also

generates relatively large percentages of income derived from crops and various forms of horticulture.

Communal areas and communal conservancies derive almost all their income from game, while individual members or livestock producers within the conservancies derives income from a mixture of livestock enterprises such as sales from cattle, sheep and goat.

14. Enterprise contribution as a percentage of income

14.1 Commercial livestock and game producers

Even though the game industry has shown tremendous growth over the past thirty years, most of the commercial producers involved in both game and livestock farming earn a large percentage of their total income from ;livestock and only a small percentage of their total income is derived from the utilisation of game. The enterprise contribution for commercial farmers as a percentage of total income derived from the qualitative research survey is presented in Table 35.

Table 35 Enterprise contribution as a percentage of total income for respondents from commercial livestock and game farms in different areas of Namibia

Description	Northern Namibia			
% Contribution to total income	**Producer 1**	**Producer 2**	**Producer 3**	**Average**
Game	24.9%	18.2%	16.1%	17.5%
Cattle	75.1%	81.8%	83.9%	82.5%
Sheep	0.0%	0.0%	0.0%	0.0%
Goats	0.0%	0.0%	0.0%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Description	**Southern Namibia**			
% Contribution to total income	**Producer 1**	**Producer 2**	**Producer 3**	**Average**
Game	23.6%	7.7%	7.8%	13.7%
Cattle	26.5%	54.0%	44.7%	41.2%
Sheep	25.9%	8.3%	37.7%	22.6%
Goats	24.0%	30.0%	9.8%	22.4%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Description	**Eastern Namibia**			

% Contribution to total income	Producer 1	Producer 2	Producer 3	Average
Game	50.3%	35.3%	13.5%	40.8%
Cattle	49.7%	44.5%	86.5%	54.7%
Sheep	0.0%	19.8%	0.0%	4.4%
Goats	0.0%	0.5%	0.0%	0.1%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**
Description	**Western Namibia**			
% Contribution to total income	**Producer 1**	**Producer 2**	**Producer 3**	**Average**
Game	11.5%	6.1%	22.8%	12.9%
Cattle	1.3%	93.9%	77.2%	36.1%
Sheep	87.1%	0.0%	0.0%	50.9%
Goats	0.0%	0.0%	0.0%	0.0%
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**

It is evident from Table 35 that livestock and game producers in the southern and western parts of Namibia have fewer game species (mostly springbok, gemsbok and kudu) on their land and an even lower percentage of their income originates from game, when compared to their peers in the other areas. However, there are exceptions, but these were not included in the study. Producers in the south do however seem to diversify more in terms of the number of livestock enterprises.

All the respondents in the south generated income from game, cattle, sheep and goat, while producers from other areas primarily farm with only cattle and game as observed in Table 35. One of the respondents in western Namibia generates an unusually large percentage of income from sheep (87.1%), which resulted in unbalanced data. The other two respondents in the west derive their income primarily from cattle farming.

In the south a new trend is observed where producers derive a larger part of total income from cattle farming (41.2%), but the average contribution to total income from sheep and goat farming is almost equal, comprising 22.6% and 22.4% of income, respectively. Game farming generated only 13.7% of the total income.

Data compiled from producers in eastern Namibia indicated a strong involvement in game farming and utilisation as this enterprise contributes 40.8% to total income compared to cattle farming with 54.7% in these areas. This resulted in an average of only 4.5% of total income

contributed by small stock farming. The most notable observation from the data compiled from the north is that 100% of income generated is derived from cattle and game farming.

14.2 Communal farmers

Farming practices (or the lack thereof) and management structures of communal areas and conservancies make it difficult to assess farming records to compare game enterprises with the various livestock enterprises. Contributing factors are;- 1) conservancies have no clear borders and 2) no single producer within the conservancy boundaries can claim game which roams freely in the area.

Game can therefore not be allocated to a specific producer, but is allocated to the management of the conservancy through a quota system operated by the Ministry of Environment and Tourism. Livestock on the other hand is owned and controlled by individual producers and not the management of conservancies.

This results in a scenario where the two farming enterprises (game and livestock farming) cannot be compared in the same financial model, as they are separate economic units and managed on a different scale. Individual livestock producers are scattered randomly within the conservancy and their basic income is generated from livestock. The game population on the other hand is owned by the management of the conservancy, meaning almost all of the income of the management structure is derived from this enterprise.

The following are prices paid to the management of conservancies (Table 36) for different game species as per respondents from the survey. In general, communal conservancies are paid below market prices for harvestable game species.

Table 36 Prices paid to conservancy management for various harvestable game species (N$/head)

	Anabeb	Sesfontein	Torra	!Khoadi	Gaingu
Springbok Live weight (N$/head)	350.00 (500.00 trophy)	350.00 (Hunting tourism) 250.00 (Live)	1 460.00 (trophy) 350.00 (live)	300.00	900.00
Gemsbok Live weight (N$/head)	1 800.00	1 500.00 (Hunting tourism) 900.00 (Live)	1 790.00 (trophy) 950.00 (live)	1 800.00	1 100.00
Kudu Live weight (N$/head)	4 000.00		2 900.00 (trophy)	1 800.00	2 900.00
Zebra Live weight (N$/head)	2 000.00	2 500.00	1 790.00 (zebra)		

It can be concluded that communal livestock and game producers are not well informed regarding market prices and do not have the same market opportunities as commercial producers due to the differences in land ownership and wildlife utilisation.

15. Game utilisation schedule of respondents

15.1 Commercial producers

Commercial producers tend to have more product diversification and utilise game in several different ways to generate income, especially in the northern and eastern Namibia where large game populations occur. The south of Namibia has fewer game species as producers prefer livestock farming. Springbok is the most widely utilised game species in the south with other species being a minority in this area. In northern Namibia game is utilised by means of trophy hunting, live capture and selling of live game for commercial meat production.

The southern and western areas of Namibia focus more on the monitoring of game numbers to prevent overgrazing as to maintain a sustainable livestock industry, rather than to investigate game farming as a viable option to generate income. This means that the game utilisation schedule in these areas is less complex. Income from game in the south and west of Namibia is thus primarily generated through harvesting by professional hunters to sell as commercial

meat or live capture.

15.2 Communal areas/conservancies

Only a few communal conservancies in Namibia are involved in capturing and selling of live game, although all of the respondents indicated that they are interested in being part of the option to sell live game in future. Income from game in the communal areas is primarily generated through trophy hunting and harvesting of game for commercial meat ("shoot and sell" as it is commonly known by the local members and conservancy management). Trophy hunting and selling of game meat for local markets usually go hand in hand, as trophy hunters are only interested in the head and horns of the animal, leaving the meat for the owners to sell.

16. Direct allocated farming costs of respondents

The direct allocated farming costs are generally low for the respondents from all the regions when reflected as a percentage of total expenses. It comprises costs such as feeding costs, veterinary costs and other costs directly contributed to a specific enterprise. This in effect means that the bulk of the farming expenses are derived from general expenses, comprising of household expenses, which can usually not be allocated to a specific enterprise.

Table 37 Expenses as a percentage of total expenses for respondents from commercial livestock and game farms in different regions of Namibia

Description	North	South	East	West
Expenses as % of total expenses	**Total**	**Total**	**Total**	**Total**
Direct allocated cost – Game	1.5%	0.9%	5.9%	5.5%
Direct allocated cost – Cattle	64.9%	6.1%	41.6%	15.3%
Direct allocated cost – Sheep	0.0%	4.6%	1.4%	7.9%
Direct allocated cost – Goats	0.0%	4.8%	0.0%	0.0%
General expenses	25.9%	63.9%	40.6%	48.1%
Labour expenses	7.7%	19.6%	10.6%	23.2%

From Table 37 it is observed that general expenses are the highest in the south (63.9%). The high direct allocated cost of cattle in the north does however not reflect the true picture, as one of the respondents in northern Namibia is a speculator cattle farmer, who feeds cattle before

selling at a higher weight for profit. This resulted in the data of the northern respondents be skewed and conceals the fact that cattle farming in the north have relatively low direct allocated costs.

Farming practices in southern Namibia however appear to have the lowest directly allocated costs as the dry and arid nature of the south results in low veterinary costs as diseases and parasites are not so prevalent than in the north and east of the country. Southern Namibia therefore appears to be the most profitable region with respect to livestock farming, with the north being more suitable to game, as these species are more adapted and less prone to disease.

Table 38 Expenses as a percentage of total income for respondents from commercial livestock and game farms in different areas of Namibia

Description	**North**	**South**	**East**	**West**
Expenses as % of total income	**Total**	**Total**	**Total**	**Total**
Direct allocated cost – Game	1.2%	0.3%	4.0%	2.0%
Direct allocated cost – Cattle	52.7%	2.1%	28.2%	5.5%
Direct allocated cost – Sheep	0.0%	1.6%	0.9%	2.8%
Direct allocated cost – Goats	0.0%	1.7%	0.0%	0.0%
General expenses	21.0%	22.0%	27.6%	17.4%
Labour expenses	6.3%	6.8%	7.2%	8.4%
Total expenses	**81.2%**	**34.5%**	**67.9%**	**36.1%**

The direct allocated costs associated with the different enterprises seem to reflect the same pattern in all the areas, for both the communal and commercial livestock and game producers. In all the areas the game enterprise proved to have the lowest direct allocated cost when reflected as a percentage of the income generated from the enterprise (Table 38 above). Table 38 confirms the findings of Table 37 as the south again proves to be the area with not only the lowest direct allocated expenses, but also the lowest total expenses as a percentage of total income.

Table 39 Production cost ratios for respondents from commercial livestock and game farms in different areas of Namibia

Description	North	South	East	West
Production cost ratio				
Game	7.0	2.4	9.8	15.2
Cattle	63.9	5.1	51.6	15.3
Sheep	-	7.0	21.0	5.6
Goats	-	7.4	12.6	-
Total (Scale Considered)	**53.9**	**5.7**	**33.1**	**10.4**

The production cost ratios as depicted in Table 39 is a reflection of the direct allocated costs of a specific enterprise, conveyed as a percentage of the total income generated from that same enterprise. For example, the 5.1% production cost ratio for cattle in southern Namibia, means that if the cattle enterprise generates an income of N$ 100.00, the direct cost associated with producing an income is 5.1% of the income (N$ 5.10).

It is evident from Table 39 that in general the game industry appears to have the lowest production cost ratio, thus the cost associated with game production is minimal. The unusually high production cost ratio of cattle in the north and south can be attributed to the fact that both these areas have one respondent involved in speculation with livestock.

Interviewers who conducted the survey in the communal areas and conservancies were only able to collect some meaningful data and information in the west and north-west of Namibia and neither one of the communal areas and conservancies visited had any direct allocated costs associated with game.

The burning question is whether the gross margin from farming enterprises will increase if the production cost ratio increases, resulting in a better net income for livestock and game producers. During the interviews held with the livestock and game producers it became evident that it will be a challenge to design an ideal economic/financial model for livestock and game farming due to the variety in farming practices. Further in-depth studies over several years are needed to answer this question.

17. Labour expenses incurred by respondents

One of the main objectives of the survey was to evaluate the labour productivity and more specifically the percentage of total labour cost allocated to the various enterprises. It was observed that neither commercial producers, nor communal producers had individual labourers allocated to a specific enterprise, but rather appointed a number of general farm workers suited for all tasks.

Labour expenses and productivity were calculated by expressing total labour expenses as a percentage of the total expenses of the farming business. The average labour expenses are similar for all areas (Table 40), with the western part of Namibia having a slightly higher average in relation to total expenses. This difference is however small and it can be concluded from the data above that average labour expenses in Namibia, calculated as a percentage of total income, are about 7%, with a maximum value of about 11%. In cases where the figure exceeds the maximum, farm workers need to be involved in other income generating operations to ensure sustainability.

Table 40 Labour expenses and productivity of respondents from commercial livestock and game farms in the different areas of Namibia

Description	**North**			
Labour productivity	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Number of labourers	10	9	22	
Average salary/labourer	1 100.0	1 200.0	1 050.0	
Total labour expenses	132 000.0	129 600.0	277 200.0	538 800.0
Percentage of income	**13.1%**	**8.4%**	**4.6%**	**6.3%**
Description	**South**			
Labour productivity	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Number of labourers	4	4	6	
Average salary/labourer	1 200.0	1 400.0	1 083.3	
Total labour expenses	57 600.0	67 200.0	83 988.0	208 788.0
Percentage of income	**4.9%**	**6.1%**	**10.4%**	**6.8%**
Description	**East**			
Labour Productivity	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Number of labourers	4	7	6	
Average salary/labourer	1 096.0	1 275.0	1 300.0	

Total labour expenses	65 750.0	104 400.0	93 600.0	263 750.0
Percentage of income	**2.9%**	**12.8%**	**15.4%**	**7.2%**
Description	**West**			
Labour productivity	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Number of labourers	15	6	8	
Average salary/labourer	5 850.0	1 150.0	1 400.0	
Total labour expenses	327 600.0	82 800.0	134 400.0	544 800.0
Percentage of income	**8.6%**	**6.5%**	**9.5%**	**8.4%**

18. General farming expenses incurred by respondents

General farming expenses as defined in the economic/financial model used for this study comprises all general costs incurred on the farm which are not allocated to a specific enterprise. This includes the following base costs (with the exception of some additional costs specific to an individual situation):

- Fuel;
- Electricity;
- Repairs and maintenance on the farm;
- Land tax;
- Insurance;
- Bank charges;
- Medical scheme; and
- Household expenses.

General expenses as a percentage of total expenses varied from 17.44% in the west, 21% in the north, 22% in the south and 27% in the east of Namibia. From observations it is clear that producers in eastern Namibia have the highest general expenses. However, when viewing the data in monetary terms, producers in the eastern part spend less than producers in the north and west. The main reason for the high percentage in the eastern part of Namibia, is that one of the respondents does not utilise the game enterprise to its full potential. There is a population of around 1 560 game (1 200 springbok) on the farm which generates an income of only N$ 81 800.00.

19. Gross margins for mixed farming (livestock and game)

From the survey it was observed that the diversity in farm management and farming practices resulted in gross margins varying substantially, making it difficult to determine averages. However, it was agreed that the data obtained is practical and a solid indication that there is not one specific formula or model for successful farming in different areas of Namibia.

The survey was also not designed to include investment and interest payments of the livestock and game producers. The capital requirements for agricultural investments are quite high, which means that the recorded expenses would have been determined by the focus of the individual at the helm of the business. This was discussed during the interviews, but it was impossible to determine optimal levels. More in-depth research on the topic is needed as it will become increasingly important for agricultural economists to have access to these figures in the future.

Table 41 Gross margin calculations for respondents from commercial livestock and game farms in different areas of Namibia

North	Producer 1	Producer 2	Producer 3	**Total**
Income	1 005 110	1 536 850	6 067 100	**8 609 060**
Expenses	765 528	856 200	5 370 700	**6 992 428**
Gross margin	239 582	680 650	696 400	**1 616 632**
Gross margin %	23.84%	44.29%	11.48%	**18.78%**
South	Producer 1	Producer 2	Producer 3	**Total**
Income	1 168 180	1 102 490	805 054	**3 075 724**
Expenses	447 630	265 580	349 988	**1 063 198**
Gross margin	720 550	836 910	455 066	**2 012526**
Gross margin %	61.68%	75.91%	56.53%	**65.43%**
East	Producer 1	Producer 2	Producer 3	**Total**
Income	2 243 180	814 972	607 980	**3 666 132**
Expenses	1 484 084	518 408	486 900	**2 489 392**
Gross margin	759 096	296 564	121 080	**1 176 740**
Gross margin %	33.84%	36.39%	19.92%	**32.10%**
West	Producer 1	Producer 2	Producer 3	**Total**

Income	3 795 228	1 280 232	1 418 220	**6 493 680**
Expenses	915 300	561 500	868 000	**2 344 800**
Gross margin	2 879 928	718 732	550 220	**4 148 880**
Gross margin %	75.88%	56.14%	38.80%	**63.89%**

The lack of uniformity in the percentages as indicated in Table 41 is an indication that there is no uniformity in the approach to farming practices across the country. An optimal gross margin percentage would be determined by economies of scale, due to change in expenses involved in farming practices as well as non-farming practices.

Furthermore, it was observed that producers have not yet adapted to the changes in all the financial aspects involved with farming. If producers introduce investments back into farming they will most probably run into future financial trouble in the future as the price-cost squeeze will take effect. The production cost ratio confirms that there is less focus on production techniques /practices, but also that the farming conditions in Namibia are still encouraging.

In today's agricultural business environment cash flow is the most important aspect to keep the business healthy. Land prices are very high in relation to production capacity and credit availability (with the farm as security) and producers are often under pressure due to high gearing. This, as well as the slow nature of extensive livestock farming often put farmers' cash flow under pressure.

Once exposed to this kind of pressure, it becomes very difficult to find a way out and that is when livestock and game production starts to take a back seat. It is therefore very important that farmers establish a sound cash flow cycle within the farming business, which would allow for at least a continuing three year plan to cover all commitments.

20. Financial modeling for livestock only, or game only farming (as opposed to mixed farming)

Table 42 depicts the financial results for only game farming or only livestock farming as opposed to mixed farming. The model converted all the livestock / game units currently on the farm into either game or livestock units and then calculated a gross margin based on the income

per unit for each individual enterprise.

Table 42 Gross margin calculations for farming with livestock only or game only

North	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Income per game LSU	617	1 246	4 534	**1 783**
Income per livestock LSU	1 471	1 713	3 371	**2 576**
Income from game only	566 696	1 194 680	7 824 427	**6 423 617**
Income from livestock only	1 351 466	1 641 521	5 816 186	**9 279 249**
Expenses	765 528	856 200	5 370 700	**6 992 428**
Gross margin game only	-198 832	338 480	2 453 727	**-568 811**
Gross margin livestock only	585 938	785 321	445 486	**2 286 821**
Gross margin % game	**-35%**	**28%**	**31%**	**-9%**
Gross margin % livestock	**43%**	**48%**	**8%**	**25%**
South	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Income per game LSU	4 696	794	1 622	**2 118**
Income per livestock LSU	2 656	3 285	2 049	**2 632**
Income from game only	1 853 677	326,457	650 195	**2 556 129**
Income from livestock only	1 048 514	1 351 064	821 540	**3 177 089**
Expenses	447 630	265,580	349 988	**1 063 198**
Gross margin game only	1 406 047	60 877	300 207	**1 492 931**
Gross margin livestock only	600 884	1 085 484	471 552	**2 113 891**
Gross margin % game	**76%**	**19%**	**46%**	**58%**
Gross margin % livestock	**57%**	**80%**	**57%**	**67%**
East	**Producer 1**	**Producer 2**	**Producer 3**	**Total**
Income per game LSU	4 235	665	289	**1 526**
Income per livestock LSU	5 965	1 337	1 660	**2 414**
Income from game only	1 919 639	549,875	173,494	**2 867 698**
Income from livestock only	2 703 973	1 105 454	995,585	**4 538 234**
Expenses	1 484 084	518 408	486,900	**2 489 392**
Gross margin game only	435 555	31 467	-313,406	**378 306**
Gross margin livestock only	1 219 889	587 046	508 685	**2 048 842**
Gross margin % game	**23%**	**6%**	**-181%**	**13%**
Gross margin % livestock	**45%**	**53%**	**51%**	**45%**
West	**Producer 1**	**Producer 2**	**Producer 3**	**Total**

Income per game LSU	1 571	586	1 026	**1 154**
Income per livestock LSU	3 695	2 809	2 399	**3 154**
Income from game only	1 864 982	329 244	791 812	**2 908 410**
Income from livestock only	4 387 821	1 577 419	1 851 767	**7 950 495**
Expenses	915 300	561 500	868 000	**2 344 800**
Gross margin game only	949 682	-232,256	-76 188	**563 610**
Gross margin livestock only	3 472 521	1 015 919	983 767	**5 605 695**
Gross margin % game	**51%**	**-71%**	**-10%**	**19%**
Gross margin % livestock	**79%**	**64%**	**53%**	**71%**
Gross margin % Game				**21%**
Gross margin % Livestock				**52%**

From Table 42 it is evident that livestock farming is more profitable than game farming. However, it must be kept in mind that in practice this might not necessarily be the case as logistical, structural and other changes will be needed should a producer decide to farm with game only. Based on the information retrieved from the survey, should producers farm with game only, they would be financially worse off than with the current mixed farming system.

Figures from Table 42 further suggest that should all the game on the farm be replaced by livestock, producers would have a better gross margin. However, in practice this would not be the case as it would increase stocking rate of livestock to ± 97%, which would be devastating to rangeland conditions and management. The standard practice of livestock stocking rate in Namibia currently requires that producers regulate livestock stocking rate to ± 75%. The study however found that producers do not keep the game stocking in mind, as is clearly shown by the results. The conclusion from the calculated figures are that farms are overstocked, which cannot be sustainable in a country like Namibia with a dry climate.

21. Advantages of mixed farming

It is strongly recommended that producers in all areas of Namibia should keep to mixed farming practices and particularly to practices including game farming, due to the fact that; 1) game populations are on the increase, 2) game farming is already such an integral part of farming practices, 3) Namibia is a natural habitat for game and 4) game farming has a low production cost ratio. However, it is of utmost importance that producers increase the efficiency of game

utilisation.

Currently game occupies ± 30% of the available farm, while it only realises ± 20% of the total income. The pressure to generate income is still on livestock enterprises, which realises ± 80% of the total income, yet only occupies 70% of available farm area. Improved management of the co-existence of game and livestock on the same farm could result in the improvement of livestock quality, as well as the control of game numbers.

It can be concluded that the survey among the commercial and communal producers proved that farming conditions in Namibia is currently favourable as depicted in the results from the economic / financial model. Rangeland stocking rates are however much too high. It can therefore be recommended that producers should rather focus on improving production cost ratios and efficiency of farming practices, as it will ensure sustainability in the long run.

22. Comparison of income, expenses, gross margins and value-added across different value chains (beef, lamb and game meat)

The game meat, beef and sheep export value chains were compared according to parameters such as unit costs, productivities and gross margins comprising the following value chain actors:

- Livestock and game producers;
- Harvesting teams (where applicable);
- Abattoirs and processors (where applicable);
- Exports to South Africa; and
- Exports to the European Union.

Included in the analyses is a similar value chain for springbok harvesting in South Africa, one with figures from helicopter harvesting and one with “bakkie” harvesting. It is interesting to note that game harvesters in South Africa have fewer expenses to harvest game.

From the value chain analyses (Table 43) it was evident that the gross margin calculated on production level was the highest for sheep (75%), followed by springbok (60%), large game (52%) and cattle (42%). Processing of meat for the South African market revealed that the

gross margin calculated for processing was the highest for cattle (31.64%), followed by sheep (26.6%), springbok (18.6%) and large game (16.2%).

Marketing and sales to the European Union revealed the highest gross margin calculation for beef (36.2%) sales, followed by lamb/mutton (31.5%), springbok meat (31.2%) and meat from large game (24.4%). When performance (gross margin calculations) of the Namibian springbok meat value chain was compared to the performance of the South African springbok meat value chain, it was evident that the South African value chain was more profitable in 2011.

23. Amortisation of the necessary investments and cash flow requirements

It is well known that one of the major bottle necks within the game meat value chain for export is the availability of processing (de-skinning and de-boning) facilities. For a new entrepreneur to construct such a facility, a capital budget of N$ 12 – 20 million is needed, as the operations must be able to comply with the required hygiene and regulatory requirements. Repayment of interest on such a huge loan can be difficult if the practise of economies of scale is not followed. It is calculated that such a facility will need to process between 8 000 – 12 000 head of game to break-even financially.

In addition, another N$ 5 – 10 million is needed for cash flow purposes (operational expenses). Sales logistics results in payments often being made two to three months after production and processing of the product, which means that the company will need a large cash flow to stay in operation.

24. Conclusion

From the economic / financial analyses it can be concluded that livestock and game farming conditions in Namibia is currently favourable, although rangeland stocking rates are too high.

Producers benefit from including game as a farming enterprise, but need to increase the efficiency of game utilisation as game currently occupies 30% of the available farm area and only realises 20% of the total income. Pressure is still on livestock production earning 80% of the total income, while occupying 70% of the available farm area.

Sufficient supply of game exists in most communal conservancies rendering harvesting for commercial purposes a possibility in these areas. However, the procedure of organised harvest in communal land needs to be simplified.

From the evaluation and analyses of the game meat value chain, it is evident that value is added along the chain and that all operators benefit from the chain, although some more than others. These discrepancies should be addressed by the industry, as benefits of value-addition should be fairly distributed across the value chain.

Table 43 Comparison of income, expenses, gross margins and value added in beef, sheep and game value chains.

Comparison of income, expenses, gross margins and value added				
Local currency	N$ (NAD)			
Calculation	Per animal /per kg			
Year of calculation	2011/2012			
Commodity	Meat from livestock (cattle, sheep) and game			
	game (Springbok, gemsbok, kudu, red hartebeest, zebra)			
Production technique	Free range			
Age at sale	Mature animals			

	Springbok Namibia (bakkie harvesting)	Springbok RSA (helicopter harvesting)	Springbok RSA (Bakkie harvesting)	Gems-bok Namibia	Kudu Namibia	Red harte-beest Namibia	Zebra Namibia	Sheep Namibia	Cattle Namibia
Production (on- farm)									
Expenses									
Direct allocated costs (N$/kg*)	0.42	0.50	0.50	0.42	0.42	0.42	0.42	0.29	6.50
General farm expenses (N$/kg*)	5.00	4.00	4.00	5.00	5.00	5.00	5.00	5.00	5.00
Labour expenses (N$/kg*)	1.70	1.80	1.80	1.70	1.70	1.70	1.70	1.70	1.70
Transport to abattoir N$/kg* (livestock)								0.50	0.50
Total	7.12	6.30	6.30	7.12	7.12	7.12	7.12	7.49	13.70

Income (Average annual prices)									
N$/kg* (all grades & age groups)	18.00	16.00	17.75	15.00	15.00	15.00	15.00	30.24	23.80
Gross margin (%)	60.44	60.63	64.51	52.53	52.53	52.53	52.53	75.23	42.44
Harvesting (game only - hunted and carcasses partially dressed)									
Expenses									
Price paid to producer	18.00	16.00	17.75	15.00	15.00	15.00	15.00	n/a	n/a
Field abattoir(N$/kg*)	1.50	0.11	0.22	1.50	1.50	1.50	1.50	n/a	n/a
Labour expenses (N$/kg*)	1.00	0.45	0.53	1.00	1.00	1.00	1.00	n/a	n/a
Harvesting operations (N$/kg*)	3.85	2.01	0.33	4.00	4.00	4.00	4.00	n/a	n/a
Refrigerated transport to abattoir/processing facility (N$/kg*)	2.50	Paid by processor	Paid by processor	2.50	2.50	2.50	2.50	n/a	n/a
Total	26.85	18.55	18.83	24.00	24.00	24.00	24.00	n/a	n/a
								n/a	n/a
Income								n/a	n/a
Profit from harvesting operations (30%)	1.65	1.10	0.46	1.50	1.50	1.50	1.50	n/a	n/a
Price received for partially dressed carcass (N$/kg*)	26.85	19.90	20.54	24.00	24.00	24.00	24.00	n/a	n/a
Total	28.50	21.00	21.00	25.50	25.50	25.50	25.50	n/a	n/a

Gross margin (%)	5.79	11.67	10.33	5.88	5.88	5.88	5.88		
Processing for RSA wholesale market (carcasses into meat cuts)									
Expenses									
Refrigerated transport to abattoir/processing facility (N$/kg*)	Paid by harvester	4.20	4.20	Paid by har-vester	Paid by har-vester	Paid by har-vester	Paid by har-vester	n/a	n/a
Purchase price of carcass (N$/kg*)	28.50	21.00	21.00	25.50	25.50	25.50	25.50	30.24	23.80
Fixed costs (excluding labour costs) N$/kg**	4.00	3.50	3.50	4.00	4.00	4.00	4.00	5.00	5.00
Labour costs (NS/kg**)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50
Variable costs (Slaughtering, de-boning, processing, packaging, storage (N$/kg**)	4.00	3.96	3.96	4.00	4.00	4.00	4.00	4.50	4.50
Marketing costs (N$/kg***)	0.10	0.03	0.03	0.10	0.10	0.10	0.10	0.20	0.20
Transport to RSA wholesale distributor (N$/kg***)	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60	2.60
Total	40.70	36.79	36.79	37.70	37.70	37.70	37.70	44.04	37.60
Income									
Average price received for primal deboned cuts (Leg N$/kg***)	45.00	45.00	45.00	n/a	n/a	n/a	n/a	65.00	n/a

Average price received for primal deboned cuts (Rump N$/kg***)	55.00	55.00	55.00	65.00	65.00	65.00	65.00		65.00
Average price received for primal deboned cuts (Loin N$/kg***)	110.00	110.00	110.00	80.00	80.00	80.00	80.00	77.00	65.00
Average price received for trimmings (N$/kg***)	25.00	25.00	25.00	25.00	25.00	25.00	25.00	43.00	35.00
Average price received for offal (N$/kg***)	n/a	n/a	n/a	n/a	n/a	n/a	n/a	8.00	20.00
Average price received for wet salted hides/skins (NS/kg per skin/hide)	12.50	0.50	12.50	3.30	6.25	1.50	180.00	34.00	8.73
Total average income (calculated from block tests)	50.00	50.00	50.00	45.00	45.00	45.00	45.00	60.00	55.00
Gross margin (%)	18.60	26.42	26.42	16.22	16.22	16.22	16.22	26.60	31.64
Processing for EU wholesale market (carcasses into meat cuts)									
Expenses									
Refrigerated transport to abattoir/processing facility (N$/kg*)	Paid by harvester	4.20	4.20	Paid by har-vester	Paid by har-vester	Paid by har-vester	Paid by har-vester		
Purchase price of carcass (N$/kg*)	28.50	21.00	21.00	25.50	25.50	25.50	25.50	30.24	23.80
Fixed costs (excluding labour costs) N$/kg**	4.00	3.50	3.50	4.00	4.00	4.00	4.00	5.00	5.00
Labour costs (NS/kg**)	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50

Variable costs (De-boning, processing, packaging, storage (N$/kg)	4.00	3.96	3.96	4.00	4.00	4.00	4.00	4.50	4.50
Marketing costs (N$/kg***)	0.10	0.03	0.03	0.10	0.10	0.10	0.10	0.20	0.20
Transport to EU wholesale distributor (N$/kg***)	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50	6.50
Total	44.60	40.69	40.69	41.60	41.60	41.60	41.60	47.94	41.50
Income									
Average price received for primal deboned cuts (Leg N$/kg***)	82.00	82.00	82.00	85.00	85.00	85.00	85.00	85.00	70.00
Average price received for primal cuts (Loin N$/kg***)	170.00	170.00	170.00	160.00	160.00	160.00	160.00	170.00	165.00
Average price received for trimmings (N$/kg***)	30.00	30.00	30.00	30.00	30.00	30.00	30.00	24.00	23.00
Total average income (calculated from block tests)	65.00	65.00	65.00	55.00	55.00	55.00	55.00	70.00	65.00
Gross margin (%)	31.38	37.40	37.40	24.36	24.36	24.36	24.36	31.51	36.15

** Carcass value*

*** Carcass & meat cut value*

**** De-boned meat cut value*

CHAPTER 8

INDUSTRY NEEDS ASSESSMENT, VISION AND STRATEGIES

During 2011 a serious of stakeholder meetings were held with actors in the game meat value chain (Van Schalkwyk, 2011a). At these meetings the needs, constraints and opportunities within the formal game meat value chain were deliberated among the participants.

1. Needs, constraints and opportunities' assessment

1.1. Sharing of information between value chain actors

Participants strongly felt that topical, historical and new information should be disseminated among the actors of the value chain. At the same time a data base could be created for the users whereby market intelligence could be built upon. Research on questions specific for the different value chain actors was also seen as a priority and could be proposed to academic institutions.

Awareness of game meat among consumers, such as the correct preparation of game meat, different cooking methods, nutritional and wholesomeness of game meat, needs to be addressed. In line with this, an economic and market analyses need to be conducted to allow actors in the game meat value chain to make informed economic decisions.

Skills of the different actors in the game meat value chain need to be developed through proper training and education. It was also proposed to include a curriculum on game meat management and commercial game meat production at a tertiary educational level.

1.2 Formalisation of the game meat value chain

Participants of the stakeholder meetings identified a need for the game meat value chain in Namibia to be formalized in the same manner as livestock value chains, which are part of

organized agriculture. This will minimize the informal trade in game meat and contribute to the promotional activities within the value chain.

In order to co-ordinate the shared responsibility in the value chain, a common body needs to be developed to harmonise actions. There was a mutual feeling among value chain actors that the informal market practices should be addressed and that biltong hunters from South Africa and communal conservancies should be included in the formal game meat value chain.

1.3 Regulatory frame work

Participants proposed that the current regulations and processes pertaining to the quota system, permit system, health and hygiene codes, local consumer protection etc. should be revised, simplified and subsequently amended and implemented. This will, however, be a major exercise which will require additional human resource capacity at the Ministry of Environment and Tourism. There was also a mutual feeling that officials dealing with quota and permits issues be properly trained in service delivery to increase the efficiency of government services for proper resource management and business support.

1.4 Access to investment capital and incentives for investments

One of the bottle necks of the game meat value chain is the difficulty to access investment capital to construct processing facilities at the required standard and also the capital needed to fund the infrastructure needed to establish harvesting teams operating at an export level.

Currently excess capacity exists at some of the livestock slaughter facilities, which can be used to dress and process game meat. It is recommended that Government should provide financial incentives to business operators investing in game meat harvesting and processing in order to enhance the development of the industry.

1.5 Common body to serve as a forum for the game meat industry

Participants expressed their need for a common body to unite the game meat industry of Namibia in an association with the purpose of harmonizing strategies and viewpoints in order for

the Association to speak with one voice on all matters pertaining to the industry.

The association should create awareness for game meat, as well as promote and upgrade the game meat value chain. Best practices and accepted standards pertaining to the production of game animals and the slaughter/processing/marketing of game meat should be promoted. Participants felt that members and stakeholders of the game meat value chain should be provided with specific and general information and statistics regarding all aspects of the game meat industry and related activities.

2. SWOT analyses

Laubscher *et al*. (2007) presented strengths, weaknesses, opportunities and threads of the game meat industry in Namibia in their study comprising the following points:

2.1 Strengths

Table 8.1 Strengths of the Namibian game meat industry (Laubscher *et al*., 2007)

Good quality game meat especially from springbok, gemsbok and kudu;
Natural, chemical-free product;
Game numbers in conservancies increased significantly;
Highly adaptable game species;
Recognition of Namibia by the European Union as a supplier of game meat;
Experience in game meat management, harvesting, processing, shipping and marketing;
Good quality lean meat with low cholesterol content and high protein and iron content;
Good shelf life in fresh or frozen form due to low fat content

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2.2 Weaknesses

Table 8.2 Weaknesses within the Namibian game meat industry (Laubscher *et al.*, 2007)

Lack of a central game meat trading data base;
Lack of aggressive game meat marketing program;
Lack of skilled hunters and skinners in communal areas;
Lack of infrastructure for culling such as cooling trucks for usage as field abattoir;
Lack of local customer awareness on healthiness of game meat;
Hobby farming of some potential game farmers;
Lack of product brand such as organic game meat;
Deficiencies in cold storage and limited choice of export companies;
Lack of adequate production and marketing information especially in communal areas;
Lack of recognised EU approved slaughtering facilities in communal areas;
Lack of an actively functional body solely responsible for game meat marketing;
Negative perception that night culling is not humane;
Seasonality of the European Union market;
High current monetary returns in trophies compared to game meat;
Some service roads leading to difficulties in removing animals from the veld after shooting;
Terrain challenges in some conservancies;
Low game densities in some of the conservancies;
High cost of processing and transport

2.3 Opportunities

Table 8.3 Opportunities within the Namibian game meat industry (Laubscher *et al.*, 2007)

High demand for springbok meat in high value European markets;
High demand for game meat in upmarket restaurants such as Joes Beer House in Windhoek;
Product development opportunities through special recipes and dishes;

Development of horizontal alliances for the selling of game meat in high value markets;
Specific practical courses that contains current and accurate information of producers;
Information aimed at improving producer understanding of the game meat industry and requirements for export;
Current high demand for beef, lamb and mutton provides an improved prospect of game meat as a substitute meat on the local market;
Potential of air shipments of high quality fresh (chilled) cuts;
Introduction of Namibian game meat on the local airline;
Alliances with South African game meat exporters;
Advertising industry developments (websites, newspapers).

2.4 Threats

Table 8.4 Threats of the Namibian game meat industry (Laubscher *et al.* (2007)

Large volumes of venison supplied by New Zealand to overseas markets;
Outbreaks and occurrences of diseases such as rabies especially in kudus;
Possibility of delisting of Namibia as a third country source of wild game meat if veterinary services are not satisfactory in terms of hygiene and compliance with the European Union inspections;
Occurrence of drought leading to volatility of the game meat industry especially springbok;
Pressure of animal groups on the culling of game;
Outbreak of veld fires in the country;
High fuel prices;
Rising freight costs;
Culling methods may be a back lash on the tourism industry;
Large build-up of game in conservancies;
Predators such as jackals, leopards and lions posing a threat to the industry by reducing returns on export.

3. Vision and strategies

3.1 Ansoff matrix

At the stakeholders meetings held with the different actors in the value chain in 2011, the following key indicators were proposed to include in a vision for the Namibian game meat industry:

- Long term sustainability;
- Structured game meat value chain;
- User-friendly acts and regulations; and
- Optimum natural resource and facility utilisation.

Future strategies were also formulated during the second round of stakeholder meetings. Participants used tools from the ValueLinks manual (GIZ, 2009) for value chain upgrading to pinpoint upgrading strategies in the areas of market penetration, market development, product development and product diversification. A second approach was followed, whereby strategies along the value chain were also formulated and discussed. Results from the session were summarised as follows:

Table 8.5 Future strategies for the Namibian game meat value chain

Ansoff matrix	**Current products**	**New products**
Current markets	**Market penetration strategy** Increase volumes & prices in current markets Increase volumes of game meat sold to local markets	**Product development strategy** Include large game as export product Include chilled game as export product New value-added products
New markets	**Market development Strategy** Investigate/research new markets Create awareness in new markets	**Product diversification strategy** Game skins Game offal Other secondary businesses

3.2 Analyses along the value chain

A second approach was followed whereby analyses among the different actors operating in the value chain revealed the following strategies:-

3.2.1 Governance

A need exists for a conducive environment to be established by policy makers to improve and accelerate business development within the game meat sector. This should first of all entail a clear clarification of ownership of game within commercial and communal areas. As the game meat sector is in its infancy, policy makers should also protect intellectual property gained through research and development programmes. In order to execute all of these, it will become necessary to establish a national game meat export policy.

3.2.2 Production

As wildlife roams around freely, it can be advantageous to the producers, processors and traders of game / wildlife and game meat to be aligned with a national strategy for wildlife use. *S*ustainable production and harvesting of game should be promoted, as this is a natural resource which can be easily exploited if not handled properly. There is also a definite need for teachers and lecturers to provide expert advice to game producers, processors and traders. As certain areas of Namibia tend to have larger numbers of game than others, care should be taken that game is not over-exploited in easily accessible areas with large populations. It is imperative that all initiatives and endeavours include game producers in communal areas.

3.2.2 Processing

Suggestions were made to de-centralise the formal processing of game meat to remote areas, as this will aid job and wealth creation. Small collection centers, capable of maintaining the cold chain, can be constructed and incorporated into the formal game meat value chain. In line with this, the existing capacity and synergies for game processing should be utilized. As game meat is a biological product, it is of utmost importance that the industry should be regulated by the competent authorities.

3.2.3 Trade

There exists and opportunity to branding of game meat and game meat products to increase its selling value. However, consistency of supply is of utmost importance when a new market is developed. Special efforts should be made to improve marketing and sales of game meat.

3.2.4 Consumption

Many consumers are unaware of the wholesomeness of Namibian game meat and it will thus be essential to embark on an awareness campaign for game meat to increase sales and popularity. In line with this it would be of value to conduct consumer surveys on prices and products of game meat and venison.

4. Conclusion

Contributions received during the stakeholder meetings held during 2011 with the game meat value chain actors were extremely valuable in identifying the needs, opportunities and risks within the value chain. Apart from the economic analyses conducted on the game meat value chain, the following endeavours can also be pursued:

- Promotion of game meat nationally and internationally;
- Revision of current legislation pertaining to game meat and game meat products;
- Sourcing of funds for the operations of the Game Meat Association;
- Closer collaboration among the members of the envisaged Game Meat Association, stakeholders and the line Ministries.

GENERAL RECOMMENDATIONS AND CONCLUSIONS

1. Livestock and game farming

The economic analyses conducted in this study strongly recommend that livestock producers in all areas of Namibia should focus on including game farming as an enterprise, since;-

- Game populations are on the increase;
- Game farming is already an integral part of farming practices;
- Namibia is a natural habitat for game; and
- Game farming has a low production cost ratio.

However, it is of utmost importance that livestock producers increase the efficiency of game utilisation. Currently game occupies ± 30% of the available area on a farm, while it only realises ± 20% of the total income. Despite on-going growth in the game / wildlife industry, Namibian producers have clearly not engaged in wildlife-based land use to its full potential. The emphasis to generate income is still on livestock enterprises, which realises ± 80% of total income, yet only occupies 70% of the available farm area. Improved management of the co-existence of game and livestock on the same farm could result in improvement of the quality of livestock, as well as the control of game numbers.

Based on the information retrieved from the survey, it is evident that should producers farm with game only, they will be financially worse off than with the current mixed farming system. On the other side, should all the game on the farm be replaced by livestock, producers will have a better gross margin. However, this will increase stocking rate of livestock to ± 97%, which could be devastating to rangeland conditions and management. The conclusion from the calculated figures are that farms are overstocked, which cannot be sustainable in a country like Namibia with its dry climate.

One of the main objectives of the survey was to evaluate the labour productivity and more specifically the percentage of total labour cost allocated to the various enterprises. It was observed that neither commercial producers, nor communal producers had individual labourers allocated to a specific enterprise, but rather appointed a number of general farm workers suited

for all tasks. It was proven that farming conditions in Namibia is currently favourable, as depicted in the results from the economic / financial model of the study. Rangeland stocking rates are much too high. It can therefore be recommended that producers should rather focus on improving production cost ratios and efficiency of farming practices as these will ensure sustainability in the long run.

2. Wildlife uses

Current wildlife use conforms to Government policy. Uses and the different combinations thereof are practised differently depending on the locality and terrain. Current combinations of game / wildlife use will, however, change in future as landowners maximise returns on their land, while opting to spread risks within the constraints of resources and markets.

3. Game harvesting and processing

Harvesting quotas are allocated to game producers according to game counts compiled from farm visits by officials from the Ministry of Environment and Tourism. Long term studies of wildlife population dynamics and aerial surveys can produce more reliable results, but these approaches may be expensive and time consuming. More research into this topic is needed.

The current practice in Namibia of declaring a harvesting season for only a few winter months does not enable the local game producers to ensure a constant supply of game throughout the year to the game processing facilities, resulting in existing facilities being reluctant to commit processing capacity to game. The informal market for game harvesting, dressing and processing in Namibia is therefore huge as many of these processing activities are undertaken by biltong hunters from South Africa, who at times are also accompanied by their own harvesting teams.

Harvesting in communal areas is in itself not an impediment, as the supply is more than the demand. The procedure of organizing harvests on communal land must, however, be simplified. Decisions to allow harvesting are vested in a committee and not in an individual. The historical conditions that necessitated the restrictive provisions are not prevalent any longer. The continued applicability of the restrictive provisions is a serious obstacle to the

realization of the Namibian game meat potential in communal areas.

For commercial harvesting purposes only night harvesting is currently allowed by Government. However, it has been scientifically proven (Laubscher, 2009) that when a trained hunting team is used for harvesting, there are only small differences in pH values (determining meat quality) between game animals shot during the day and those shot during the night. It should be recommended to the Government to also allow day harvesting for commercial harvesting purposes, provided that game animals are shot and eviscerated hygienically.

Producer prices for game meat appeared to have increased significantly in recent years, from an average N$ 12.00/kg three years ago, to N$ 18.00/kg in 2011. Prices paid to producers for game meat are lower than prices paid for beef and lamb, since a portion of the price paid by the game meat handling facility is deducted for the services rendered by the harvesting team. Approximately 4 500 tonnes of game meat is used as food on farms. The food security benefit of game meat is unlikely to be threatened by the rising value of game meat as meat from lower value species and damaged meat from body shots will always be available for farm workers

4. Game meat markets

The demand for game meat from Africa is undeniably on the increase as it offers a healthy alternative to discerning customers. No official figures for game meat produced in Namibia are available, although it is estimated that close to 5 000 tonnes are produced annually. South Africa produced 43 500 tonnes, Zimbabwe 35 200 tonnes and Botswana 23 200 tonnes of game meat in 2010.

During 2010 and 2011 a total of 95 and 28 tonnes of de-boned springbok meat were exported to South Africa and the European Union, respectively. Whereas springbok meat is well known in international markets, meat of the larger game species is still unknown in overseas markets. To date no facility exists to export meat or processed meat products from large game species to overseas markets. A total of approximately 637 tonnes of biltong were exported to South Africa in 2011.

5. Value chain performance

The beef, lamb/mutton and game value chains were analysed and evaluated. It was found from the survey data that there is no uniformity in the approach to farming practices across the country. From the value chain analyses across different value chains, it was evident that the gross margin calculated for sheep production was the highest, followed by springbok, large game and cattle production. Processing of game meat for the South African market revealed that the gross margin calculated for processing of cattle was the highest, followed by sheep, springbok and then large game processing. Marketing and sales to the European Union revealed the highest gross margin calculation for beef marketing, followed by sheep, springbok and then large game marketing. When performance of the Namibian springbok meat value chain was compared to South Africa, it was evident that the South African value chain was more efficient.

6. Industry needs and constraints

A need for a common body to unite the game meat industry of Namibia in an association with the purpose of harmonizing strategies and viewpoints of the game meat industry was listed as the main priority. Other priorities to be addressed are:

- Sharing and dissemination of information;
- Formalisation of the game meat value chain;
- Simplifying of current regulations and processes; and
- Access to investment capital and incentives for investments.

7. Conclusion

There is scope for meat from communal conservancies south of the veterinary cordon fence to be included in the existing rudimentary export value chain for game meat, provided that regulations are favourable towards exports and prescribed conditions are followed. The formal game meat value chain is profitable and by increasing economies of scale, rural populations can also benefit from these developments. Increasing wealth and business opportunities in Namibia are crucial preconditions for political stability and sustainable growth of industries.

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ANNEXURES

1. Questionnaires for the Qualitative Research Survey:

    1.1 Game and livestock producers
    1.2 Game harvesting teams
    1.3 Game meat processors
    1.4 Game meat traders

2. Interviews

3. Summary of economic / financial model for livestock and game farming

ANNEXURE 1

1.1

ECONOMIC ANALYSES – GAME MEAT VALUE CHAIN
DRAFT QUESTIONNAIRE FOR PRODUCERS – JANUARY 2012

QUESTIONNAIRE OUTLINE

- Respondent General Information
- Game and Livestock Production Information

SECTION 1: RESPONDENT INFORMATION

1. **Name** _____

2. **Surname** _____

3. **Date of Birth** _____

4. **E-mail Address** _____

5. **Contact Number** _____

6. **Farm Name / Communal Area and Stand Nr.**
   _____

7. **Farm / Communal Area Size (ha)**
   _____

8. **Ownership of Farm / Communal Area**
   _____

9. **Enterprises from which Income is Generated**

   ☐ **Game (including tourism)**

   ☐ **Cattle**

☐ **Sheep**

☐ **Crops**

☐ **Goats**

☐ **Other (specify)** _____

10. Enterprise Contribution as Percentage (%) of Total Income

☐ **Game** _____

☐ **Cattle** _____

☐ **Sheep** _____

☐ **Goats** _____

☐ **Crops** _____

☐ **Other** _____

SECTION 2: GAME AND LIVESTOCK PRODUCTION

1. **List Game Species Prevalent on Farm /Communal Area**

   1) _____

   2) _____

   3) _____

   4) _____

   5) _____

   6) _____

   7) _____

   8) _____

   9) _____

   10) _____

2. **Carrying Capacity of Farm /Communal Area**

   a) **Ha/LSU (Hectare / Large Stock Unit)** _____

   b) **Ha/SSU (Hectare / Small Stock Unit)** _____

   c) **Hectare/Grazer-and/or Browser Unit**

      1) _____

      2) _____

      3) _____

      4) _____

      5) _____

      6) _____

7) _____

8) _____

9) _____

10) _____

3. Cattle Inventory (Reflected in Table Form)

Description	Number	Price/Live Weight Unit	Total Value
Cows			
Bulls			
Heifers			
Young Bulls			
Oxen			
Calves			

4. Sheep Inventory (Reflected in Table Form)

Description	Number	Price/Live Weight Unit	Total Value
Ewes			
Rams			
Replacement Ewes			
Replacement Rams			
Weathers			
Lambs			

5. Goat Inventory (Reflected in Table Form)

Description	Number	Price/Live Weight Unit	Total Value
Ewes			
Rams			
Replacement Ewes			
Replacement Rams			
Weathers			
Lambs			

6. Wildlife Inventory (Reflected in Table Form)

Description	Number	Price/Live Weight Unit	Total Value
1)			

2)			
3)			
4)			
5)			
6)			
7)			
8)			
9)			
10)			

7. **Marketing Channels through which Cattle/Sheep/Goats are Marketed**

☐ **Export Abattoir**

☐ **Local Abattoir**

☐ **Butcher**

☐ **Auction**

☐ **Live Exports**

8. **How is Income Generated from Game?**

☐ **Wildlife Viewing**

☐ **Hunting Tourism**

☐ **Trophy hunting**

☐ **Live Game**

☐ **Commercial Meat**

9. **Live Game is Usually Sold to:**

☐ **Commercial Farmers**

☐ **Local game dealers**

☐ **Export game dealers**

☐ **Auctions**

☐ **Other (specify)** _____

10. Game Harvested for Commercial Meat is Usually Sold to:

☐ **Local Butchers**

☐ **Private individuals**

☐ **Local Abattoirs**

☐ **Export Abattoirs**

☐ **Other (specify)** _____

11. Hides, Heads, Horns, Offal, Legs etc. is Usually Sold to: _____

12. Marketing Schedule of Cattle (Reflected in Table Form)

Description	Number Sold in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Bought in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Own Use
Cows									
Bulls									
Heifers									
Young Bulls									
Oxen									
Calves									

13. Marketing Schedule of Sheep (Reflected in Table Form)

Description	Number Sold in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Bought in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Own Use
Ewes									
Rams									
Replacement Ewes									
Replacement Rams									
Weathers									
Lambs									

14. Marketing Schedule of Goats (Reflected in Table Form)

Description	Number Sold in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Bought in past 12 Months	Animal Weight (kg)	N$/kg	Total Value	Number Own Use
Ewes									
Rams									
Replacement Ewes									
Replacement Rams									
Weathers									
Lambs									

15. Game Utilization Schedule (Reflected in Table Form)

Description		1)	2)	3)	4)	5)
Wildlife Viewing	Price Charged					
	Income Generated past 12 Months					
Hunting Tourism	Price Received per Animal					
	Number of Animals Hunted past 12 Months					

Trophy hunting	Price Received per Animal					
	Number of Animals Trophy Hunted past 12 Months					
Live Game	Live Animals Sold past 12 Months					
	N$/animal Received					
	Live Animals Bought past 12 Months					
	N$/animal Paid					
Commercial Meat	Number of Animals Harvested in past 12 Months					
	N$/kg Received					
	Price Received for Carcasses					
	Price Received for Hides					
	Price Received for Offal					
	Price Received for Heads					
	Price Received for Horns					
	Price Received for Legs/Hooves					
Number Own Use past 12 Months						

16. Direct Allocated Costs (Reflected in Table Form)

Directly Allocated Costs (Cattle)	Cost/Month	Cost/Annum	Cost/Animal
Lick			
Feed			

Veterinary Costs	Vaccine			
	Dose			
Transport Costs				
Marketing Costs				
Directly Allocated Costs (Sheep)		**Cost/Month**	**Cost/Annum**	**Cost/Animal**
Lick				
Feed				
Veterinary Costs	Vaccine			
	Dose			
Transport Costs				
Marketing Costs				
Directly Allocated Costs (Goat)		**Cost/Month**	**Cost/Annum**	**Cost/Animal**
Lick				
Feed				
Veterinary Costs	Vaccine			
	Dose			
Transport Costs				
Marketing Costs				
Directly Allocated Costs (Wildlife)		**Cost/Month**	**Cost/Annum**	**Cost/Animal**
Harvesting Cost/Contractors				
Harvesting Cost/Internal				
Tourist Catering Costs (Fuel, etc.)				
Live Game Costs (Transport, etc.)				

17. Labour Expenses (Reflected in Table Form)

Labour Expenses	Labourers Employed	Labourer Position	Wage Paid/Unit/Month	Additional employee benefits
Cattle Enterprise				
Sheep Enterprise				
Goat Enterprise				
Wildlife Enterprise				

18. General Farm Expenses (Reflected in Table Form)

General Expenses	Cost/Month	Cost/Annum
Fuel		
Repairs and Maintenance		
Land Tax		
Nampower		
Bookkeeper		
Insurance		
Medical Scheme		
Household Expenses		

19. Average rainfall per year in the area (mm)? _____

20. Effects of livestock on land degradation?

☐ **Low**

☐ **Medium**

☐ **High**

Comments:
_____

_____

21. Effects of game populations on land degradation?

☐ **Low**

☐ **Medium**

☐ **High**

Comments:

_____

_____

22. Opinion: Impact of land use (livestock and wildlife) on climate change in Namibia?

Comments:

_____

_____

23. Opinion: Impact of land use (livestock and wildlife) on livelihoods in Namibia?

Comments:

_____

_____

24. Opinion: Impact of HIV/AIDS on the livestock and wildlife sector on Namibia?

Comments:

_____

_____

25. Opinion: Impact of the mainstream climate change scenario on future businesses?

Comments:

_____

---

26. Impact of different uses on other ecosystem functions or services (Role the animal play in surrounding ecosystems, feeding of people, use of water, CO2 emission, use of chemical / nutritional additives, effect on plant growth / recovery etc.) ?

Comments:

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

ANNEXURE 1.2

ECONOMIC ANALYSES – GAME MEAT VALUE CHAIN

DRAFT QUESTIONNAIRE FOR PRODUCERS – JANUARY 2012

QUESTIONNAIRE OUTLINE

- Respondent General Information
- Game Harvesting Information

SECTION 1: RESPONDENT INFORMATION

1. **Name** _____
2. **Surname** _____
3. **Date of Birth** _____
4. **E-mail Address** _____
5. **Contact Number** _____
6. **Business name** _____
7. **Ownership of Business (Sole proprietor, Close Corporation, Private or Public Company)**

   _____

SECTION 2: GAME HARVESTING INFORMATION

1. **Registered with MET**

Yes		No	

2. **Number of game harvested**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

3. **Average prices paid for game per kg (N$)**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

4. **Operational cost 1) per game animal harvested (N$) or 2) per kg harvested (Please indicate)**

Costs	2007	2008	2009	2010	2011
Fuel					
Labour					
Breakages					
Food					
Accommodation/Camping					
Other					

5. **Average number of labourers employed per harvest**

	2007	2008	2009	2010	2011
Labourers					

6. **Average wage paid per labourer (N$ per harvest or per month (Please indicate))**

	2007	2008	2009	2010	2011
Wage					

7. **Average prices paid to farmer for game per kg (N$) (Skin on or skin off YES , NO)**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

8. **Prices paid for hides/skins (if applicable)**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

9. Prices paid for horns (if applicable)

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

10. Prices paid for offal (if applicable)

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

11. Effects of game populations on land degradation?

☐ **Low**

☐ **Medium**

☐ **High**

Comments:

_____

_____

12. Opinion: Impact of land use (livestock and wildlife) on climate change in Namibia?

Comments:

_____

_____

13. Opinion: Impact of land use (livestock and wildlife) on livelihoods in Namibia?

Comments:

_____

_____

14. Opinion: Effect of other wildlife uses on future business prospects?

Comments:

_____

_____

15. Opinion: Impact of HIV/AIDS on the livestock and wildlife sector on Namibia?

_____

_____

ANNEXURE 1.3

ECONOMIC ANALYSES – GAME MEAT VALUE CHAIN

DRAFT QUESTIONNAIRE FOR GAME PROCESSORS AND TRADERS

JANUARY 2012

QUESTIONNAIRE OUTLINE

- Respondent General Information
- Game Harvesting Information

SECTION 1: RESPONDENT INFORMATION

1. **Name** _____
2. **Surname** _____
3. **Date of Birth (optional)** _____
4. **E-mail Address** _____
5. **Contact Number** _____
6. **Business name** _____
7. **Ownership of Business (Sole proprietor, Close Corporation, Private or Public Company)**

   _____

SECTION 2: GAME PROCESSING AND TRADING INFORMATION

1. **Number of farmers involved in the game meat value chain from 2006 until now?**

	2006	2007	2008	2009	2010	2011
Number						

2. **Capacity of facility to process game meat on annual basis**

Species	Capacity / Number
Springbok	
Gemsbok	
Kudu	
Red hartebeest	
Eland	
Other	

3. **Number of game carcasses purchased and processed**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

4. **Demand for game meat (Number of carcasses or kg processed (Please indicate))**

Species	Local demand	International demand
Springbok		
Gemsbok		
Kudu		
Red hartebeest		
Eland		
Other		

5. **Average prices paid for game carcasses per kg (N$)**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

6. **Processing and trading costs (where applicable). Please indicate whether costs are <u>per annum, per animal or per kg (circle).</u>**

Costs	2007	2008	2009	2010	2011
De-boning, processing, packaging and storage costs					
Labour costs					
Transport costs to distributor/trader					
Marketing costs					
Other					
Total					

7. Average number of skilled and unskilled labourers employed for game processing

	2007	2008	2009	2010	2011
Unskilled					
Skilled					

8. Average wage per unskilled and skilled employee

	2007	2008	2009	2010	2011
Unskilled					
Skilled					

9. Selling prices of different game cuts (local)

	2007	2008	2009	2010	2011
Large game					
Rump					
Sir(loin)					
Silver side					
Top side					
Fillet					
T-flank					
Bolo					
Trimmings					
Bones					
Liver					
Offal					
Other					
Small game					

Leg					
Loin					
Fillet					
Trimmings					
Shanks					
Bone					
Liver					
Offal					
Other					

10. Selling prices of different game cuts (international)

	2007	2008	2009	2010	2011
Large game					
Rump					
Sir(loin)					
Silver side					
Top side					
Fillet					
T-flank					
Bolo					
Trimmings					
Bones					
Liver					
Offal					
Other					
Small game					
Leg					
Loin					
Fillet					

Trimmings					
Shanks					
Bone					
Liver					
Offal					
Other					

11. Investments made in game processing facilities as from 2006 until now (N$)?

	2006	**2007**	**2008**	**2009**	**2010**	**2011**
Domestic purposes						
EU and other markets						

12. Opinion: Impact of sustainability aspects (economic/social/environmental considerations by consumers) on future business prospects?

Economic	
Social	
Environmental	

13. Opinion: Impact of mainstream climate change scenario on future businesses prospects?

_____

_____

_____

14. Opinion: Impact of HIV/AIDS on the livestock and wildlife sector on Namibia?

_____

_____

_____

ANNEXURE 1.4

ECONOMIC ANALYSES – GAME MEAT VALUE CHAIN

DRAFT QUESTIONNAIRE FOR GAME MEAT BUYERS

JANUARY 2012

QUESTIONNAIRE OUTLINE

- Respondent General Information
- Game Meat Purchasing Information

SECTION 1: RESPONDENT INFORMATION

1. **Name** _____
2. **Surname** _____
3. **Date of Birth (optional)** _____
4. **E-mail Address** _____
5. **Contact Number** _____
6. **Business name** _____
7. **Ownership of Business (Sole proprietor, Close Corporation, Private or Public Company)**

   _____

8. **Namibian or international business** _____

SECTION 2: GAME PURCHASING INFORMATION

1. **Number of game carcasses or kg of game meat purchased**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					
Kudu					
Red hartebeest					
Eland					
Other					

2. **Demand for game meat (kg)**

Species	Local demand	International demand
Springbok		
Gemsbok		
Kudu		
Red hartebeest		
Eland		
Other		

3. **Average prices paid for game carcasses or cuts per kg (N$) (if applicable)**

Species	2007	2008	2009	2010	2011
Springbok					
Gemsbok					

Kudu					
Red hartebeest					
Eland					
Other					

4. Costs associated with the purchasing of game meat (where applicable). Please indicate whether costs are per annum, per animal or per kg (circle).

Costs	**2007**	**2008**	**2009**	**2010**	**2011**
Labour costs					
Transport costs					
Marketing costs					
Storage costs					
Other					
Total					

5. Average number of workers employed to purchase game meat?

	2007	**2008**	**2009**	**2010**	**2011**
Unskilled					
Skilled					

6. Average wages of workers employed to purchase game meat?

	2007	**2008**	**2009**	**2010**	**2011**
Unskilled					
Skilled					

7. Purchasing prices of different game cuts

	2007	2008	2009	2010	2011
Large game					
Rump					
Sir(loin)					
Silver side					
Top side					
Fillet					
T-flank					
Bolo					
Trimmings					
Bones					
Liver					
Offal					
Other					
Small game					
Leg					
Loin					
Fillet					
Trimmings					
Shanks					
Bone					
Liver					
Offal					
Other					

8. Opinion: Impact of mainstream climate change scenario on future businesses prospects?

_____

_____

9. **Opinion: Impact of sustainability aspects (economic/social/environmental considerations by consumers) on future business prospects?**

Economic	
Social	
Environmental	

10. **Opinion: Impact of HIV/AIDS on the game meat sector on Namibia?**

_____

_____

_____

ANNEXURE 2

LIST OF INTERVIEWEES

/Howoses, Hilga. !Khoadi Conservancy. Cell. 0812006973.

Anonymous. Commercial livestock and game producers .

Anonymous. Communal livestock and game producers.

Brown,Chris. Sustainable Solutions Trust. chrisbrown.namibia@gmail.com

Bruwer, Jaco Ben. Vasvat Skietspan. bruwerbj@telkomsa.net

Davidou, Kevin. Nakara. nakara@mweb.com.na

Dawids, Euphrasiw. Torra Conservancy. Cell. 0813311445

De Villiers, Charl. Mosstrich. cdevilliers@mosstrich.co.za

De Wet, Francois. Mosstrich. fdewet@mosstrich.co.za

DeHaan, Keith. Food and Livestock Planning Inc. keith@foodandlivestock.com

Deleersnyder, Luc. Deli-Ostrich. luc@deli-ostrich.com

Du Plessis, Fanie. Hartlief Corporation Ltd. nsduplessis@hartlief.com.na

Faschina, Nadine. GIZ. nadine.faschina@giz.de

Fourie, Herman. Closwa. herman@closwa.com

Fryer, Richard. IRDNS. Fryerr@africaonline.com.na

Gerber, Roger. Blackwing USA. RogerGerber@blackwing.com

Gurirab, Seth. Tsiseb Conservancy. Cell. 0811424220 / 0812946274

Kasupi, Redney. Sesfontein Conservancy. Cell. 0817109571

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Le Riche, Kabols. Just Lamb. kabols@justlamb.co.za

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Marais, Wittes. Mos-Mar Harvesting Team. leana@mweb.com.na

Matongo Greenwell. WWF. gmatongo@wwf.na

Mbomboro, Linus. Anabeb Conservancy. Cell. 0814210825

Moller, Wilma. MET. mollerwilma@yahoo.com

Mulder Reinhard. Just Lamb. Reinhard@justlamb.co.za

Mupetami Louisa. MET. lmupetami@met.na

Neethling, Piet. Camdeboo. piet@camdeboo.co.za

Rechter, Thomas. Gourmet Inn. gourmet@iway.na

Schutte, Jan. Namco. jan@namco.com.na

Shutz, Willie. Meat Board of Namibia. willie@nammic.com.na

Smith, Werdus. Koes Harvesting Team. werdussmith@gmail.com

Thompson, Chris. MET. chris.thompson188@gmail.com

Tjongarero, Lesley. Gaingu Conservancy. Cell. 0812116291

Uahengo, Toivo. MET. tuahengo@met.na

Uazukuani, John. Ozonahi Conservancy. Cell. 0816253944.

ANNEXURE 3

Description	North				South				East				West				Avg
	1	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Hectares	10,000	9,480	15,000	**34,480**	8,890	3,288	9,152	**21,330**	6,029	7,814	8,500	**22,343**	22,500	7,800	8,950	**39,250**	
LSU's - Game	405	225	216	**845**	59	100	39	**197**	266	432	283	**981**	279	134	316	**728**	
LSU's - Livestock	513	734	1,510	**2,757**	336	312	362	**1,010**	187	394	317	**898**	909	428	456	**1,793**	
Total LSU's	918	959	1,726	**3,603**	395	411	401	**1,207**	453	827	600	**1,880**	1,188	561	772	**2,521**	
Stocking rate Ha/LSU	10.9	9.9	8.7	**9.8**	22.5	8.0	22.8	**17.8**	13.3	9.5	14.2	**12.3**	18.9	13.9	11.6	**15.6**	
Carrying Capacity	10	10	10	**10**	24	12	18	**18**	10	10	12	**11**	18	12	10	**13**	
Stocking % Game	40.54 %	23.68 %	14.37 %	**26.20 %**	15.84 %	36.42 %	7.59%	**19.95 %**	44.17 %	55.31 %	39.92 %	**46.47 %**	22.31 %	20.57 %	35.28 %	**26.05 %**	**29.67 %**
Stocking % Livestock	51.31 %	77.43 %	100.67 %	**76.47 %**	90.73 %	113.69 %	71.27 %	**91.89 %**	31.02 %	50.48 %	44.75 %	**42.08 %**	72.69 %	65.82 %	50.98 %	**63.16 %**	**68.40 %**
Total Stocking %	**91.85 %**	**101.11 %**	**115.04 %**	**102.67 %**	**106.56 %**	**150.10 %**	**78.86 %**	**111.84 %**	**75.19 %**	**105.79 %**	**84.68 %**	**88.55 %**	**95.00 %**	**86.38 %**	**86.26 %**	**85.64 %**	**97.18 %**
Gross Margin Calculation																	
Income	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Game	250,110	279,850	977,600	**1,507,560**	275,500	79,200	62,560	**417,260**	1,127,780	287,500	81,800	**1,497,080**	438,068	78,392	323,870	**840,330**	
Cattle	755,000	1,257,000	5,089,500	**7,101,500**	310,080	598,950	360,000	**1,269,030**	1,115,400	362,338	526,180	**2,003,918**	51,200	1,201,840	1,094,350	**2,347,390**	
Sheep	0	0	0	**0**	302,320	91,840	303,744	**697,904**	0	161,174	0	**161,174**	3,305,960	0	0	**3,305,960**	
Goats	0	0	0	**0**	280,280	332,500	78,750	**691,530**	0	3,960	0	**3,960**	0	0	0	**0**	
Total	**1,005,110**	**1,536,850**	**6,067,100**	**8,609,060**	**1,168,180**	**1,102,490**	**805,054**	**3,075,724**	**2,243,180**	**814,972**	**607,980**	**3,666,132**	**3,795,228**	**1,280,232**	**1,418,220**	**6,493,680**	
Expenses																	
Direct Allocated Cost - Game	40,000	0	65,000	**105,000**	0	10,000	0	**10,000**	66,000	80,000	0	**146,000**	8,000	0	120,000	**128,000**	
Direct Allocated Cost - Cattle	133,000	167,000	4,237,500	**4,537,500**	16,800	36,000	12,000	**64,800**	854,000	113,127	67,500	**1,034,627**	7,700	86,500	265,000	**359,200**	
Direct Allocated Cost - Sheep	0	0	0	**0**	35,400	3,600	10,000	**49,000**	0	33,781	0	**33,781**	185,000	0	0	**185,000**	
Direct Allocated Cost - Goats	0	0	0	**0**	32,230	13,200	6,000	**51,430**	0	500	0	**500**	0	0	0	**0**	

General Expenses	460,528	559,600	791,000	**1,811,128**	305,600	135,580	238,000	**679,180**	498,334	186,600	325,800	**1,010,734**	387,000	392,200	348,600	**1,127,800**	
Labour Expenses	132,000	129,600	277,200	**538,800**	57,600	67,200	83,988	**208,788**	65,750	104,400	93,600	**263,750**	327,600	82,800	134,400	**544,800**	
Total	**765,528**	**856,200**	**5,370,700**	**6,992,428**	**447,630**	**265,580**	**349,988**	**1,063,198**	**1,484,084**	**518,408**	**486,900**	**2,489,392**	**915,300**	**561,500**	**868,000**	**2,344,800**	
Gross Margin	**239,582**	**680,650**	**696,400**	**1,616,632**	**720,550**	**836,910**	**455,066**	**2,012,526**	**759,096**	**296,564**	**121,080**	**1,176,740**	**2,879,928**	**718,732**	**550,220**	**4,148,880**	
Gross Margin %	**23.84%**	**44.29%**	**11.48%**	**18.78%**	**61.68%**	**75.91%**	**56.53%**	**65.43%**	**33.84%**	**36.39%**	**19.92%**	**32.10%**	**75.88%**	**56.14%**	**38.80%**	**63.89%**	
Capital Productivity	**31.30%**	**79.50%**	**12.97%**	**23.12%**	**160.97%**	**315.13%**	**130.02%**	**189.29%**	**51.15%**	**57.21%**	**24.87%**	**47.27%**	**314.64%**	**128.00%**	**63.39%**	**176.94%**	

Financial Information per Hectare

Income/ha	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Game	25.0	29.5	65.2	**43.7**	31.0	24.1	6.8	**19.6**	187.1	36.8	9.6	**67.0**	19.5	10.1	36.2	**21.4**	**37.92**
Cattle	75.5	132.6	339.3	**206.0**	34.9	182.2	39.3	**59.5**	185.0	46.4	61.9	**89.7**	2.3	154.1	122.3	**59.8**	**103.74**
Sheep	0.0	0.0	0.0	**0.0**	34.0	27.9	33.2	**32.7**	0.0	20.6	0.0	**7.2**	146.9	0.0	0.0	**84.2**	**31.04**
Goats	0.0	0.0	0.0	**0.0**	31.5	101.1	8.6	**32.4**	0.0	0.5	0.0	**0.2**	0.0	0.0	0.0	**0.0**	**8.15**
Total	**100.5**	**162.1**	**404.5**	**249.7**	**131.4**	**335.3**	**88.0**	**144.2**	**372.1**	**104.3**	**71.5**	**164.1**	**168.7**	**164.1**	**158.5**	**165.4**	**180.85**
Expenses/ha	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Direct Allocated Cost - Game	4.0	0.0	4.3	**3.0**	0.0	3.0	0.0	**0.5**	10.9	10.2	0.0	**6.5**	0.4	0.0	13.4	**3.3**	**3.33**
Direct Allocated Cost - Cattle	13.3	17.6	282.5	**131.6**	1.9	10.9	1.3	**3.0**	141.6	14.5	7.9	**46.3**	0.3	11.1	29.6	**9.2**	**47.52**
Direct Allocated Cost - Sheep	0.0	0.0	0.0	**0.0**	4.0	1.1	1.1	**2.3**	0.0	4.3	0.0	**1.5**	8.2	0.0	0.0	**4.7**	**2.13**
Direct Allocated Cost - Goats	0.0	0.0	0.0	**0.0**	3.6	4.0	0.7	**2.4**	0.0	0.1	0.0	**0.0**	0.0	0.0	0.0	**0.0**	**0.61**
General Expenses	46.1	59.0	52.7	**52.5**	34.4	41.2	26.0	**31.8**	82.7	23.9	38.3	**45.2**	17.2	50.3	38.9	**28.7**	**39.58**
Labour Expenses	13.2	13.7	18.5	**15.6**	6.5	20.4	9.2	**9.8**	10.9	13.4	11.0	**11.8**	14.6	10.6	15.0	**13.9**	
Total	**76.6**	**90.3**	**358.0**	**202.8**	**50.4**	**80.8**	**38.2**	**49.8**	**246.2**	**66.3**	**57.3**	**111.4**	**40.7**	**72.0**	**97.0**	**59.7**	**105.95**
Gross Margin/ha	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Game	21.0	29.5	60.8	**40.7**	31.0	21.0	6.8	**19.1**	176.1	26.6	9.6	**60.5**	19.1	10.1	22.8	**18.1**	**34.60**

Cattle	62.2	115.0	56.8	**74.4**	33.0	171.2	38.0	**56.5**	43.4	31.9	54.0	**43.4**	1.9	143.0	92.7	**50.7**	**56.21**
Sheep	0.0	0.0	0.0	**0.0**	30.0	26.8	32.1	**30.4**	0.0	16.3	0.0	**5.7**	138.7	0.0	0.0	**79.5**	**28.91**
Goats	0.0	0.0	0.0	**0.0**	27.9	97.1	7.9	**30.0**	0.0	0.4	0.0	**0.2**	0.0	0.0	0.0	**0.0**	**7.54**
Gross Margin/ha	**83.2**	**144.5**	**117.6**	**115.0**	**121.9**	**316.2**	**84.9**	**136.0**	**219.5**	**75.2**	**63.6**	**109.7**	**159.8**	**153.0**	**115.4**	**148.3**	**127.26**
Cash Flow Surplus/ha	**24.0**	**71.8**	**46.4**	**46.9**	**81.1**	**254.5**	**49.7**	**94.4**	**125.9**	**38.0**	**14.2**	**52.7**	**128.0**	**92.1**	**61.5**	**105.7**	**74.90**

Enterprise Contribution to Income

Percentage Contribution	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Game	24.9%	18.2%	16.1%	**17.5%**	23.6%	7.2%	7.8%	**13.6%**	50.3%	35.3%	13.5%	**40.8%**	11.5%	6.1%	22.8%	**12.9%**	**21.21%**
Cattle	75.1%	81.8%	83.9%	**82.5%**	26.5%	54.3%	44.7%	**41.3%**	49.7%	44.5%	86.5%	**54.7%**	1.3%	93.9%	77.2%	**36.1%**	**53.64%**
Sheep	0.0%	0.0%	0.0%	**0.0%**	25.9%	8.3%	37.7%	**22.7%**	0.0%	19.8%	0.0%	**4.4%**	87.1%	0.0%	0.0%	**50.9%**	**19.50%**
Goats	0.0%	0.0%	0.0%	**0.0%**	24.0%	30.2%	9.8%	**22.5%**	0.0%	0.5%	0.0%	**0.1%**	0.0%	0.0%	0.0%	**0.0%**	**5.65%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.00%**

Contribution to Expenses

Expense Contribution	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	**1**	**2**	**3**	**Total**	
Direct Allocated Cost - Game	5.2%	0.0%	1.2%	**1.5%**	0.0%	3.8%	0.0%	**0.9%**	4.4%	15.4%	0.0%	**5.9%**	0.9%	0.0%	13.8%	**5.5%**	**3.44%**
Direct Allocated Cost - Cattle	17.4%	19.5%	78.9%	**64.9%**	3.8%	13.6%	3.4%	**6.1%**	57.5%	21.8%	13.9%	**41.6%**	0.8%	15.4%	30.5%	**15.3%**	**31.97%**
Direct Allocated Cost - Sheep	0.0%	0.0%	0.0%	**0.0%**	7.9%	1.4%	2.9%	**4.6%**	0.0%	6.5%	0.0%	**1.4%**	20.2%	0.0%	0.0%	**7.9%**	**3.46%**
Direct Allocated Cost - Goats	0.0%	0.0%	0.0%	**0.0%**	7.2%	5.0%	1.7%	**4.8%**	0.0%	0.1%	0.0%	**0.0%**	0.0%	0.0%	0.0%	**0.0%**	**1.21%**
General Expenses	60.2%	65.4%	14.7%	**25.9%**	68.3%	51.1%	68.0%	**63.9%**	33.6%	36.0%	66.9%	**40.6%**	42.3%	69.8%	40.2%	**48.1%**	**44.62%**
Labour Expenses	17.2%	15.1%	5.2%	**7.7%**	12.9%	25.3%	24.0%	**19.6%**	4.4%	20.1%	19.2%	**10.6%**	35.8%	14.7%	15.5%	**23.2%**	**15.29%**
Total	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.0%**	**100.00%**

Production Cost Ratio

Production Cost Ratio	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total	
Game	16.0%	-	6.6%	**7.0%**	-	12.6%	-	**2.4%**	5.9%	27.8%	-	**9.8%**	1.8%	-	37.1%	**15.2%**	**8.59%**
Cattle	17.6%	13.3%	83.3%	**63.9%**	5.4%	6.0%	3.3%	**5.1%**	76.6%	31.2%	12.8%	**51.6%**	15.0%	7.2%	24.2%	**15.3%**	**33.98 %**
Sheep	-	-	-	**-**	11.7%	3.9%	3.3%	**7.0%**	-	21.0%	-	**21.0%**	5.6%	-	-	**5.6%**	**11.19 %**
Goats	-	-	-	**-**	11.5%	4.0%	7.6%	**7.4%**	-	12.6%	-	**12.6%**	-	-	-	**-**	**10.03 %**
Total (Scale Considered)	**17.2%**	**10.9%**	**70.9%**	**53.9%**	**7.2%**	**5.7%**	**3.5%**	**5.7%**	**41.0%**	**27.9%**	**11.1%**	**33.1%**	**5.3%**	**6.8%**	**27.1%**	**10.4%**	**25.78 %**

Expenses as % of Total Income

Percentage Expenses	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total	
Direct Allocated Cost - Game	4.0%	0.0%	1.1%	**1.2%**	0.0%	0.9%	0.0%	**0.3%**	2.9%	9.8%	0.0%	**4.0%**	0.2%	0.0%	8.5%	**2.0%**	**1.87%**
Direct Allocated Cost - Cattle	13.2%	10.9%	69.8%	**52.7%**	1.4%	3.3%	1.5%	**2.1%**	38.1%	13.9%	11.1%	**28.2%**	0.2%	6.8%	18.7%	**5.5%**	**22.14 %**
Direct Allocated Cost - Sheep	0.0%	0.0%	0.0%	**0.0%**	3.0%	0.3%	1.2%	**1.6%**	0.0%	4.1%	0.0%	**0.9%**	4.9%	0.0%	0.0%	**2.8%**	**1.34%**
Direct Allocated Cost - Goats	0.0%	0.0%	0.0%	**0.0%**	2.8%	1.2%	0.7%	**1.7%**	0.0%	0.1%	0.0%	**0.0%**	0.0%	0.0%	0.0%	**0.0%**	**0.42%**
General Expenses	45.8%	36.4%	13.0%	**21.0%**	26.2%	12.3%	29.6%	**22.1%**	22.2%	22.9%	53.6%	**27.6%**	10.2%	30.6%	24.6%	**17.4%**	**22.01 %**
Labour Expenses	13.1%	8.4%	4.6%	**6.3%**	4.9%	6.1%	10.4%	**6.8%**	2.9%	12.8%	15.4%	**7.2%**	8.6%	6.5%	9.5%	**8.4%**	**7.16%**
Total Expenses	**76.2%**	**55.7%**	**88.5%**	**81.2%**	**38.3%**	**24.1%**	**43.5%**	**34.6%**	**66.2%**	**63.6%**	**80.1%**	**67.9%**	**24.1%**	**43.9%**	**61.2%**	**36.1%**	**54.95 %**

Labour Expenses

Labour Productivity	1	2	3	Total	1	2	3	Total	1	2	3	Total	1	2	3	Total	
Number of Labourers	10	9	22		4	4	6		4	7	6		15	6	8		
Average Salary/Labourer	1,100.0	1,200.0	1,050.0		1,200.0	1,400.0	1,083.3		1,096.0	1,275.0	1,300.0		5,850.0	1,150.0	1,400.0		
Total Labour Expenses	132,000.0	129,600.0	277,200.0	**538,800.0**	57,600.0	67,200.0	83,988.0	**208,788.0**	65,750.0	104,400.0	93,600.0	**263,750.0**	327,600.0	82,800.0	134,400.0	**544,800.0**	
Labour Productivity	83,211.0	152,205.6	80,209.1		270,937.5	259,922.5	129,509.0		330,795.0	83,937.7	90,080.0		239,635.2	198,955.3	129,152.5		

Percentage of Income	**13.1%**	**8.4%**	**4.6%**	**6.3%**	**4.9%**	**6.1%**	**10.4%**	**6.8%**	**2.9%**	**12.8%**	**15.4%**	**7.2%**	**8.6%**	**6.5%**	**9.5%**	**8.4%**	**7.16%**

Income from Game and Livestock Individually																	
Income per Game LSU	617	1,246	4,534	**1,783**	4,696	794	1,622	**2,118**	4,235	665	289	**1,526**	1,571	586	1,026	**1,154**	
Income per Livestock LSU	1,471	1,713	3,371	**2,576**	2,656	3,285	2,049	**2,632**	5,965	1,337	1,660	**2,414**	3,695	2,809	2,399	**3,154**	
Income from Game only	566,696	1,194,680	7,824,427	**6,423,617**	1,853,677	326,457	650,195	**2,556,129**	1,919,639	549,875	173,494	**2,867,698**	1,864,982	329,244	791,812	**2,908,410**	
Income from Livestock only	1,351,466	1,641,521	5,816,186	**9,279,249**	1,048,514	1,351,064	821,540	**3,177,089**	2,703,973	1,105,454	995,585	**4,538,234**	4,387,821	1,577,419	1,851,767	**7,950,495**	
Expenses	765,528	856,200	5,370,700	**6,992,428**	447,630	265,580	349,988	**1,063,198**	1,484,084	518,408	486,900	**2,489,392**	915,300	561,500	868,000	**2,344,800**	
Gross Margin Game Only	-198,832	338,480	2,453,727	**-568,811**	1,406,047	60,877	300,207	**1,492,931**	435,555	31,467	-313,406	**378,306**	949,682	-232,256	-76,188	**563,610**	
Gross Margin Livestock Only	585,938	785,321	445,486	**2,286,821**	600,884	1,085,484	471,552	**2,113,891**	1,219,889	587,046	508,685	**2,048,842**	3,472,521	1,015,919	983,767	**5,605,695**	
Gross Margin % Game	-35%	28%	31%	**-9%**	76%	19%	46%	**58%**	23%	6%	-181%	**13%**	51%	-71%	-10%	**19%**	**21%**
Gross Margin % Livestock	43%	48%	8%	**25%**	57%	80%	57%	**67%**	45%	53%	51%	**45%**	79%	64%	53%	**71%**	**52%**